# Table of Contents

## 1 Brief Overview ........................................... 1
  1.1 Gnulib Basics............................................ 1  
  1.2 Git Checkout............................................. 1  
  1.3 Keeping Up-to-date...................................... 2  
  1.4 Contributing to Gnulib.................................. 2  
    1.4.1 Gnulib licensing................................... 2  
    1.4.2 Indent with spaces not TABs....................... 2  
    1.4.3 How to add a new module.......................... 3  
  1.5 Portability guidelines.................................. 4  
    1.5.1 C language versions................................ 4  
    1.5.2 C99 features assumed by Gnulib................... 5  
    1.5.3 C99 features avoided by Gnulib................... 5  
    1.5.4 Other portability assumptions made by Gnulib..... 6  
  1.6 High Quality............................................ 7  
    1.6.1 Stable Branches..................................... 7  
    1.6.2 Writing reliable code................................ 8  
  1.7 Join the GNU Project.................................... 8

## 2 Philosophy................................................. 10
  2.1 Benefits of using Gnulib................................. 10  
  2.2 Library vs. Reusable Code............................... 10  
  2.3 Portability and Application Code....................... 10  
  2.4 Target Platforms........................................ 11  
    2.4.1 Supported Platforms................................ 11  
    2.4.2 Formerly Supported Platforms....................... 12  
    2.4.3 Unsupported Platforms............................... 12  
  2.5 Modules.................................................. 13  
  2.6 Various Kinds of Modules................................. 14  
    2.6.1 Support for ISO C or POSIX functions................ 14  
    2.6.2 Enhancements of ISO C or POSIX functions........... 15  
    2.6.3 Portable general use facilities..................... 15  
    2.6.4 Reusable application code.......................... 15  
    2.6.5 Object oriented classes............................. 15  
    2.6.6 Interfaces to external libraries.................... 15  
    2.6.7 Build / maintenance infrastructure............... 15  
  2.7 Collaborative Development............................... 16  
  2.8 Copyright.............................................. 16  
  2.9 Steady Development..................................... 17  
  2.10 Openness............................................... 17

## 3 Invoking gnulib-tool...................................... 18
  3.1 Finding modules.......................................... 18
9 ISO C and POSIX Header File Substitutes . . 52

9.1 aio.h ................................................................. 52
9.2 arpa/inet.h ......................................................... 52
9.3 assert.h ............................................................. 52
9.4 complex.h .......................................................... 53
9.5 cpio.h ............................................................... 53
9.6 ctype.h .............................................................. 53
9.7 dirent.h ............................................................. 54
9.8 dlfcn.h ............................................................... 54
9.9 errno.h ............................................................... 54
9.10 fnctl.h ............................................................... 55
9.11 fenv.h ............................................................... 56
9.12 float.h ............................................................... 57
9.13 fmtmsg.h ............................................................. 57
9.14 fnmatch.h .......................................................... 57
9.15 ftw.h ............................................................... 57
9.16 glob.h ............................................................... 58
9.17 grp.h ............................................................... 58
9.18 iconv.h ............................................................. 58
9.19 inttypes.h .......................................................... 58
9.20 iso646.h ............................................................ 59
9.21 langinfo.h .......................................................... 59
9.22 libgen.h ............................................................ 59
9.23 limits.h ............................................................. 60
9.24 locale.h ............................................................ 60
9.25 math.h .............................................................. 61
9.26 monetary.h .......................................................... 61
9.27 mqueue.h ........................................................... 62
9.28 ndbm.h ............................................................... 62
9.29 net/if.h ............................................................. 62
9.30 netdb.h ............................................................. 62
9.31 netinet/in.h ......................................................... 63
9.32 netinet/tcp.h ....................................................... 63
9.33 nl_types.h .......................................................... 63
9.34 poll.h .............................................................. 63
9.35 pthread.h .......................................................... 64
9.36 pwd.h ............................................................... 64
9.37 regex.h ............................................................. 64
9.38 sched.h ............................................................. 64
9.39 search.h ........................................................... 65
9.40 semaphore.h ......................................................... 65
9.41 setjmp.h ............................................................. 65
9.42 signal.h ............................................................. 65
9.43 spawn.h ............................................................. 66
9.44 stdalign.h .......................................................... 66
9.45 stdarg.h ............................................................. 67
| 9.46 | stdatomic.h | 67 |
| 9.47 | stdbool.h | 68 |
| 9.48 | stdc dint.h | 68 |
| 9.49 | stddef.h | 69 |
| 9.50 | stdint.h | 69 |
| 9.51 | stdio.h | 70 |
| 9.52 | stdlib.h | 71 |
| 9.53 | stdnoreturn.h | 71 |
| 9.54 | string.h | 72 |
| 9.55 | strings.h | 72 |
| 9.56 | stropts.h | 73 |
| 9.57 | sys/ipc.h | 73 |
| 9.58 | sys/mman.h | 73 |
| 9.59 | sys/msg.h | 73 |
| 9.60 | sys/resource.h | 74 |
| 9.61 | sys/select.h | 74 |
| 9.62 | sys/sem.h | 74 |
| 9.63 | sys/shm.h | 75 |
| 9.64 | sys/socket.h | 75 |
| 9.65 | sys/stat.h | 75 |
| 9.66 | sys/statvfs.h | 76 |
| 9.67 | sys/time.h | 77 |
| 9.68 | sys/timeb.h | 77 |
| 9.69 | sys/times.h | 77 |
| 9.70 | sys/types.h | 78 |
| 9.71 | sys/uio.h | 78 |
| 9.72 | sys/un.h | 78 |
| 9.73 | sys/utsname.h | 79 |
| 9.74 | sys/wait.h | 79 |
| 9.75 | syslog.h | 79 |
| 9.76 | tar.h | 79 |
| 9.77 | termios.h | 80 |
| 9.78 | tgmath.h | 80 |
| 9.79 | threads.h | 80 |
| 9.80 | time.h | 81 |
| 9.81 | trace.h | 81 |
| 9.82 | uchar.h | 81 |
| 9.83 | ucontext.h | 82 |
| 9.84 | ulimit.h | 82 |
| 9.85 | unistd.h | 82 |
| 9.86 | utime.h | 83 |
| 9.87 | utmpx.h | 83 |
| 9.88 | wchar.h | 83 |
| 9.89 | wctype.h | 84 |
| 9.90 | wordexp.h | 84 |
10 ISO C and POSIX Function Substitutes... 85

<table>
<thead>
<tr>
<th>Section</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.1</td>
<td>FD_CLR</td>
</tr>
<tr>
<td>10.2</td>
<td>FD_ISSET</td>
</tr>
<tr>
<td>10.3</td>
<td>FD_SET</td>
</tr>
<tr>
<td>10.4</td>
<td>FD_ZERO</td>
</tr>
<tr>
<td>10.5</td>
<td>_Exit</td>
</tr>
<tr>
<td>10.6</td>
<td>_exit</td>
</tr>
<tr>
<td>10.7</td>
<td>_longjmp</td>
</tr>
<tr>
<td>10.8</td>
<td>_setjmp</td>
</tr>
<tr>
<td>10.9</td>
<td>_tolower</td>
</tr>
<tr>
<td>10.10</td>
<td>_toupper</td>
</tr>
<tr>
<td>10.11</td>
<td>a64l</td>
</tr>
<tr>
<td>10.12</td>
<td>abort</td>
</tr>
<tr>
<td>10.13</td>
<td>abs</td>
</tr>
<tr>
<td>10.14</td>
<td>accept</td>
</tr>
<tr>
<td>10.15</td>
<td>access</td>
</tr>
<tr>
<td>10.16</td>
<td>acos</td>
</tr>
<tr>
<td>10.17</td>
<td>acosf</td>
</tr>
<tr>
<td>10.18</td>
<td>acosh</td>
</tr>
<tr>
<td>10.19</td>
<td>acoshf</td>
</tr>
<tr>
<td>10.20</td>
<td>acosh1</td>
</tr>
<tr>
<td>10.21</td>
<td>acosl</td>
</tr>
<tr>
<td>10.22</td>
<td>aio_cancel</td>
</tr>
<tr>
<td>10.23</td>
<td>aio_error</td>
</tr>
<tr>
<td>10.24</td>
<td>aio_fsync</td>
</tr>
<tr>
<td>10.25</td>
<td>aio_read</td>
</tr>
<tr>
<td>10.26</td>
<td>aio_return</td>
</tr>
<tr>
<td>10.27</td>
<td>aio_suspend</td>
</tr>
<tr>
<td>10.28</td>
<td>aio_write</td>
</tr>
<tr>
<td>10.29</td>
<td>alarm</td>
</tr>
<tr>
<td>10.30</td>
<td>aligned_alloc</td>
</tr>
<tr>
<td>10.31</td>
<td>alphasort</td>
</tr>
<tr>
<td>10.32</td>
<td>asctime</td>
</tr>
<tr>
<td>10.33</td>
<td>asctime_r</td>
</tr>
<tr>
<td>10.34</td>
<td>asin</td>
</tr>
<tr>
<td>10.35</td>
<td>asinf</td>
</tr>
<tr>
<td>10.36</td>
<td>asinh</td>
</tr>
<tr>
<td>10.37</td>
<td>asinhf</td>
</tr>
<tr>
<td>10.38</td>
<td>asinh1</td>
</tr>
<tr>
<td>10.39</td>
<td>asinl</td>
</tr>
<tr>
<td>10.40</td>
<td>assert</td>
</tr>
<tr>
<td>10.41</td>
<td>atan</td>
</tr>
<tr>
<td>10.42</td>
<td>atan2</td>
</tr>
<tr>
<td>10.43</td>
<td>atan2f</td>
</tr>
<tr>
<td>10.44</td>
<td>atan2l</td>
</tr>
<tr>
<td>10.45</td>
<td>atanf</td>
</tr>
<tr>
<td>Page</td>
<td>Function</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
</tr>
<tr>
<td>10.46</td>
<td>atanh</td>
</tr>
<tr>
<td>10.47</td>
<td>atanhf</td>
</tr>
<tr>
<td>10.48</td>
<td>atanh1</td>
</tr>
<tr>
<td>10.49</td>
<td>atanl</td>
</tr>
<tr>
<td>10.50</td>
<td>atexit</td>
</tr>
<tr>
<td>10.51</td>
<td>atof</td>
</tr>
<tr>
<td>10.52</td>
<td>atoi</td>
</tr>
<tr>
<td>10.53</td>
<td>atol</td>
</tr>
<tr>
<td>10.54</td>
<td>atoll</td>
</tr>
<tr>
<td>10.55</td>
<td>basename</td>
</tr>
<tr>
<td>10.56</td>
<td>bind</td>
</tr>
<tr>
<td>10.57</td>
<td>bsearch</td>
</tr>
<tr>
<td>10.58</td>
<td>btowc</td>
</tr>
<tr>
<td>10.59</td>
<td>c8rtomb</td>
</tr>
<tr>
<td>10.60</td>
<td>c16rtomb</td>
</tr>
<tr>
<td>10.61</td>
<td>c32rtomb</td>
</tr>
<tr>
<td>10.62</td>
<td>cabs</td>
</tr>
<tr>
<td>10.63</td>
<td>cabsf</td>
</tr>
<tr>
<td>10.64</td>
<td>cabsl</td>
</tr>
<tr>
<td>10.65</td>
<td>cacos</td>
</tr>
<tr>
<td>10.66</td>
<td>cacosf</td>
</tr>
<tr>
<td>10.67</td>
<td>cacosl</td>
</tr>
<tr>
<td>10.68</td>
<td>cacosfhl</td>
</tr>
<tr>
<td>10.69</td>
<td>cacosfhl</td>
</tr>
<tr>
<td>10.70</td>
<td>cacosl</td>
</tr>
<tr>
<td>10.71</td>
<td>calc</td>
</tr>
<tr>
<td>10.72</td>
<td>call_once</td>
</tr>
<tr>
<td>10.73</td>
<td>canonicalize</td>
</tr>
<tr>
<td>10.74</td>
<td>canonicalizef</td>
</tr>
<tr>
<td>10.75</td>
<td>canonicalizef</td>
</tr>
<tr>
<td>10.76</td>
<td>carg</td>
</tr>
<tr>
<td>10.77</td>
<td>cargf</td>
</tr>
<tr>
<td>10.78</td>
<td>cargl</td>
</tr>
<tr>
<td>10.79</td>
<td>casin</td>
</tr>
<tr>
<td>10.80</td>
<td>casinf</td>
</tr>
<tr>
<td>10.81</td>
<td>casinh</td>
</tr>
<tr>
<td>10.82</td>
<td>casinhf</td>
</tr>
<tr>
<td>10.83</td>
<td>casinhl</td>
</tr>
<tr>
<td>10.84</td>
<td>casinl</td>
</tr>
<tr>
<td>10.85</td>
<td>catan</td>
</tr>
<tr>
<td>10.86</td>
<td>catanf</td>
</tr>
<tr>
<td>10.87</td>
<td>catanh</td>
</tr>
<tr>
<td>10.88</td>
<td>catanhf</td>
</tr>
<tr>
<td>10.89</td>
<td>catanhl</td>
</tr>
<tr>
<td>10.90</td>
<td>catanl</td>
</tr>
<tr>
<td>10.91</td>
<td>catclose</td>
</tr>
<tr>
<td>10.92</td>
<td>catgets</td>
</tr>
<tr>
<td>Function</td>
<td>Page</td>
</tr>
<tr>
<td>------------------</td>
<td>------</td>
</tr>
<tr>
<td>catopen</td>
<td>110</td>
</tr>
<tr>
<td>cbrt</td>
<td>110</td>
</tr>
<tr>
<td>cbrtf</td>
<td>110</td>
</tr>
<tr>
<td>cbrtl</td>
<td>110</td>
</tr>
<tr>
<td>ccos</td>
<td>111</td>
</tr>
<tr>
<td>ccosf</td>
<td>111</td>
</tr>
<tr>
<td>ccosh</td>
<td>111</td>
</tr>
<tr>
<td>ccoshf</td>
<td>111</td>
</tr>
<tr>
<td>ccoshl</td>
<td>112</td>
</tr>
<tr>
<td>ccosl</td>
<td>112</td>
</tr>
<tr>
<td>ceil</td>
<td>112</td>
</tr>
<tr>
<td>ceilf</td>
<td>112</td>
</tr>
<tr>
<td>ceill</td>
<td>113</td>
</tr>
<tr>
<td>cexp</td>
<td>113</td>
</tr>
<tr>
<td>cexpf</td>
<td>113</td>
</tr>
<tr>
<td>cexpl</td>
<td>114</td>
</tr>
<tr>
<td>cfgetispeed</td>
<td>114</td>
</tr>
<tr>
<td>cfgetospeed</td>
<td>114</td>
</tr>
<tr>
<td>cfsetispeed</td>
<td>114</td>
</tr>
<tr>
<td>cfsetospeed</td>
<td>115</td>
</tr>
<tr>
<td>chdir</td>
<td>115</td>
</tr>
<tr>
<td>chmod</td>
<td>115</td>
</tr>
<tr>
<td>chown</td>
<td>115</td>
</tr>
<tr>
<td>cimag</td>
<td>116</td>
</tr>
<tr>
<td>cimagf</td>
<td>116</td>
</tr>
<tr>
<td>cimagl</td>
<td>116</td>
</tr>
<tr>
<td>clearerr</td>
<td>117</td>
</tr>
<tr>
<td>clock</td>
<td>117</td>
</tr>
<tr>
<td>clock_gettime</td>
<td>117</td>
</tr>
<tr>
<td>clock_gettime</td>
<td>118</td>
</tr>
<tr>
<td>clock_gettime</td>
<td>118</td>
</tr>
<tr>
<td>clock_nanosleep</td>
<td>118</td>
</tr>
<tr>
<td>clock_settime</td>
<td>118</td>
</tr>
<tr>
<td>clog</td>
<td>119</td>
</tr>
<tr>
<td>clogf</td>
<td>119</td>
</tr>
<tr>
<td>clogfl</td>
<td>119</td>
</tr>
<tr>
<td>close</td>
<td>119</td>
</tr>
<tr>
<td>closedir</td>
<td>120</td>
</tr>
<tr>
<td>closedir</td>
<td>120</td>
</tr>
<tr>
<td>closelog</td>
<td>120</td>
</tr>
<tr>
<td>cnd_broadcast</td>
<td>120</td>
</tr>
<tr>
<td>cnd_destroy</td>
<td>120</td>
</tr>
<tr>
<td>cnd_init</td>
<td>121</td>
</tr>
<tr>
<td>cnd_signal</td>
<td>121</td>
</tr>
<tr>
<td>cnd_timedwait</td>
<td>121</td>
</tr>
<tr>
<td>cnd_wait</td>
<td>121</td>
</tr>
<tr>
<td>confstr</td>
<td>122</td>
</tr>
<tr>
<td>conj</td>
<td>122</td>
</tr>
</tbody>
</table>
10.140 conjf ................................................................. 122
10.141 conjl ................................................................. 122
10.142 connect ............................................................. 123
10.143 copsygn ............................................................ 123
10.144 copsygnf ........................................................... 123
10.145 copsygnl ........................................................... 123
10.146 cos ................................................................. 124
10.147 cosf ............................................................... 124
10.148 cosh ............................................................... 124
10.149 coshf ............................................................. 124
10.150 coshl ............................................................. 125
10.151 cosl .............................................................. 125
10.152 cpow ............................................................. 125
10.153 cpowf ............................................................ 125
10.154 cpowl ............................................................ 126
10.155 cproj ............................................................. 126
10.156 cprojf ........................................................... 126
10.157 cprojl ........................................................... 126
10.158 creal ............................................................. 127
10.159 crealf ........................................................... 127
10.160 creall .......................................................... 127
10.161 creat ........................................................... 127
10.162 crypt ............................................................ 128
10.163 csin .............................................................. 128
10.164 csinf ........................................................... 128
10.165 csinh .......................................................... 129
10.166 csinhf .......................................................... 129
10.167 csinhl ......................................................... 129
10.168 csinl .......................................................... 129
10.169 csqrt .......................................................... 130
10.170 csqrtf ........................................................ 130
10.171 csqrtl ......................................................... 130
10.172 ctan ............................................................ 130
10.173 ctanf ........................................................... 131
10.174 ctanh .......................................................... 131
10.175 ctanhf ......................................................... 131
10.176 ctanhl ......................................................... 131
10.177 ctanl .......................................................... 132
10.178 ctermid ......................................................... 132
10.179 ctime .......................................................... 132
10.180 ctime_r ........................................................... 133
10.181 daddl ........................................................... 133
10.182 daylight .......................................................... 133
10.183 dbm_clearerr .................................................. 134
10.184 dbm_close ..................................................... 134
10.185 dbm_delete ..................................................... 134
10.186 dbm_error ...................................................... 134
10.187  dbm_fetch .................................................. 135
10.188  dbm_firstkey ............................................. 135
10.189  dbm_nextkey ............................................. 135
10.190  dbm_open .................................................. 135
10.191  dbm_store .................................................. 136
10.192  ddivl ....................................................... 136
10.193  difftime .................................................... 136
10.194  dirfd ...................................................... 136
10.195  dirname ..................................................... 137
10.196  div ........................................................ 137
10.197  dlclose ...................................................... 137
10.198  dlopen ..................................................... 137
10.199  dlsym ....................................................... 138
10.200  encrypt ..................................................... 138
10.201  dlerror ...................................................... 139
10.202  dprintf .................................................... 140
10.203  dprintf .................................................... 140
10.204  dprintf .................................................... 140
10.205  dup ........................................................ 140
10.206  dup2 ....................................................... 140
10.207  duplocale ................................................... 141
10.208  encrypt ..................................................... 141
10.209  dprintf .................................................... 141
10.210  dprintf .................................................... 142
10.211  dprintf .................................................... 142
10.212  dprintf .................................................... 142
10.213  dprintf .................................................... 143
10.214  dprintf .................................................... 143
10.215  dprintf .................................................... 143
10.216  dprintf .................................................... 143
10.217  dprintf .................................................... 144
10.218  dprintf .................................................... 144
10.219  dprintf .................................................... 144
10.220  dprintf .................................................... 144
10.221  dprintf .................................................... 145
10.222  dprintf .................................................... 145
10.223  dprintf .................................................... 145
10.224  dprintf .................................................... 145
10.225  dprintf .................................................... 146
10.226  dprintf .................................................... 146
10.227  dprintf .................................................... 146
10.228  dprintf .................................................... 147
10.229  dprintf .................................................... 147
10.230  dprintf .................................................... 148
10.231  exit ........................................................ 148
10.232  exec ....................................................... 148
10.233  exp ........................................................ 149
10.234 exp2f......................................................... 149
10.235 exp2l......................................................... 149
10.236 expf......................................................... 150
10.237 expl......................................................... 150
10.238 expml....................................................... 150
10.239 expmf....................................................... 151
10.240 expml....................................................... 151
10.241 fabs......................................................... 151
10.242 fabsf....................................................... 151
10.243 fabsl....................................................... 152
10.244 accessat.................................................. 152
10.245 fadd......................................................... 153
10.246 faddl....................................................... 153
10.247 fopen....................................................... 153
10.248 fchdir..................................................... 153
10.249 fchmod..................................................... 154
10.250 fchmodat.............................. .......................... 154
10.251 fchown.................................................... 154
10.252 fchownat.............................. .......................... 155
10.253 fclose...................................................... 155
10.254 fctnl....................................................... 155
10.255 fdatasync................................................. 156
10.256 fdatasync................................................. 156
10.257 fdim......................................................... 157
10.258 fdimf....................................................... 157
10.259 fdiml....................................................... 157
10.260 fdiv......................................................... 157
10.261 fdivl....................................................... 158
10.262 fread....................................................... 158
10.263 fread....................................................... 158
10.264 fclearexcept................................. .......................... 159
10.265 fchdir..................................................... 159
10.266 fchownat.............................. .......................... 159
10.267 fgets......................................................... 159
10.268 fgets......................................................... 160
10.269 fgetround................................................. 160
10.270 feof......................................................... 160
10.271 feofexcep................................. .......................... 160
10.272 ferror......................................................... 161
10.273 fesetenv................................. .......................... 161
10.274 fesetenv.................................................... 161
10.275 fesetenv.................................................... 161
10.276 fesetmode................................. .......................... 162
10.277 fesetround................................. .......................... 162
10.278 fetestexcept................................. .......................... 162
10.279 fetestexceptflag................................. .......................... 162
10.280 ferror......................................................... 163
10.281  fexecve.................................................. 163
10.282  fflush .................................................... 163
10.283  ffs ...................................................... 164
10.284  fgetc.................................................... 164
10.285  fgetpos .................................................. 164
10.286  fgets .................................................... 165
10.287  fgetwc ................................................... 165
10.288  fgets .................................................... 165
10.289  fileno ................................................... 165
10.290  flockfile ................................................ 166
10.291  floor .................................................... 166
10.292  floorf .................................................. 166
10.293  floorl .................................................. 166
10.294  fma ..................................................... 167
10.295  fmaf ..................................................... 167
10.296  fmal ..................................................... 167
10.297  fmax .................................................... 168
10.298  fmaxf .................................................. 168
10.299  fmaxl .................................................. 168
10.300  fmaxmag ................................................ 168
10.301  fmaxmagf ................................................. 169
10.302  fmaxmagl ............................................... 169
10.303  fmemopen ............................................... 169
10.304  fmin .................................................... 169
10.305  fminf .................................................. 170
10.306  fminl .................................................. 170
10.307  fminmag ............................................... 170
10.308  fminmagf ............................................... 170
10.309  fminmagl ............................................... 171
10.310  fmod .................................................... 171
10.311  fmodf .................................................. 171
10.312  fmodl .................................................. 171
10.313  fmsg .................................................... 172
10.314  fmul .................................................... 172
10.315  fmul .................................................... 172
10.316  fnmatch ................................................ 173
10.317  fopen ................................................... 173
10.318  fork ..................................................... 174
10.319  fpathconf .............................................. 174
10.320  fpclassify .............................................. 174
10.321  fprintf ................................................ 174
10.322  fprintf ............................................... 176
10.323  fputs .................................................. 177
10.324  fprintf ............................................... 177
10.325  fputwc ................................................ 177
10.326  fread ................................................... 178
10.327  free .................................................... 178
<p>| 10.328 | freeaddrinfo                      | 178 |
| 10.329 | freelow                            | 179 |
| 10.331 | frexp                             | 179 |
| 10.332 | frexpf                            | 180 |
| 10.333 | frexpl                            | 180 |
| 10.334 | fromfp                            | 181 |
| 10.335 | fromfpf                           | 181 |
| 10.336 | fromfpl                           | 181 |
| 10.337 | fromfx                            | 181 |
| 10.338 | fromfpfx                          | 182 |
| 10.339 | fromfpfxl                         | 182 |
| 10.340 | fscanf                           | 182 |
| 10.341 | fseek                            | 183 |
| 10.342 | fseeko                           | 183 |
| 10.343 | fsetpos                           | 183 |
| 10.344 | fstat                            | 183 |
| 10.345 | fstatat                           | 184 |
| 10.346 | fstatvfs                          | 185 |
| 10.347 | fsub                             | 185 |
| 10.348 | fsubl                            | 185 |
| 10.349 | fsync                            | 185 |
| 10.350 | ftell                            | 186 |
| 10.351 | ftello                            | 186 |
| 10.352 | ftok                             | 187 |
| 10.353 | ftruncate                         | 187 |
| 10.354 | ftrylockfile                      | 187 |
| 10.355 | ftw                              | 188 |
| 10.356 | funlockfile                       | 188 |
| 10.357 | futimens                          | 188 |
| 10.358 | fwide                             | 189 |
| 10.359 | fprintf                           | 189 |
| 10.360 | fwrite                            | 190 |
| 10.361 | fscanff                           | 190 |
| 10.362 | gai_strerror                      | 190 |
| 10.363 | getaddrinfo                       | 191 |
| 10.364 | getc                              | 191 |
| 10.365 | getc_unlocked                     | 191 |
| 10.366 | getchar                           | 192 |
| 10.367 | getchar_unlocked                  | 192 |
| 10.368 | getcwd                            | 192 |
| 10.369 | getdate                           | 193 |
| 10.370 | getdate_err                       | 193 |
| 10.371 | getdelim                          | 194 |
| 10.372 | getegid                           | 194 |
| 10.373 | getenv                            | 194 |
| 10.374 | geteuid                           | 194 |</p>
<table>
<thead>
<tr>
<th>Page</th>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.375</td>
<td>getgid</td>
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</tr>
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<td>getgrent</td>
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<td>getgrgid</td>
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<td>getgrgid_r</td>
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</tr>
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<td>getgrnam</td>
<td>196</td>
</tr>
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<td>10.380</td>
<td>getgrnam_r</td>
<td>196</td>
</tr>
<tr>
<td>10.381</td>
<td>getgroups</td>
<td>196</td>
</tr>
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<td>10.382</td>
<td>gethostent</td>
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</tr>
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<td>gethostid</td>
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</tr>
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<td>10.384</td>
<td>gethostname</td>
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</tr>
<tr>
<td>10.385</td>
<td>getitimer</td>
<td>197</td>
</tr>
<tr>
<td>10.386</td>
<td>getline</td>
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</tr>
<tr>
<td>10.387</td>
<td>getlogin</td>
<td>198</td>
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<td>10.388</td>
<td>getlogin_r</td>
<td>198</td>
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<td>getmsg</td>
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</tr>
<tr>
<td>10.390</td>
<td>getnameinfo</td>
<td>199</td>
</tr>
<tr>
<td>10.391</td>
<td>getnetbyaddr</td>
<td>199</td>
</tr>
<tr>
<td>10.392</td>
<td>getnetbyname</td>
<td>200</td>
</tr>
<tr>
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<td>getnetent</td>
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<td>getrlimit</td>
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<td>getsockopt</td>
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<tr>
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<td></td>
</tr>
</tbody>
</table>
10.469 isblank ......................................................... 223
10.470 isblank_l ...................................................... 224
10.471 iscntrl ......................................................... 224
10.472 iscntrl_l ....................................................... 225
10.473 isdigit ......................................................... 225
10.474 isdigit_l ....................................................... 225
10.475 isfinite ......................................................... 226
10.476 isgraph ......................................................... 227
10.477 isgraph_l ....................................................... 227
10.478 isgreater ...................................................... 228
10.479 isgreaterequal ................................................ 228
10.480 isnf .......................................................... 228
10.481 isless ......................................................... 228
10.482 islessequal .................................................... 229
10.483 islessgreater .................................................. 229
10.484 islower ......................................................... 229
10.485 islower_l ....................................................... 230
10.486 isnan .......................................................... 230
10.487 isnormal ....................................................... 230
10.488 isprint ......................................................... 231
10.489 isprint_l ....................................................... 231
10.490 ispunct ........................................................ 232
10.491 ispunct_l ....................................................... 232
10.492 isspace ........................................................ 233
10.493 isspace_l ....................................................... 233
10.494 isunordered .................................................... 234
10.495 isupper ......................................................... 234
10.496 isupper_l ....................................................... 235
10.497 iswalnum ....................................................... 235
10.498 iswalnum_l .................................................... 235
10.499 iswalpha ....................................................... 236
10.500 iswalpha_l ..................................................... 236
10.501 iswblank ....................................................... 236
10.502 iswblank_l ..................................................... 237
10.503 iswctrl ........................................................ 237
10.504 iswctrl_l ....................................................... 237
10.505 iswctype ....................................................... 238
10.506 iswctype_l ..................................................... 238
10.507 iswdigit ....................................................... 238
10.508 iswdigit_l ..................................................... 239
10.509 iswgraph ...................................................... 239
10.510 iswgraph_l .................................................... 239
10.511 iswlower ...................................................... 240
10.512 iswlower_l ..................................................... 240
10.513 iswprint ...................................................... 240
10.514 iswprint_l .................................................... 241
10.515 iswpunct ...................................................... 241
<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>iswpunct_l</td>
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</tr>
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</tr>
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<td></td>
<td>253</td>
</tr>
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<td>254</td>
</tr>
<tr>
<td>log</td>
<td></td>
<td>254</td>
</tr>
</tbody>
</table>
10.563 log10................................................................. 255
10.564 log10f .............................................................. 255
10.565 log10l ............................................................... 255
10.566 log1p ............................................................... 256
10.567 log1pf .............................................................. 256
10.568 log1pl .............................................................. 256
10.569 log2 ................................................................. 257
10.570 log2f ............................................................... 257
10.571 log2l ............................................................... 257
10.572 logb ............................................................... 258
10.573 logbf .............................................................. 258
10.574 logbl .............................................................. 258
10.575 logf ............................................................... 259
10.576 logl ............................................................... 259
10.577 longjmp ........................................................... 259
10.578 lrand48 ........................................................... 260
10.579 lrint .............................................................. 260
10.580 lrintf .............................................................. 260
10.581 lrintl .............................................................. 260
10.582 lround ............................................................ 261
10.583 lroundf .......................................................... 261
10.584 lroundl ........................................................... 261
10.585 lsearch ........................................................... 261
10.586 lseek .............................................................. 262
10.587 lstat .............................................................. 262
10.588 malloc ........................................................... 263
10.589 mblen ............................................................. 263
10.590 mbrlen ............................................................ 263
10.591 mbtetc8 .......................................................... 264
10.592 mbtetc16 ........................................................ 264
10.593 mbtetc32 ........................................................ 265
10.594 mbtetcw ........................................................ 265
10.595 mbstcinit ........................................................ 266
10.596 mbsncrwc ....................................................... 266
10.597 mbsncrwc ....................................................... 267
10.598 mbstowcs ......................................................... 267
10.599 mbstowc ......................................................... 267
10.600 memccpy ......................................................... 268
10.601 memchr .......................................................... 268
10.602 memcmp .......................................................... 268
10.603 memcpy .......................................................... 269
10.604 memmove ........................................................ 269
10.605 memset ........................................................... 269
10.606 memset_explicit ................................................ 269
10.607 mkdir ............................................................ 270
10.608 mkdirat .......................................................... 270
10.609 mkdtemp .......................................................... 270
10.610  mknod .................................................. 272
10.612  mkfifo .................................................. 271
10.613  mkfifoat ................................................ 271
10.614  mkstemp ................................................ 272
10.615  mktime .................................................. 273
10.616  mlock .................................................. 273
10.617  mlockall ............................................... 273
10.618  mmap .................................................... 273
10.619  modf .................................................... 274
10.620  modff ................................................... 274
10.621  modfl .................................................. 275
10.622  mprotect .............................................. 275
10.623  mq_close ............................................. 275
10.624  mq_getattr ........................................... 275
10.625  mq_notify ............................................. 276
10.626  mq_open .............................................. 276
10.627  mq_receive .......................................... 276
10.628  mq_send ............................................... 276
10.629  mq_setattr .......................................... 277
10.630  mq_timedreceive .................................... 277
10.631  mq_timedsend ....................................... 277
10.632  mq_unlink .......................................... 277
10.633  mrand48 .............................................. 278
10.634  msgctl ................................................ 278
10.635  msgget ............................................... 278
10.636  msqrcv ............................................... 278
10.637  msgsnd ............................................... 279
10.638  msync ............................................... 279
10.639  mtx_destroy ......................................... 279
10.640  mtx_init .............................................. 279
10.641  mtx_lock ............................................. 280
10.642  mtx_timedlock ...................................... 280
10.643  mtx_trylock ......................................... 280
10.644  mtx_unlock ......................................... 280
10.645  munlock .............................................. 281
10.646  munlockall ......................................... 281
10.647  munmap ............................................... 281
10.648  nan .................................................... 281
10.649  nanf ................................................... 282
10.650  nanl ................................................... 282
10.651  nanosleep ........................................... 282
10.652  nearbyint ............................................ 282
10.653  nearbyintf .......................................... 283
10.654  nearbyintl .......................................... 283
10.655  newlocale ........................................... 283
10.656  nextafter ............................................ 283
nextafterf.................................284
nextafterl...............................284
extdown.................................284
nextdownf...............................284
nextdownl...............................285
nexttoward..............................285
nexttowardf.............................285
nexttowardl.............................286
nextup.................................286
nextupf.................................286
nextup1.................................286
nftw..................................287
nice..................................287
nl_langinfo.............................287
nl_langinfo_l...........................288
nrand48................................288
ntohl..................................289
ntohs..................................289
open..................................289
openat..................................290
opendir................................290
openlog................................290
open_memstream........................291
open_wmemstream.........................291
optarg..................................291
opterr..................................291
optind..................................292
optopt..................................292
pathconf................................292
pause..................................292
pclose..................................292
perror..................................293
pipe....................................293
poll....................................293
popen..................................294
posix_fadvise...........................294
posix_fallocate........................294
posix_madvise...........................295
posix_mem_offset.......................295
posix_memalign..........................295
posix_openpt...........................296
posix_spawn.............................296
posix_spawn_file_actions_addclose....297
posix_spawn_file_actions_adddup2.....297
posix_spawn_file_actions_addopen.....297
posix_spawn_file_actions_destroy.....298
posix_spawn_file_actions_init........298
posix_trace_eventset_empty
posix_trace_eventset_del
posix_trace_eventset_add
posix_trace_eventid_open
posix_trace_eventid_get_name
posix_trace_eventid_equal
posix_trace_event
posix_trace_create_withlog
posix_trace_create
posix_trace_close
posix_trace_clear
posix_trace_attr_setstreamsize
posix_trace_attr_setstreamfullpolicy
posix_trace_attr_setname
posix_trace_attr_setmaxdatasize
posix_trace_attr_setlogsize
posix_trace_attr_setlogfullpolicy
posix_trace_attr_setinherited
posix_trace_attr_init
posix_trace_attr_getstreamsize
posix_trace_attr_getstreamfullpolicy
posix_trace_attr_getname
posix_trace_attr_getmaxusereventsize
posix_trace_attr_getmaxsystemeventsize
posix_trace_attr_getmaxdatasize
posix_trace_attr_getlogsize
posix_trace_attr_getlogfullpolicy
posix_trace_attr_getinherited
posix_trace_attr_getgenversion
posix_trace_attr_getcreatetime
posix_trace_attr_getclockres
posix_trace_attr_destroy
posix_spawnp
posix_spawnattr_setsigmask
posix_spawnattr_setsigdefault
posix_spawnattr_setschedpolicy
posix_spawnattr_setschedparam
posix_spawnattr_setpgroup
posix_spawnattr_setflags
posix_spawnattr_init
posix_spawnattr_getsigmask
posix_spawnattr_getsigdefault
posix_spawnattr_getschedpolicy
posix_spawnattr_getschedparam
posix_spawnattr_getpgroup
posix_spawnattr_destroy
<table>
<thead>
<tr>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>posix_trace_eventset_fill</td>
<td>312</td>
</tr>
<tr>
<td>posix_trace_eventset_ismember</td>
<td>312</td>
</tr>
<tr>
<td>posix_trace_eventtypelist_getnext_id</td>
<td>312</td>
</tr>
<tr>
<td>posix_trace_eventtypelist_rewind</td>
<td>312</td>
</tr>
<tr>
<td>posix_trace_flush</td>
<td>313</td>
</tr>
<tr>
<td>posix_trace_get_attr</td>
<td>313</td>
</tr>
<tr>
<td>posix_trace_get_filter</td>
<td>313</td>
</tr>
<tr>
<td>posix_trace_get_status</td>
<td>314</td>
</tr>
<tr>
<td>posix_trace_getnext_event</td>
<td>314</td>
</tr>
<tr>
<td>posix_trace_open</td>
<td>314</td>
</tr>
<tr>
<td>posix_trace_rewind</td>
<td>314</td>
</tr>
<tr>
<td>posix_trace_set_filter</td>
<td>315</td>
</tr>
<tr>
<td>posix_trace_shutdown</td>
<td>315</td>
</tr>
<tr>
<td>posix_trace_start</td>
<td>315</td>
</tr>
<tr>
<td>posix_trace_stop</td>
<td>316</td>
</tr>
<tr>
<td>posix_trace_timedelta_getnext_event</td>
<td>316</td>
</tr>
<tr>
<td>posix_trace_trid_eventid_open</td>
<td>316</td>
</tr>
<tr>
<td>posix_trace_trygetnext_event</td>
<td>316</td>
</tr>
<tr>
<td>posix_typed_mem_get_info</td>
<td>317</td>
</tr>
<tr>
<td>posix_typed_mem_open</td>
<td>317</td>
</tr>
<tr>
<td>pow</td>
<td>317</td>
</tr>
<tr>
<td>powf</td>
<td>317</td>
</tr>
<tr>
<td>powl</td>
<td>318</td>
</tr>
<tr>
<td>pread</td>
<td>318</td>
</tr>
<tr>
<td>printf</td>
<td>318</td>
</tr>
<tr>
<td>pselect</td>
<td>320</td>
</tr>
<tr>
<td>psignal</td>
<td>320</td>
</tr>
<tr>
<td>pthread_atfork</td>
<td>321</td>
</tr>
<tr>
<td>pthread_attr_destroy</td>
<td>321</td>
</tr>
<tr>
<td>pthread_attr_getdetachstate</td>
<td>321</td>
</tr>
<tr>
<td>pthread_attr_getguardsize</td>
<td>322</td>
</tr>
<tr>
<td>pthread_attr_getinheritsched</td>
<td>322</td>
</tr>
<tr>
<td>pthread_attr_getschedparam</td>
<td>322</td>
</tr>
<tr>
<td>pthread_attr_getschedpolicy</td>
<td>322</td>
</tr>
<tr>
<td>pthread_attr_getscope</td>
<td>323</td>
</tr>
<tr>
<td>pthread_attr_getstack</td>
<td>323</td>
</tr>
<tr>
<td>pthread_attr_getstacksize</td>
<td>323</td>
</tr>
<tr>
<td>pthread_attr_init</td>
<td>323</td>
</tr>
<tr>
<td>pthread_attr_setdetachstate</td>
<td>324</td>
</tr>
<tr>
<td>pthread_attr_setguardsize</td>
<td>324</td>
</tr>
<tr>
<td>pthread_attr_setinheritsched</td>
<td>324</td>
</tr>
<tr>
<td>pthread_attr_setschedparam</td>
<td>324</td>
</tr>
<tr>
<td>pthread_attr_setschedpolicy</td>
<td>325</td>
</tr>
<tr>
<td>pthread_attr_setscope</td>
<td>325</td>
</tr>
<tr>
<td>pthread_attr_setstack</td>
<td>325</td>
</tr>
<tr>
<td>pthread_attr_setstacksize</td>
<td>325</td>
</tr>
<tr>
<td>Function</td>
<td>Page</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>pthread_barrier_destroy</td>
<td>326</td>
</tr>
<tr>
<td>pthread_barrier_init</td>
<td>326</td>
</tr>
<tr>
<td>pthread_barrier_wait</td>
<td>326</td>
</tr>
<tr>
<td>pthread_barrierattr_destroy</td>
<td>326</td>
</tr>
<tr>
<td>pthread_barrierattr_getpshared</td>
<td>327</td>
</tr>
<tr>
<td>pthread_barrierattr_init</td>
<td>327</td>
</tr>
<tr>
<td>pthread_barrierattr_setpshared</td>
<td>327</td>
</tr>
<tr>
<td>pthread_cancel</td>
<td>328</td>
</tr>
<tr>
<td>pthread_cancel</td>
<td>328</td>
</tr>
<tr>
<td>pthread_cleanup_pop</td>
<td>328</td>
</tr>
<tr>
<td>pthread_cond_broadcast</td>
<td>328</td>
</tr>
<tr>
<td>pthread_cond_destroy</td>
<td>329</td>
</tr>
<tr>
<td>pthread_cond_init</td>
<td>329</td>
</tr>
<tr>
<td>pthread_cond_signal</td>
<td>329</td>
</tr>
<tr>
<td>pthread_cond_timedwait</td>
<td>329</td>
</tr>
<tr>
<td>pthread_cond_timedlock</td>
<td>330</td>
</tr>
<tr>
<td>pthread_condattr_destroy</td>
<td>330</td>
</tr>
<tr>
<td>pthread_condattr_getclock</td>
<td>330</td>
</tr>
<tr>
<td>pthread_condattr_getpshared</td>
<td>330</td>
</tr>
<tr>
<td>pthread_condattr_init</td>
<td>331</td>
</tr>
<tr>
<td>pthread_condattr_setclock</td>
<td>331</td>
</tr>
<tr>
<td>pthread_condattr_setpshared</td>
<td>331</td>
</tr>
<tr>
<td>pthread_create</td>
<td>331</td>
</tr>
<tr>
<td>pthread_detach</td>
<td>332</td>
</tr>
<tr>
<td>pthread_equal</td>
<td>332</td>
</tr>
<tr>
<td>pthread_equal</td>
<td>332</td>
</tr>
<tr>
<td>pthread_exit</td>
<td>332</td>
</tr>
<tr>
<td>pthread_getconcurrency</td>
<td>332</td>
</tr>
<tr>
<td>pthread_getcpuclockid</td>
<td>333</td>
</tr>
<tr>
<td>pthread_getschedparam</td>
<td>333</td>
</tr>
<tr>
<td>pthread_getspecific</td>
<td>333</td>
</tr>
<tr>
<td>pthread_join</td>
<td>334</td>
</tr>
<tr>
<td>pthread_key_create</td>
<td>334</td>
</tr>
<tr>
<td>pthread_key_delete</td>
<td>334</td>
</tr>
<tr>
<td>pthread_key_delete</td>
<td>334</td>
</tr>
<tr>
<td>pthread_kill</td>
<td>334</td>
</tr>
<tr>
<td>pthread_mutex_consistent</td>
<td>335</td>
</tr>
<tr>
<td>pthread_mutex_destroy</td>
<td>335</td>
</tr>
<tr>
<td>pthread_mutex_getprioceiling</td>
<td>335</td>
</tr>
<tr>
<td>pthread_mutex_init</td>
<td>335</td>
</tr>
<tr>
<td>pthread_mutex_sync</td>
<td>336</td>
</tr>
<tr>
<td>pthread_mutex_lock</td>
<td>336</td>
</tr>
<tr>
<td>pthread_mutexattr_getpshared</td>
<td>337</td>
</tr>
<tr>
<td>pthread_mutexattr_getprioceiling</td>
<td>337</td>
</tr>
<tr>
<td>pthread_mutexattr_getprotocol</td>
<td>337</td>
</tr>
<tr>
<td>pthread_mutexattr_getpshared</td>
<td>338</td>
</tr>
<tr>
<td>Function Name</td>
<td>Page</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>pthread_mutexattr_getrobust</td>
<td>338</td>
</tr>
<tr>
<td>pthread_mutexattr_gettype</td>
<td>338</td>
</tr>
<tr>
<td>pthread_mutexattr_init</td>
<td>338</td>
</tr>
<tr>
<td>pthread_mutexattr_setprioceiling</td>
<td>339</td>
</tr>
<tr>
<td>pthread_mutexattr_setprotocol</td>
<td>339</td>
</tr>
<tr>
<td>pthread_mutexattr_setpshared</td>
<td>339</td>
</tr>
<tr>
<td>pthread_mutexattr_setrobust</td>
<td>339</td>
</tr>
<tr>
<td>pthread_mutexattr_settype</td>
<td>340</td>
</tr>
<tr>
<td>pthread_once</td>
<td>340</td>
</tr>
<tr>
<td>pthread_rwlock_destroy</td>
<td>340</td>
</tr>
<tr>
<td>pthread_rwlock_init</td>
<td>340</td>
</tr>
<tr>
<td>pthread_rwlock_rdlock</td>
<td>341</td>
</tr>
<tr>
<td>pthread_rwlock_timedrdlock</td>
<td>341</td>
</tr>
<tr>
<td>pthread_rwlock_timedwrlock</td>
<td>341</td>
</tr>
<tr>
<td>pthread_rwlock_tryrdlock</td>
<td>342</td>
</tr>
<tr>
<td>pthread_rwlock_trywrlock</td>
<td>342</td>
</tr>
<tr>
<td>pthread_rwlock_unlock</td>
<td>342</td>
</tr>
<tr>
<td>pthread_rwlock_wrlock</td>
<td>343</td>
</tr>
<tr>
<td>pthread_rwlockattr_destroy</td>
<td>343</td>
</tr>
<tr>
<td>pthread_rwlockattr_getpshared</td>
<td>343</td>
</tr>
<tr>
<td>pthread_rwlockattr_init</td>
<td>343</td>
</tr>
<tr>
<td>pthread_rwlockattr_setpshared</td>
<td>344</td>
</tr>
<tr>
<td>pthread_rwlockattr_setprioceiling</td>
<td>344</td>
</tr>
<tr>
<td>pthread_rwlockattr_setprotocol</td>
<td>344</td>
</tr>
<tr>
<td>pthread_rwlockattr_settype</td>
<td>344</td>
</tr>
<tr>
<td>pthread_self</td>
<td>344</td>
</tr>
<tr>
<td>pthread_setcancelstate</td>
<td>344</td>
</tr>
<tr>
<td>pthread_setcanceltype</td>
<td>344</td>
</tr>
<tr>
<td>pthread_setschedule</td>
<td>345</td>
</tr>
<tr>
<td>pthread_setspecific</td>
<td>345</td>
</tr>
<tr>
<td>pthread_sigmask</td>
<td>346</td>
</tr>
<tr>
<td>pthread_spin_destroy</td>
<td>346</td>
</tr>
<tr>
<td>pthread_spin_init</td>
<td>346</td>
</tr>
<tr>
<td>pthread_spin_lock</td>
<td>347</td>
</tr>
<tr>
<td>pthread_spin_trylock</td>
<td>347</td>
</tr>
<tr>
<td>pthread_spin_unlock</td>
<td>347</td>
</tr>
<tr>
<td>pthread_testcancel</td>
<td>348</td>
</tr>
<tr>
<td>ptsname</td>
<td>348</td>
</tr>
<tr>
<td>putc</td>
<td>348</td>
</tr>
<tr>
<td>putc_unlocked</td>
<td>349</td>
</tr>
<tr>
<td>putchar</td>
<td>349</td>
</tr>
<tr>
<td>putchar_unlocked</td>
<td>349</td>
</tr>
<tr>
<td>putenv</td>
<td>350</td>
</tr>
<tr>
<td>putmsg</td>
<td>350</td>
</tr>
<tr>
<td>putpmsg</td>
<td>350</td>
</tr>
<tr>
<td>puts</td>
<td>350</td>
</tr>
<tr>
<td>pututxline</td>
<td>351</td>
</tr>
<tr>
<td>putwc</td>
<td>351</td>
</tr>
<tr>
<td>Function</td>
<td>Page</td>
</tr>
<tr>
<td>-------------------</td>
<td>------</td>
</tr>
<tr>
<td>setpayloadf</td>
<td>380</td>
</tr>
<tr>
<td>setpayloadl</td>
<td>380</td>
</tr>
<tr>
<td>setpayloadsig</td>
<td>380</td>
</tr>
<tr>
<td>setpayloadsigf</td>
<td>380</td>
</tr>
<tr>
<td>sigset</td>
<td>381</td>
</tr>
<tr>
<td>sigqueue</td>
<td>380</td>
</tr>
<tr>
<td>sigprocmask</td>
<td>381</td>
</tr>
<tr>
<td>sigpending</td>
<td>381</td>
</tr>
<tr>
<td>signgam</td>
<td>381</td>
</tr>
<tr>
<td>signbit</td>
<td>381</td>
</tr>
<tr>
<td>signal</td>
<td>381</td>
</tr>
<tr>
<td>siglongjmp</td>
<td>382</td>
</tr>
<tr>
<td>sigismember</td>
<td>382</td>
</tr>
<tr>
<td>siginterrupt</td>
<td>382</td>
</tr>
<tr>
<td>setpgid</td>
<td>382</td>
</tr>
<tr>
<td>setgrp</td>
<td>382</td>
</tr>
<tr>
<td>setpriority</td>
<td>383</td>
</tr>
<tr>
<td>setprotoent</td>
<td>382</td>
</tr>
<tr>
<td>setwcnt</td>
<td>382</td>
</tr>
<tr>
<td>setregid</td>
<td>382</td>
</tr>
<tr>
<td>setreuid</td>
<td>382</td>
</tr>
<tr>
<td>setrlimit</td>
<td>382</td>
</tr>
<tr>
<td>setservent</td>
<td>383</td>
</tr>
<tr>
<td>setsid</td>
<td>383</td>
</tr>
<tr>
<td>setsockopt</td>
<td>384</td>
</tr>
<tr>
<td>setsockopt</td>
<td>385</td>
</tr>
<tr>
<td>setsockopt</td>
<td>385</td>
</tr>
<tr>
<td>shmbuf</td>
<td>385</td>
</tr>
<tr>
<td>shm_open</td>
<td>385</td>
</tr>
<tr>
<td>shm_unlink</td>
<td>385</td>
</tr>
<tr>
<td>shmat</td>
<td>385</td>
</tr>
<tr>
<td>shmctl</td>
<td>385</td>
</tr>
<tr>
<td>shmdt</td>
<td>386</td>
</tr>
<tr>
<td>shmget</td>
<td>386</td>
</tr>
<tr>
<td>shutdown</td>
<td>386</td>
</tr>
<tr>
<td>sigaction</td>
<td>386</td>
</tr>
<tr>
<td>sigaddset</td>
<td>387</td>
</tr>
<tr>
<td>sigaltstack</td>
<td>387</td>
</tr>
<tr>
<td>sigdelset</td>
<td>387</td>
</tr>
<tr>
<td>sigemptyset</td>
<td>388</td>
</tr>
<tr>
<td>sigfillset</td>
<td>388</td>
</tr>
<tr>
<td>sighold</td>
<td>388</td>
</tr>
<tr>
<td>sigignore</td>
<td>388</td>
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<td>391</td>
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<td>sigrlset</td>
<td>391</td>
</tr>
<tr>
<td>sigset</td>
<td>392</td>
</tr>
<tr>
<td>Function</td>
<td>Page</td>
</tr>
<tr>
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<tr>
<td>sigsetjmp</td>
<td>392</td>
</tr>
<tr>
<td>sigsuspend</td>
<td>392</td>
</tr>
<tr>
<td>sigtimedwait</td>
<td>392</td>
</tr>
<tr>
<td>sigwait</td>
<td>393</td>
</tr>
<tr>
<td>sigwaitinfo</td>
<td>393</td>
</tr>
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<td>strdup</td>
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<td>408</td>
</tr>
<tr>
<td>strfromd</td>
<td>408</td>
</tr>
<tr>
<td>Page</td>
<td>Function</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
</tr>
<tr>
<td>10.1080</td>
<td><code>strfromf</code> ........................................ 408</td>
</tr>
<tr>
<td>10.1081</td>
<td><code>strfroml</code> ........................................ 409</td>
</tr>
<tr>
<td>10.1082</td>
<td><code>strftime</code> ........................................ 409</td>
</tr>
<tr>
<td>10.1083</td>
<td><code>strftime_l</code> ....................................... 410</td>
</tr>
<tr>
<td>10.1084</td>
<td><code>strlen</code> ........................................... 410</td>
</tr>
<tr>
<td>10.1085</td>
<td><code>strncasecmp</code> ...................................... 410</td>
</tr>
<tr>
<td>10.1086</td>
<td><code>strncasecmp_l</code> .................................... 410</td>
</tr>
<tr>
<td>10.1087</td>
<td><code>strncat</code> .......................................... 411</td>
</tr>
<tr>
<td>10.1088</td>
<td><code>strncpy</code> .......................................... 411</td>
</tr>
<tr>
<td>10.1089</td>
<td><code>strncpy</code> .......................................... 411</td>
</tr>
<tr>
<td>10.1090</td>
<td><code>strndup</code> .......................................... 411</td>
</tr>
<tr>
<td>10.1091</td>
<td><code>strnlen</code> .......................................... 412</td>
</tr>
<tr>
<td>10.1092</td>
<td><code>strpbrk</code> .......................................... 412</td>
</tr>
<tr>
<td>10.1093</td>
<td><code>strptime</code> .......................................... 412</td>
</tr>
<tr>
<td>10.1094</td>
<td><code>strstr</code> ........................................... 413</td>
</tr>
<tr>
<td>10.1095</td>
<td><code>strsignal</code> ......................................... 413</td>
</tr>
<tr>
<td>10.1096</td>
<td><code>strspn</code> ........................................... 413</td>
</tr>
<tr>
<td>10.1097</td>
<td><code>strstr</code> ........................................... 413</td>
</tr>
<tr>
<td>10.1098</td>
<td><code>strtok</code> ........................................... 414</td>
</tr>
<tr>
<td>10.1099</td>
<td><code>strtok</code> ........................................... 415</td>
</tr>
<tr>
<td>10.1100</td>
<td><code>strtoimax</code> ........................................ 415</td>
</tr>
<tr>
<td>10.1101</td>
<td><code>strtol</code> ........................................... 415</td>
</tr>
<tr>
<td>10.1102</td>
<td><code>strtok_r</code> ......................................... 416</td>
</tr>
<tr>
<td>10.1103</td>
<td><code>strtold</code> ........................................... 416</td>
</tr>
<tr>
<td>10.1104</td>
<td><code>strtoimax</code> ........................................ 416</td>
</tr>
<tr>
<td>10.1105</td>
<td><code>strtoimax</code> ........................................ 417</td>
</tr>
<tr>
<td>10.1106</td>
<td><code>strtoimax</code> ........................................ 417</td>
</tr>
<tr>
<td>10.1107</td>
<td><code>strtoimax</code> ........................................ 418</td>
</tr>
<tr>
<td>10.1108</td>
<td><code>strtoimax</code> ........................................ 418</td>
</tr>
<tr>
<td>10.1109</td>
<td><code>strtoimax</code> ........................................ 418</td>
</tr>
<tr>
<td>10.1110</td>
<td><code>strtoimax</code> ........................................ 418</td>
</tr>
<tr>
<td>10.1111</td>
<td><code>swab</code> ............................................. 419</td>
</tr>
<tr>
<td>10.1112</td>
<td><code>swprintf</code> ......................................... 419</td>
</tr>
<tr>
<td>10.1113</td>
<td><code>swscanf</code> ......................................... 420</td>
</tr>
<tr>
<td>10.1114</td>
<td><code> symlink</code> ......................................... 420</td>
</tr>
<tr>
<td>10.1115</td>
<td><code> symlink</code> ......................................... 420</td>
</tr>
<tr>
<td>10.1116</td>
<td><code> sync</code> ............................................. 421</td>
</tr>
<tr>
<td>10.1117</td>
<td><code> symlink</code> ......................................... 421</td>
</tr>
<tr>
<td>10.1118</td>
<td><code> syslog</code> ........................................... 421</td>
</tr>
<tr>
<td>10.1119</td>
<td><code> system</code> ........................................... 422</td>
</tr>
<tr>
<td>10.1120</td>
<td><code> tan</code> ............................................. 422</td>
</tr>
<tr>
<td>10.1121</td>
<td><code> tanf</code> ............................................. 422</td>
</tr>
<tr>
<td>10.1122</td>
<td><code> tanh</code> ............................................. 422</td>
</tr>
<tr>
<td>10.1123</td>
<td><code> tanhf</code> ............................................ 423</td>
</tr>
<tr>
<td>10.1124</td>
<td><code> tanhl</code> ............................................ 423</td>
</tr>
<tr>
<td>10.1125</td>
<td><code> tanl</code> ............................................. 423</td>
</tr>
<tr>
<td>10.1126</td>
<td><code> tcdrain</code> ......................................... 423</td>
</tr>
<tr>
<td>Page</td>
<td>Function</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
</tr>
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<td>tgammal</td>
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<td>thrd_create</td>
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<td>thrd_detach</td>
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<td>thrd_equal</td>
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<td>thrd_exit</td>
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<td>thrd_join</td>
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<td>thrd_sleep</td>
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<td>thrd_yield</td>
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<td>timer_create</td>
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<td>timer_delete</td>
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<tr>
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<td>timer_getoverrun</td>
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<td>timer_gettime</td>
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<td>timer_settime</td>
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<tr>
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<td>times</td>
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<td>10.1158</td>
<td>timespec_getres</td>
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<td>tolower</td>
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<td>tolowerl</td>
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<td>totalorder</td>
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<td>10.1166</td>
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<td>10.1167</td>
<td>totalorderl</td>
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<td>10.1169</td>
<td>totalordermagf</td>
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<td>10.1170</td>
<td>totalordermagl</td>
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<td>10.1172</td>
<td>toupperl</td>
</tr>
<tr>
<td>10.1173</td>
<td>towctrans</td>
</tr>
</tbody>
</table>
10.1174  towctrans_l ...........................................  437
10.1175  tolower ..............................................  438
10.1176  tolower_l ............................................  438
10.1177  towupper .............................................  438
10.1178  towupper_l ...........................................  439
10.1179  trunc ................................................  439
10.1180  truncate .............................................  439
10.1181  truncf ..............................................  440
10.1182  trunc1 ...............................................  440
10.1183  tsearch .............................................  440
10.1184  tss_create ...........................................  441
10.1185  tss_delete ..........................................  441
10.1186  tss_get .............................................  441
10.1187  tss_set ...............................................  441
10.1188  ttyname ..............................................  442
10.1189  ttyname_r ............................................  442
10.1190  twalk ...............................................  442
10.1191  tzname ...............................................  443
10.1192  tzset .................................................  443
10.1193  ufromfp ..............................................  443
10.1194  ufromfpf .............................................  444
10.1195  ufromfpfl ............................................  444
10.1196  ufromfpfx ............................................  444
10.1197  ufromfpfxf ..........................................  444
10.1198  ufromfpfxl ..........................................  445
10.1199  ulimit ...............................................  445
10.1200  umask ...............................................  445
10.1201  uname .................................................  445
10.1202  ungetc ...............................................  446
10.1203  ungetwc ..............................................  446
10.1204  unlink ...............................................  446
10.1205  unlinkat ..............................................  447
10.1206  unlockpt .............................................  447
10.1207  unsetenv ............................................  448
10.1208  uselocale ............................................  448
10.1209  utime ................................................  449
10.1210  utimensat ..........................................  449
10.1211  utimes ..............................................  450
10.1212  va_arg ..............................................  450
10.1213  va_copy .............................................  451
10.1214  va_end ..............................................  451
10.1215  va_start .............................................  451
10.1216  vfprintf .............................................  452
10.1217  vprintf ..............................................  453
10.1218  vfscanf ..............................................  454
10.1219  vfscanf ..............................................  455
10.1220  vfwscanf .............................................  455
11 Past POSIX Function Substitutes ........ 484
11.1 bcmp ........................................... 484
11.2 bcopy ........................................... 484
11.3 bsd_signal ..................................... 484
11.4 bzero ............................................. 485
11.5 ecvt ............................................. 485
11.6 fcvt ............................................. 485
11.7 fprintf ......................................... 485
11.8 gcvt ............................................. 486
11.9 getcontext ....................................... 486
11.10 gethostbyaddr ................................. 486
11.11 gethostbyname ................................ 486
11.12 getwd ......................................... 487
11.13 h_errno ....................................... 487
11.14 index .......................................... 487
11.15 makecontext .................................... 487
11.16 mktemp ........................................ 488
11.17 pthread_attr_getstackaddr .................. 488
11.18 pthread_attr_setstackaddr ............................. 488
11.19 rindex .................................................. 488
11.20 scalb .................................................... 489
11.21 setcontext ............................................. 489
11.22 swapcontext ............................................. 489
11.23 ualarm ................................................... 489
11.24 usleep .................................................. 490
11.25 vfork .................................................... 490
11.26 wcswcs ................................................ 490

12  Glibc Header File Substitutes .................. 491

12.1 a.out.h .................................................. 491
12.2 aliases.h ............................................... 491
12.3 alloca.h ................................................ 491
12.4 ar.h ..................................................... 492
12.5 argp.h ................................................... 492
12.6 argz.h ................................................... 492
12.7 byteswap.h ............................................. 493
12.8 crypt.h ................................................ 493
12.9 endian.h ............................................... 493
12.10 envz.h .................................................. 494
12.11 err.h ................................................... 494
12.12 error.h ............................................... 494
12.13 execinfo.h ............................................ 495
12.14 fpu_control.h ....................................... 495
12.15 fstab.h ................................................ 495
12.16 fts.h .................................................. 496
12.17 getopt.h ............................................... 496
12.18 gshadow.h ............................................ 496
12.19 ieee754.h ............................................. 497
12.20 ifaddrs.h ............................................. 497
12.21 libintl.h .............................................. 497
12.22 link.h ................................................ 498
12.23 malloc.h .............................................. 498
12.24 mcheck.h ............................................. 498
12.25 mntent.h ............................................. 498
12.26 obstack.h ............................................ 499
12.27 paths.h ............................................... 499
12.28 printf.h .............................................. 499
12.29 pty.h .................................................. 500
12.30 resolv.h .............................................. 500
12.31 shadow.h ............................................. 501
12.32 sys/file.h .......................................... 501
12.33 sys/ioct1.h ......................................... 501
12.34 sys/random.h ....................................... 502
12.35 sysexits.h .......................................... 502
13 Glibc Function Substitutes .......................... 504
  13.1 Glibc Extensions to <aio.h> ....................... 504
    13.1.1 aio_init .................................... 504
  13.2 Glibc <aliases.h> ................................ 504
    13.2.1 endaliasent .................................. 504
    13.2.2 getaliasbyname ................................ 505
    13.2.3 getaliasbyname_r .............................. 505
    13.2.4 getaliasent .................................... 505
    13.2.5 getaliasent_r .................................. 505
    13.2.6 setaliasent .................................... 506
  13.3 Glibc <argp.h> .................................... 506
    13.3.1 argp_err_exit_status ......................... 506
    13.3.2 argp_error ................................... 506
    13.3.3 argp_failure .................................. 506
    13.3.4 argp_help .................................... 507
    13.3.5 argp_parse .................................... 507
    13.3.6 argp_program_bug_address ..................... 507
    13.3.7 argp_program_version ......................... 507
    13.3.8 argp_program_version_hook .................... 508
    13.3.9 argp_state_help ................................ 508
    13.3.10 argp_usage ................................... 508
  13.4 Glibc <argz.h> .................................... 508
    13.4.1 argz_add ...................................... 508
    13.4.2 argz_add_sep .................................. 509
    13.4.3 argz_append ................................... 509
    13.4.4 argz_count .................................... 510
    13.4.5 argz_create ................................... 510
    13.4.6 argz_create_sep ................................ 510
    13.4.7 argz_delete ................................... 511
    13.4.8 argz_extract .................................. 511
    13.4.9 argz_insert ................................... 511
    13.4.10 argz_next .................................... 512
    13.4.11 argz_replace .................................. 512
    13.4.12 argz_stringify ................................ 513
  13.5 Glibc Extensions to <arpa/inet.h> ............... 513
    13.5.1 inet_aton ..................................... 513
    13.5.2 inet_lnaof .................................... 513
    13.5.3 inet_makeaddr .................................. 514
    13.5.4 inet_net_ntop .................................. 514
    13.5.5 inet_net_ntop .................................. 514
    13.5.6 inet_netof ..................................... 514
    13.5.7 inet_network ................................... 515
    13.5.8 inet_nsap_addr .................................. 515
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.5.9</td>
<td>inet_nsap_ntoa</td>
<td>515</td>
</tr>
<tr>
<td>13.6</td>
<td>Glibc &lt;byteswap.h&gt;</td>
<td>515</td>
</tr>
<tr>
<td>13.6.1</td>
<td>bswap_16</td>
<td>515</td>
</tr>
<tr>
<td>13.6.2</td>
<td>bswap_32</td>
<td>516</td>
</tr>
<tr>
<td>13.6.3</td>
<td>bswap_64</td>
<td>516</td>
</tr>
<tr>
<td>13.7</td>
<td>Glibc Extensions to &lt;complex.h&gt;</td>
<td>516</td>
</tr>
<tr>
<td>13.7.1</td>
<td>clog10</td>
<td>516</td>
</tr>
<tr>
<td>13.7.2</td>
<td>clog10f</td>
<td>516</td>
</tr>
<tr>
<td>13.7.3</td>
<td>clog10l</td>
<td>517</td>
</tr>
<tr>
<td>13.8</td>
<td>Glibc Extensions to &lt;ctype.h&gt;</td>
<td>517</td>
</tr>
<tr>
<td>13.8.1</td>
<td>isctype</td>
<td>517</td>
</tr>
<tr>
<td>13.9</td>
<td>Glibc Extensions to &lt;dirent.h&gt;</td>
<td>517</td>
</tr>
<tr>
<td>13.9.1</td>
<td>getdirent</td>
<td>518</td>
</tr>
<tr>
<td>13.9.2</td>
<td>scdirat</td>
<td>518</td>
</tr>
<tr>
<td>13.9.3</td>
<td>versionsort</td>
<td>518</td>
</tr>
<tr>
<td>13.10</td>
<td>Glibc Extensions to &lt;dlfcn.h&gt;</td>
<td>518</td>
</tr>
<tr>
<td>13.10.1</td>
<td>dladdr</td>
<td>518</td>
</tr>
<tr>
<td>13.10.2</td>
<td>dladdr1</td>
<td>519</td>
</tr>
<tr>
<td>13.10.3</td>
<td>dlinfo</td>
<td>519</td>
</tr>
<tr>
<td>13.10.4</td>
<td>dimopen</td>
<td>519</td>
</tr>
<tr>
<td>13.10.5</td>
<td>dlvsym</td>
<td>519</td>
</tr>
<tr>
<td>13.11</td>
<td>Glibc &lt;envz.h&gt;</td>
<td>520</td>
</tr>
<tr>
<td>13.11.1</td>
<td>envz_add</td>
<td>520</td>
</tr>
<tr>
<td>13.11.2</td>
<td>envz_entry</td>
<td>520</td>
</tr>
<tr>
<td>13.11.3</td>
<td>envz_get</td>
<td>521</td>
</tr>
<tr>
<td>13.11.4</td>
<td>envz_merge</td>
<td>521</td>
</tr>
<tr>
<td>13.11.5</td>
<td>envz_remove</td>
<td>521</td>
</tr>
<tr>
<td>13.11.6</td>
<td>envz_strip</td>
<td>522</td>
</tr>
<tr>
<td>13.12</td>
<td>Glibc &lt;err.h&gt;</td>
<td>522</td>
</tr>
<tr>
<td>13.12.1</td>
<td>err</td>
<td>522</td>
</tr>
<tr>
<td>13.12.2</td>
<td>errx</td>
<td>522</td>
</tr>
<tr>
<td>13.12.3</td>
<td>verr</td>
<td>523</td>
</tr>
<tr>
<td>13.12.4</td>
<td>verror</td>
<td>523</td>
</tr>
<tr>
<td>13.12.5</td>
<td>vwarn</td>
<td>523</td>
</tr>
<tr>
<td>13.12.6</td>
<td>vwarnx</td>
<td>523</td>
</tr>
<tr>
<td>13.12.7</td>
<td>warn</td>
<td>524</td>
</tr>
<tr>
<td>13.12.8</td>
<td>warnx</td>
<td>524</td>
</tr>
<tr>
<td>13.13</td>
<td>Glibc Extensions to &lt;errno.h&gt;</td>
<td>524</td>
</tr>
<tr>
<td>13.13.1</td>
<td>program_invocation_name</td>
<td>524</td>
</tr>
<tr>
<td>13.13.2</td>
<td>program_invocation_short_name</td>
<td>525</td>
</tr>
<tr>
<td>13.14</td>
<td>Glibc &lt;error.h&gt;</td>
<td>525</td>
</tr>
<tr>
<td>13.14.1</td>
<td>error</td>
<td>525</td>
</tr>
<tr>
<td>13.14.2</td>
<td>error_at_line</td>
<td>525</td>
</tr>
<tr>
<td>13.14.3</td>
<td>error_message_count</td>
<td>526</td>
</tr>
<tr>
<td>13.14.4</td>
<td>error_one_per_line</td>
<td>526</td>
</tr>
<tr>
<td>13.14.5</td>
<td>error_print_program</td>
<td>526</td>
</tr>
<tr>
<td>13.15</td>
<td>Glibc &lt;execinfo.h&gt;</td>
<td>527</td>
</tr>
</tbody>
</table>
13.25.4 getsgent ........................................ 539
13.25.5 getsgent_r .................................... 539
13.25.6 getsgnam ....................................... 539
13.25.7 getsgnam_r .................................... 539
13.25.8 putsgent ....................................... 539
13.25.9 sgetsgent ...................................... 540
13.25.10 sgetsgent ..................................... 540
13.25.11 sgetsgent_r .................................. 540
13.26 Glibc <ifaddrs.h> ................................ 540
13.26.1 getifaddrs ..................................... 540
13.26.2 freeifaddrs .................................... 541
13.27 Glibc <libintl.h> ................................ 541
13.27.1 bind_textdomain_codeset ....................... 541
13.27.2 bindtextdomain ................................ 541
13.27.3 dcgettext .................................... 542
13.27.4 dcngettext ................................... 542
13.27.5 dgettext ...................................... 542
13.27.6 dngettext ..................................... 543
13.27.7 gettext ........................................ 543
13.27.8 ngettext ....................................... 544
13.27.9 textdomain ..................................... 544
13.28 Glibc <link.h> ................................... 544
13.28.1 dl_iterate_phdr ................................ 544
13.29 Glibc <malloc.h> ................................ 545
13.29.1 malloc .......................................... 545
13.29.2 malloc2 ........................................ 545
13.29.3 malloc_info .................................... 545
13.29.4 malloc_stats ................................... 546
13.29.5 malloc_trim ................................... 546
13.29.6 malloc_usable_size ............................. 546
13.29.7 malloc ......................................... 547
13.29.8 memalign ....................................... 547
13.29.9 pvalloc ........................................ 547
13.30 Glibc Extensions to <math.h> ..................... 547
13.30.1 drem ............................................ 547
13.30.2 dremf ........................................... 548
13.30.3 dreml ........................................... 548
13.30.4 exp10 ........................................... 548
13.30.5 exp10f .......................................... 549
13.30.6 exp10l .......................................... 549
13.30.7 finite ........................................... 549
13.30.8 finitef .......................................... 550
13.30.9 finitel .......................................... 550
13.30.10 gamma .......................................... 550
13.30.11 gammaf ......................................... 551
13.30.12 gammal ......................................... 551
13.30.13 isnff .......................................... 551
13.30.14 isinf1................................. 552
13.30.15 isnanf................................. 552
13.30.16 isnanl................................. 552
13.30.17 j0f.................................. 553
13.30.18 j0l.................................. 553
13.30.19 j1f.................................. 553
13.30.20 j1l.................................. 554
13.30.21 jnf.................................. 554
13.30.22 jnl.................................. 554
13.30.23 lgamma_r.............................. 555
13.30.24 lgammaf_r.............................. 555
13.30.25 lgammal_r............................ 556
13.30.26 matherr.............................. 556
13.30.27 pow10................................. 556
13.30.28 pow10l............................... 557
13.30.29 pow10f............................... 557
13.30.30 scalbf............................... 557
13.30.31 scalbl............................... 558
13.30.32 significand.......................... 558
13.30.33 significandf.......................... 558
13.30.34 significandl........................ 559
13.30.35 sincos............................... 559
13.30.36 sincosf.............................. 559
13.30.37 sincosl.............................. 560
13.30.38 y0f.................................. 560
13.30.39 y0l.................................. 560
13.30.40 y1f.................................. 561
13.30.41 y1l.................................. 561
13.30.42 ynf.................................. 561
13.30.43 ynl.................................. 562
13.31 Glibc <mcheck.h>.......................... 562
13.31.1 mcheck................................. 562
13.31.2 mcheck_check_all....................... 562
13.31.3 mcheck_pedantic....................... 563
13.31.4 mprobe............................... 563
13.31.5 mtrace................................. 563
13.31.6 muntrace.............................. 563
13.32 Glibc <mntent.h>.......................... 564
13.32.1 addmntent.............................. 564
13.32.2 endmntent.............................. 564
13.32.3 getmntent.............................. 564
13.32.4 getmntent_r............................ 565
13.32.5 hasmntopt............................. 565
13.32.6 setmntent.............................. 565
13.33 Glibc Extensions to <netdb.h>.............. 565
13.33.1 endnetgrent............................ 565
13.33.2 gethostbyaddr_r........................ 566
13.35 Glibc Extensions to <netinet/in.h>

13.34 Glibc

13.35.11 inet6_option_space
13.35.10 inet6_option_next
13.35.9 inet6_option_init
13.35.7 inet6_option_append
13.35.6 inet6_option_alloc
13.35.5 in6addr_loopback
13.35.4 13.35.3
13.35.2 getipv4sourcefilter
13.35.1 13.35.0
13.34.7 bindresvport
13.34.6 ether_ntohost
13.34.5 ether_ntoa_r
13.34.4 ether_line
13.34.3 ether_aton_r
13.34.2 ether_aton

13.33.11 gethostbyaddr_r
13.33.10 getnetgrent_r
13.33.9 getnetbyaddr
13.33.8 getnetbyname
13.33.7 getnetbyaddr_r
13.33.6 gethostent_r
13.33.5 gethostbyname_r
13.33.4 gethostbyname2_r
13.33.3 gethostbyname2
13.33.2 rexec
13.33.1 getrresvport
13.33.0 rresvport
13.32.9 rexec
13.32.8 getnetbyname_r
13.32.7 getnetbyname
13.32.6 getnetbyaddr
13.32.5 getnetbyname_r
13.32.4 getnetbyname
13.32.3 getnetbyname
13.32.2 getnetbyname
13.32.1 getnetbyname
13.31.10 gethostbyname
13.31.9 gethostbyname
13.31.8 gethostbyname
13.31.7 gethostbyname
13.31.6 gethostbyname
13.31.5 gethostbyname
13.31.4 gethostbyname
13.31.3 gethostbyname
13.31.2 gethostbyname
13.31.1 gethostbyname
13.30.10 gethostbyname
13.30.9 gethostbyname
13.30.8 gethostbyname
13.30.7 gethostbyname
13.30.6 gethostbyname
13.30.5 gethostbyname
13.30.4 gethostbyname
13.30.3 gethostbyname
13.30.2 gethostbyname
13.30.1 gethostbyname
13.29.10 gethostbyname
13.29.9 gethostbyname
13.29.8 gethostbyname
13.29.7 gethostbyname
13.29.6 gethostbyname
13.29.5 gethostbyname
13.29.4 gethostbyname
13.29.3 gethostbyname
13.29.2 gethostbyname
13.29.1 gethostbyname
13.28.10 gethostbyname
13.28.9 gethostbyname
13.28.8 gethostbyname
13.28.7 gethostbyname
13.28.6 gethostbyname
13.28.5 gethostbyname
13.28.4 gethostbyname
13.28.3 gethostbyname
13.28.2 gethostbyname
13.28.1 gethostbyname
13.27.10 gethostbyname
13.27.9 gethostbyname
13.27.8 gethostbyname
13.27.7 gethostbyname
13.27.6 gethostbyname
13.27.5 gethostbyname
13.27.4 gethostbyname
13.27.3 gethostbyname
13.27.2 gethostbyname
13.27.1 gethostbyname
13.26.10 gethostbyname
13.26.9 gethostbyname
13.26.8 gethostbyname
13.26.7 gethostbyname
13.26.6 gethostbyname
13.26.5 gethostbyname
13.26.4 gethostbyname
13.26.3 gethostbyname
13.26.2 gethostbyname
13.26.1 gethostbyname
13.25.10 gethostbyname
13.25.9 gethostbyname
13.25.8 gethostbyname
13.25.7 gethostbyname
13.25.6 gethostbyname
13.25.5 gethostbyname
13.25.4 gethostbyname
13.25.3 gethostbyname
13.25.2 gethostbyname
13.25.1 gethostbyname
13.24.10 gethostbyname
13.24.9 gethostbyname
13.24.8 gethostbyname
13.24.7 gethostbyname
13.24.6 gethostbyname
13.24.5 gethostbyname
13.24.4 gethostbyname
13.24.3 gethostbyname
13.24.2 gethostbyname
13.24.1 gethostbyname
13.23.10 gethostbyname
13.23.9 gethostbyname
13.23.8 gethostbyname
13.23.7 gethostbyname
13.23.6 gethostbyname
13.23.5 gethostbyname
13.23.4 gethostbyname
13.23.3 gethostbyname
13.23.2 gethostbyname
13.23.1 gethostbyname
13.22.10 gethostbyname
13.22.9 gethostbyname
13.22.8 gethostbyname
13.22.7 gethostbyname
13.22.6 gethostbyname
13.22.5 gethostbyname
13.22.4 gethostbyname
13.22.3 gethostbyname
13.22.2 gethostbyname
13.22.1 gethostbyname
13.35.12 inet6_opt_append................................. 577
13.35.13 inet6_opt_find................................. 578
13.35.14 inet6_opt_finish.............................. 578
13.35.15 inet6_opt_get_val.............................. 578
13.35.16 inet6_opt_init................................. 578
13.35.17 inet6_opt_next................................. 578
13.35.18 inet6_opt_set_val.............................. 579
13.35.19 inet6_rth_add................................. 579
13.35.20 inet6_rth_getaddr............................. 579
13.35.21 inet6_rth_init................................. 579
13.35.22 inet6_rth_reverse............................ 579
13.35.23 inet6_rth_segments.......................... 580
13.35.24 inet6_rth_space.............................. 580
13.35.25 setipv4sourcefilter.......................... 580
13.35.26 setssourcefilter.................................. 580
13.36 Glibc <obstack.h>................................. 580
13.36.1 obstack_alloc_failed_handler.................. 580
13.36.2 obstack_exit_failure........................... 581
13.36.3 obstack_free.................................. 581
13.36.4 obstack_printf................................ 581
13.36.5 obstack_vprintf................................ 582
13.37 Glibc Extensions to <poll.h>...................... 584
13.37.1 ppoll........................................... 584
13.38 Glibc <printf.h>................................ 584
13.38.1 parse_printf_format........................... 584
13.38.2 printf_size................................... 584
13.38.3 printf_size_info............................... 585
13.38.4 register_printf_function........................ 585
13.38.5 register_printf_modifier....................... 585
13.38.6 register_printfSpecifier....................... 585
13.38.7 register_printf_type........................... 586
13.39 Glibc Extensions to <pthread.h>.................... 586
13.39.1 pthread_attr_getaffinity_np.................... 586
13.39.2 pthread_attr_setaffinity_np................... 586
13.39.3 pthread_attr_getsigmask_np.................... 586
13.39.4 pthread_attr_setsigmask_np.................... 587
13.39.5 pthread_clockjoin_np......................... 587
13.39.6 pthread_cond_clockwait....................... 587
13.39.7 pthread_getaffinity_np....................... 587
13.39.8 pthread_getattr_default_np.................... 588
13.39.9 pthread_getattr_np............................. 588
13.39.10 pthread_getname_np........................... 588
13.39.11 pthread_kill_other_threads_np................ 589
13.39.12 pthread_mutex_clocklock...................... 589
13.39.13 pthread_rwlock_clockrdlock................... 589
13.39.14 pthread_rwlock_clockwrlock................... 589
13.39.15 pthread_rwlockattr_getkind_np................ 590
13.39.16 pthread_rwlockattr_setkind_np
13.39.17 pthread_setaffinity_np
13.39.18 pthread_setattr_default_np
13.39.19 pthread_setname_np
13.39.20 pthread_sigqueue
13.39.21 pthread_timedjoin_np
13.39.22 pthread_tryjoin_np
13.40 Glibc <pty.h>
13.40.1 forkpty
13.40.2 openpty
13.41 Glibc Extensions to <pwd.h>
13.41.1 fgetpwent
13.41.2 fgetpwent_r
13.41.3 getpw
13.41.4 getpwent_r
13.41.5 putpwent
13.42 Glibc Extensions to <regex.h>
13.42.1 re_comp
13.42.2 re_compile_fastmap
13.42.3 re_compile_pattern
13.42.4 re_exec
13.42.5 re_match
13.42.6 re_match_2
13.42.7 re_search
13.42.8 re_search_2
13.42.9 re_set_registers
13.42.10 re_set_syntax
13.42.11 re_syntax_options
13.43 Glibc <regexp.h>
13.43.1 advance
13.43.2 loc1
13.43.3 loc2
13.43.4 locs
13.43.5 step
13.44 Glibc <resolv.h>
13.44.1 dn_comp
13.44.2 dn_expand
13.44.3 dn_skipname
13.44.4 res_dnok
13.44.5 res_hnok
13.44.6 res_init
13.44.7 res_mailok
13.44.8 res_mkquery
13.44.9 res_nmquery
13.44.10 res_nquery
13.44.11 res_nquerydomain
13.44.12 res_nsearch
13.44.13 res_nsend................................. 601
13.44.14 res_ownok.............................. 601
13.44.15 res_query............................... 601
13.44.16 res_querydomain....................... 601
13.44.17 res_search............................. 601
13.44.18 res_send............................... 602
13.45 Glibc <rpc/auth.h>......................... 602
  13.45.1 authdes_create.......................... 602
  13.45.2 authdes_pk_create....................... 602
  13.45.3 authnone_create........................ 602
  13.45.4 authunix_create........................ 603
  13.45.5 authunix_create_default................ 603
  13.45.6 getnetname.............................. 603
  13.45.7 host2netname............................ 603
  13.45.8 key_decryptsession..................... 603
  13.45.9 key_decryptsession_pk................... 604
  13.45.10 key_encryptsession..................... 604
  13.45.11 key_encryptsession_pk.................. 604
  13.45.12 key_gendes............................ 604
  13.45.13 key_get_conv........................... 604
  13.45.14 key_secretkey_is_set................... 605
  13.45.15 key_setsecret.......................... 605
  13.45.16 netname2host........................... 605
  13.45.17 netname2user........................... 605
  13.45.18 user2netname........................... 605
  13.45.19 xdr_des_block......................... 606
  13.45.20 xdr_opaque_auth....................... 606
13.46 Glibc <rpc/auth_des.h>..................... 606
  13.46.1 authdes_getucred....................... 606
  13.46.2 getpublickey............................ 606
  13.46.3 getsecretkey............................ 606
  13.46.4 rtime.................................. 607
13.47 Glibc <rpc/auth_unix.h>................... 607
  13.47.1 xdr_authunix_parms..................... 607
13.48 Glibc <rpc/clnt.h>........................ 607
  13.48.1 callrpc.................................. 607
  13.48.2 clnt_create............................. 607
  13.48.3 clnt_pcreateerror....................... 608
  13.48.4 clnt_perrno.............................. 608
  13.48.5 clnt_perror.............................. 608
  13.48.6 clnt_spcreateerror...................... 608
  13.48.7 clnt_sperrno............................. 608
  13.48.8 clnt_sperror............................. 609
  13.48.9 clntraw_create.......................... 609
  13.48.10 clnttcp_create......................... 609
  13.48.11 clntudp_bufcreate...................... 609
  13.48.12 clntudp_create......................... 610
<table>
<thead>
<tr>
<th>Section</th>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.55.6</td>
<td>svc_getreqset</td>
<td>619</td>
</tr>
<tr>
<td>13.55.7</td>
<td>svc_max_pollfd</td>
<td>619</td>
</tr>
<tr>
<td>13.55.8</td>
<td>svc_pollfd</td>
<td>619</td>
</tr>
<tr>
<td>13.55.9</td>
<td>svc_register</td>
<td>619</td>
</tr>
<tr>
<td>13.55.10</td>
<td>svc_run</td>
<td>620</td>
</tr>
<tr>
<td>13.55.11</td>
<td>svc_sendreply</td>
<td>620</td>
</tr>
<tr>
<td>13.55.12</td>
<td>svc_unregister</td>
<td>620</td>
</tr>
<tr>
<td>13.55.13</td>
<td>svcerr_auth</td>
<td>620</td>
</tr>
<tr>
<td>13.55.14</td>
<td>svcerr_decode</td>
<td>621</td>
</tr>
<tr>
<td>13.55.15</td>
<td>svcerr_noproc</td>
<td>621</td>
</tr>
<tr>
<td>13.55.16</td>
<td>svcerr_noprogs</td>
<td>621</td>
</tr>
<tr>
<td>13.55.17</td>
<td>svcerr_progvers</td>
<td>621</td>
</tr>
<tr>
<td>13.55.18</td>
<td>svcerr_systemerr</td>
<td>621</td>
</tr>
<tr>
<td>13.55.19</td>
<td>svcerr_weakauth</td>
<td>622</td>
</tr>
<tr>
<td>13.55.20</td>
<td>svcraw_create</td>
<td>622</td>
</tr>
<tr>
<td>13.55.21</td>
<td>svctcp_create</td>
<td>622</td>
</tr>
<tr>
<td>13.55.22</td>
<td>svcudp_bufcreate</td>
<td>622</td>
</tr>
<tr>
<td>13.55.23</td>
<td>svcudp_create</td>
<td>623</td>
</tr>
<tr>
<td>13.55.24</td>
<td>svcunix_create</td>
<td>623</td>
</tr>
<tr>
<td>13.55.25</td>
<td>xprt_register</td>
<td>623</td>
</tr>
<tr>
<td>13.55.26</td>
<td>xprt_unregister</td>
<td>623</td>
</tr>
<tr>
<td>13.56</td>
<td>Glibc &lt;rpc/xdr.h&gt;</td>
<td>624</td>
</tr>
<tr>
<td>13.56.1</td>
<td>xdr_array</td>
<td>624</td>
</tr>
<tr>
<td>13.56.2</td>
<td>xdr_array</td>
<td>624</td>
</tr>
<tr>
<td>13.56.3</td>
<td>xdr_bytes</td>
<td>624</td>
</tr>
<tr>
<td>13.56.4</td>
<td>xdr_bytes</td>
<td>624</td>
</tr>
<tr>
<td>13.56.5</td>
<td>xdr_double</td>
<td>625</td>
</tr>
<tr>
<td>13.56.6</td>
<td>xdr_enum</td>
<td>625</td>
</tr>
<tr>
<td>13.56.7</td>
<td>xdr_float</td>
<td>625</td>
</tr>
<tr>
<td>13.56.8</td>
<td>xdr_free</td>
<td>625</td>
</tr>
<tr>
<td>13.56.9</td>
<td>xdr_hyper</td>
<td>625</td>
</tr>
<tr>
<td>13.56.10</td>
<td>xdr_int</td>
<td>626</td>
</tr>
<tr>
<td>13.56.11</td>
<td>xdr_int16_t</td>
<td>626</td>
</tr>
<tr>
<td>13.56.12</td>
<td>xdr_int32_t</td>
<td>626</td>
</tr>
<tr>
<td>13.56.13</td>
<td>xdr_int64_t</td>
<td>626</td>
</tr>
<tr>
<td>13.56.14</td>
<td>xdr_int8_t</td>
<td>626</td>
</tr>
<tr>
<td>13.56.15</td>
<td>xdr_long</td>
<td>627</td>
</tr>
<tr>
<td>13.56.16</td>
<td>xdr_longlong_t</td>
<td>627</td>
</tr>
<tr>
<td>13.56.17</td>
<td>xdr_netobj</td>
<td>627</td>
</tr>
<tr>
<td>13.56.18</td>
<td>xdr_opaque</td>
<td>627</td>
</tr>
<tr>
<td>13.56.19</td>
<td>xdr_pointer</td>
<td>627</td>
</tr>
<tr>
<td>13.56.20</td>
<td>xdr_quad_t</td>
<td>628</td>
</tr>
<tr>
<td>13.56.21</td>
<td>xdr_reference</td>
<td>628</td>
</tr>
<tr>
<td>13.56.22</td>
<td>xdr_short</td>
<td>628</td>
</tr>
<tr>
<td>13.56.23</td>
<td>xdr_sizeof</td>
<td>628</td>
</tr>
<tr>
<td>13.56.24</td>
<td>xdr_string</td>
<td>628</td>
</tr>
<tr>
<td>13.56.25</td>
<td>xdr_u_char</td>
<td>629</td>
</tr>
</tbody>
</table>
13.56.26 xdr_u_hyper................................. 629
13.56.27 xdr_u_int................................. 629
13.56.28 xdr_u_long............................... 629
13.56.29 xdr_u_longlong_t ...................... 630
13.56.30 xdr_u_quad_t ............................ 630
13.56.31 xdr_u_short.............................. 630
13.56.32 xdr_uint16_t ............................ 630
13.56.33 xdr_uint32_t ............................ 630
13.56.34 xdr_uint64_t ............................ 631
13.56.35 xdr_uint8_t .............................. 631
13.56.36 xdr_union ................................. 631
13.56.37 xdr_vector ................................ 631
13.56.38 xdr_void ................................ 631
13.56.39 xdr_wrapstring ......................... 632
13.56.40 xdrmem_create ........................... 632
13.56.41 xdrrec_create ........................... 632
13.56.42 xdrrec_endofrecord ..................... 632
13.56.43 xdrrec_eof ............................... 633
13.56.44 xdrrec_skiprecord ...................... 633
13.56.45 xdrstdio_create ......................... 633

13.57 Glibc <rpcsvc/nislib.h>..................... 633
13.57.1 nis_add .................................. 633
13.57.2 nis_add_entry ............................ 634
13.57.3 nis_addmember ............................ 634
13.57.4 nis_checkpoint ........................... 634
13.57.5 nis_clone_object ......................... 634
13.57.6 nis_creategroup ......................... 634
13.57.7 nis_destroy_object ....................... 635
13.57.8 nis_destroygroup ......................... 635
13.57.9 nis_dir_cmp ............................... 635
13.57.10 nis_domain_of ............................ 635
13.57.11 nis_domain_of_r .......................... 635
13.57.12 nis_first_entry .......................... 636
13.57.13 nis_freenames ............................ 636
13.57.14 nis_freeresult ........................... 636
13.57.15 nis_freeservlist ......................... 636
13.57.16 nis_freetags ............................. 636
13.57.17 nis_getnames ............................. 637
13.57.18 nis_getservlist ......................... 637
13.57.19 nis_ismember ............................ 637
13.57.20 nis_leaf_of .............................. 637
13.57.21 nis_leaf_of_r ............................ 637
13.57.22 nis_terror ............................... 638
13.57.23 nis_list ................................ 638
13.57.24 nis_local_directory ..................... 638
13.57.25 nis_local_group ......................... 638
13.57.26 nis_local_host ........................... 638
<table>
<thead>
<tr>
<th>Page</th>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.57.27</td>
<td>nis_local_principal</td>
<td>639</td>
</tr>
<tr>
<td>13.57.28</td>
<td>nis_lookup</td>
<td>639</td>
</tr>
<tr>
<td>13.57.29</td>
<td>nis_mkdir</td>
<td>639</td>
</tr>
<tr>
<td>13.57.30</td>
<td>nis_modify</td>
<td>639</td>
</tr>
<tr>
<td>13.57.31</td>
<td>nis_modify_entry</td>
<td>639</td>
</tr>
<tr>
<td>13.57.32</td>
<td>nis_name_of</td>
<td>640</td>
</tr>
<tr>
<td>13.57.33</td>
<td>nis_name_of_r</td>
<td>640</td>
</tr>
<tr>
<td>13.57.34</td>
<td>nis_next_entry</td>
<td>640</td>
</tr>
<tr>
<td>13.57.35</td>
<td>nis_perror</td>
<td>640</td>
</tr>
<tr>
<td>13.57.36</td>
<td>nis_ping</td>
<td>640</td>
</tr>
<tr>
<td>13.57.37</td>
<td>nis_print_directory</td>
<td>641</td>
</tr>
<tr>
<td>13.57.38</td>
<td>nis_print_entry</td>
<td>641</td>
</tr>
<tr>
<td>13.57.39</td>
<td>nis_print_group</td>
<td>641</td>
</tr>
<tr>
<td>13.57.40</td>
<td>nis_print_group_entry</td>
<td>641</td>
</tr>
<tr>
<td>13.57.41</td>
<td>nis_print_link</td>
<td>641</td>
</tr>
<tr>
<td>13.57.42</td>
<td>nis_print_object</td>
<td>642</td>
</tr>
<tr>
<td>13.57.43</td>
<td>nis_print_result</td>
<td>642</td>
</tr>
<tr>
<td>13.57.44</td>
<td>nis_print_rights</td>
<td>642</td>
</tr>
<tr>
<td>13.57.45</td>
<td>nis_print_table</td>
<td>642</td>
</tr>
<tr>
<td>13.57.46</td>
<td>nis_remove</td>
<td>642</td>
</tr>
<tr>
<td>13.57.47</td>
<td>nis_remove_entry</td>
<td>643</td>
</tr>
<tr>
<td>13.57.48</td>
<td>nis_removemember</td>
<td>643</td>
</tr>
<tr>
<td>13.57.49</td>
<td>nis_rmdir</td>
<td>643</td>
</tr>
<tr>
<td>13.57.50</td>
<td>nis_servstate</td>
<td>643</td>
</tr>
<tr>
<td>13.57.51</td>
<td>nis_sperrno</td>
<td>643</td>
</tr>
<tr>
<td>13.57.52</td>
<td>nis_sperror</td>
<td>644</td>
</tr>
<tr>
<td>13.57.53</td>
<td>nis_sperror_r</td>
<td>644</td>
</tr>
<tr>
<td>13.57.54</td>
<td>nis_stats</td>
<td>644</td>
</tr>
<tr>
<td>13.57.55</td>
<td>nis_verifygroup</td>
<td>644</td>
</tr>
<tr>
<td>13.58</td>
<td>Glibc &lt;rpcsvc/nis_callback.h</td>
<td>644</td>
</tr>
<tr>
<td>13.58.1</td>
<td>xdr_cback_data</td>
<td>644</td>
</tr>
<tr>
<td>13.58.2</td>
<td>xdr_obj_p</td>
<td>645</td>
</tr>
<tr>
<td>13.59</td>
<td>Glibc &lt;rpcsvc/yp.h</td>
<td>645</td>
</tr>
<tr>
<td>13.59.1</td>
<td>xdr_domainname</td>
<td>645</td>
</tr>
<tr>
<td>13.59.2</td>
<td>xdr_keydat</td>
<td>645</td>
</tr>
<tr>
<td>13.59.3</td>
<td>xdr_valdat</td>
<td>645</td>
</tr>
<tr>
<td>13.59.4</td>
<td>xdr_ybind_resptype</td>
<td>645</td>
</tr>
<tr>
<td>13.59.5</td>
<td>xdr_ypmap_parms</td>
<td>646</td>
</tr>
<tr>
<td>13.59.6</td>
<td>xdr_ypmaplist</td>
<td>646</td>
</tr>
<tr>
<td>13.59.7</td>
<td>xdr_yppushresp_xfr</td>
<td>646</td>
</tr>
<tr>
<td>13.59.8</td>
<td>xdr_ypreq_key</td>
<td>646</td>
</tr>
<tr>
<td>13.59.9</td>
<td>xdr_ypreq_nokey</td>
<td>646</td>
</tr>
<tr>
<td>13.59.10</td>
<td>xdr_ypreq_xfr</td>
<td>646</td>
</tr>
<tr>
<td>13.59.11</td>
<td>xdr_ypresp_all</td>
<td>647</td>
</tr>
<tr>
<td>13.59.12</td>
<td>xdr_ypresp_key_val</td>
<td>647</td>
</tr>
<tr>
<td>13.59.13</td>
<td>xdr_ypresp_maplist</td>
<td>647</td>
</tr>
<tr>
<td>13.59.14</td>
<td>xdr_ypresp_master</td>
<td>647</td>
</tr>
</tbody>
</table>
13.59.15 xdr_ypresp_order .................................. 647
13.59.16 xdr_ypresp_val .................................. 647
13.59.17 xdr_ypresp_xfr .................................. 648
13.59.18 xdr_ypstat ....................................... 648
13.59.19 xdr_ypxfrstat .................................... 648
13.60  Glibc <rpcsvc/ypclnt.h> ............................... 648
       13.60.1 yp_all ........................................ 648
       13.60.2 yp_bind ....................................... 648
       13.60.3 yp_first ...................................... 649
       13.60.4 yp_get_default_domain ....................... 649
       13.60.5 yp_master .................................... 649
       13.60.6 yp_match ..................................... 649
       13.60.7 yp_next ...................................... 649
       13.60.8 yp_order ..................................... 649
       13.60.9 yp_unbind ................................... 650
       13.60.10 ypbinderr_string ............................. 650
       13.60.11 yperr_string ................................ 650
       13.60.12 ypprot_err .................................. 650
13.61  Glibc Extensions to <sched.h> ........................ 650
       13.61.1 clone ........................................ 650
       13.61.2 getcpu ....................................... 651
       13.61.3 sched_getaffinity .............................. 651
       13.61.4 sched_getcpu .................................. 651
       13.61.5 sched_setaffinity ............................. 651
       13.61.6 setsns ........................................ 652
13.62  Glibc Extensions to <search.h> ....................... 652
       13.62.1 hcreate ........................................ 652
       13.62.2 hdestroy ...................................... 652
       13.62.3 hsearch ....................................... 653
       13.62.4 tdestroy ...................................... 653
       13.62.5 twalk .......................................... 653
13.63  Glibc Extensions to <selinux/selinux.h> .............. 654
       13.63.1 fgetfilecon ................................... 654
       13.63.2 getfilecon .................................... 654
       13.63.3 lgetfilecon ................................... 655
13.64  Glibc Extensions to <semaphore.h> .................... 655
       13.64.1 sem_clockwait .................................. 655
13.65  Glibc <shadow.h> .................................... 655
       13.65.1endspent ....................................... 656
       13.65.2 fgetspent ...................................... 656
       13.65.3 fgetspent ...................................... 656
       13.65.4 getspent ....................................... 656
       13.65.5 getspent ....................................... 657
       13.65.6 getspnam ....................................... 657
       13.65.7 getspnam ....................................... 657
       13.65.8 lckpwdf ........................................ 657
       13.65.9 putspent ....................................... 658
13.65.10 setspent ........................................ 658
13.65.11 sgetspent ..................................... 658
13.65.12 sgetspent_r .................................. 658
13.65.13 ulckpwdf ..................................... 659
13.66 Glibc Extensions to <signal.h> .................. 659
13.66.1 gsignal ........................................ 659
13.66.2 sigandset ...................................... 659
13.66.3 sigblock ........................................ 659
13.66.4 siggetmask ..................................... 660
13.66.5 sigisemptyset ................................ 660
13.66.6 sigorset ....................................... 660
13.66.7 sigreturn ...................................... 661
13.66.8 sigsetmask ..................................... 661
13.66.9 sigstack ........................................ 661
13.66.10 sigvec .......................................... 661
13.66.11 ssignal ........................................ 662
13.66.12 sys_siglist ................................... 662
13.66.13 sysv_signal .................................. 662
13.66.14 tgkill ......................................... 662
13.67 Glibc Extensions to <spawn.h> ....................... 663
13.67.1 posix_spawn_file_actions_addchdir_np ......... 663
13.67.2 posix_spawn_file_actions_addclosefrom_np .... 663
13.67.3 posix_spawn_file_actions_addfchdir_np .......... 663
13.68 Glibc Extensions to <stdio.h> ..................... 664
13.68.1 asprintf ....................................... 664
13.68.2 cuserid ........................................ 665
13.68.3 clearerr_unlocked .............................. 665
13.68.4 fcloseall ...................................... 665
13.68.5 feof_unlocked .................................. 666
13.68.6 ferror_unlocked ............................... 666
13.68.7 fflush_unlocked ................................ 666
13.68.8 fgets_unlocked .................................. 667
13.68.9 fgets_unlocked .................................. 667
13.68.10 fileno_unlocked ................................ 667
13.68.11 fopencookie .................................... 668
13.68.12 fputc_unlocked ................................ 668
13.68.13 fputs_unlocked ................................ 668
13.68.14 fread_unlocked ................................ 669
13.68.15 fwrite_unlocked ................................ 669
13.68.16 getw ........................................... 669
13.68.17 putw ........................................... 670
13.68.18 renameat ...................................... 670
13.68.19 setbuffer ...................................... 670
13.68.20 setlinebuf ..................................... 670
13.68.21 sys_errlist ................................... 671
13.68.22 sys_nerr ....................................... 671
13.68.23 tmpnam_r ...................................... 671
13.68.24 vasprintf ........................................... 671
13.69 Glibc Extensions to <stdlib.h> ..................... 673
13.69.1 canonicalize_file_name ............................ 673
13.69.2 cfree .............................................. 673
13.69.3 clearenv .......................................... 673
13.69.4 drand48_r .......................................... 673
13.69.5 ecvt .............................................. 674
13.69.6 erand48_r .......................................... 674
13.69.7 fcvt .............................................. 674
13.69.8 getloadavg ......................................... 675
13.69.9 getpt .............................................. 675
13.69.10 initstate_r ....................................... 675
13.69.11 jrand48_r ........................................ 676
13.69.12 lcong48_r ........................................ 676
13.69.13 lrand48_r ........................................ 677
13.69.14 mkostemp ......................................... 677
13.69.15 mkostemps ........................................ 677
13.69.16 mkstemps ......................................... 678
13.69.17 mrand48_r ........................................ 678
13.69.18 nrand48_r ........................................ 678
13.69.19 on_exit .......................................... 679
13.69.20 ptsname_r ....................................... 679
13.69.21 qecvt ............................................ 680
13.69.22 qecvt_r .......................................... 680
13.69.23 qfcvt ............................................ 680
13.69.24 qfcvt_r .......................................... 681
13.69.25 qgcvt ............................................ 681
13.69.26 qsort_r .......................................... 681
13.69.27 random_r ........................................ 681
13.69.28 rpmatch .......................................... 682
13.69.29 secure_getenv .................................... 682
13.69.30 seed48_r ......................................... 682
13.69.31 setstate_r ....................................... 683
13.69.32 srand48_r ........................................ 683
13.69.33 srandom_r ....................................... 684
13.69.34 strtod_l .......................................... 684
13.69.35 strtof_l .......................................... 684
13.69.36 strtol_l .......................................... 684
13.69.37 strtold_l ........................................ 685
13.69.38 strtoll_l ........................................ 685
13.69.39 strtol ............................................ 685
13.69.40 strtoul .......................................... 685
13.69.41 strtoull_l ....................................... 686
13.69.42 strtoq ........................................... 686
13.69.43 valloc ............................................ 686
13.70 Glibc Extensions to <string.h> ...................... 686
13.70.1 explicit_bzero .................................... 686
13.70.2 ffsl ......................................................... 687
13.70.3 ffsll ....................................................... 687
13.70.4 memfrob ..................................................... 688
13.70.5 memmem ..................................................... 688
13.70.6 mempcpy ..................................................... 689
13.70.7 memrchr ..................................................... 689
13.70.8 rawmemchr .................................................. 689
13.70.9 sigabbrev_np ................................................ 690
13.70.10 sigdescr_np ............................................... 690
13.70.11 strcasestr ............................................... 690
13.70.12 strchrnul ................................................ 691
13.70.13 strerrordesc_np .......................................... 691
13.70.14 strerrorname_np .......................................... 691
13.70.15 strfry .................................................... 692
13.70.16 strsep .................................................... 692
13.70.17 strverscmp ............................................... 692
13.71 Glibc <sys/auxv.h> ........................................ 693
13.71.1 getauxval ................................................ 693
13.72 Glibc <sys/capability.h> .................................. 693
13.72.1 capget .................................................... 693
13.72.2 capset .................................................... 693
13.73 Glibc <sys/epoll.h> ......................................... 693
13.73.1 epoll_create .............................................. 694
13.73.2 epoll_create1 ............................................. 694
13.73.3 epoll_ctl ................................................ 694
13.73.4 epoll_pwait ............................................... 694
13.73.5 epoll_wait ............................................... 695
13.74 Glibc <sys/eventfd.h> ...................................... 695
13.74.1 eventfd ................................................... 695
13.74.2 eventfd_read .............................................. 695
13.74.3 eventfd_write .............................................. 696
13.75 Glibc <sys/fanotify.h> ..................................... 696
13.75.1 fanotify_init .............................................. 696
13.75.2 fanotify_mark ............................................. 696
13.76 Glibc <sys/file.h> ......................................... 696
13.76.1 flock ..................................................... 696
13.77 Glibc <sys/fsuid.h> ........................................ 697
13.77.1 setfsgid .................................................. 697
13.77.2 setfsuid .................................................. 697
13.78 Glibc <sys/gmon.h> ......................................... 697
13.78.1 monstartup ............................................... 697
13.79 Glibc <sys/inotify.h> ...................................... 698
13.79.1 inotify_add_watch ........................................ 698
13.79.2 inotify_init .............................................. 698
13.79.3 inotify_init1 .............................................. 698
13.79.4 inotify_rm_watch ......................................... 698
13.80 Glibc <sys/io.h>, <sys/perm.h> ............................. 699
13.80.1 ioperm ................................................................. 699
13.80.2 iopl ................................................................. 699
13.81 Glibc <sys/kdaemon.h> .................................................. 699
13.81.1 bdflush ............................................................. 699
13.82 Glibc <sys/klog.h> ..................................................... 700
13.82.1 klogctl ............................................................. 700
13.83 Glibc Extensions to <sys/mman.h> ..................................... 700
13.83.1 madvise ............................................................. 700
13.83.2 memfd_create ....................................................... 700
13.83.3 mincore ............................................................ 701
13.83.4 mlock2 ............................................................. 701
13.83.5 mremap ............................................................. 701
13.83.6 pkey_alloc ........................................................ 701
13.83.7 pkey_free .......................................................... 702
13.83.8 pkey_get ........................................................... 702
13.83.9 pkey_mprotect ..................................................... 702
13.83.10 pkey_set .......................................................... 703
13.83.11 remap_file_pages ................................................ 703
13.84 Glibc <sys/mount.h> .................................................. 703
13.84.1 mount .............................................................. 703
13.84.2 umount ............................................................. 703
13.84.3 umount2 ............................................................ 704
13.85 Glibc <sys/personality.h> ............................................. 704
13.85.1 personality ........................................................ 704
13.86 Glibc <sys/prctl.h> .................................................. 704
13.86.1 prctl ............................................................... 704
13.87 Glibc <sys/profil.h> .................................................. 704
13.87.1 sprofil ............................................................ 705
13.88 Glibc <sys/prace.h> .................................................. 705
13.88.1 ptrace ............................................................. 705
13.89 Glibc <sys/quotactl.h> ................................................. 705
13.89.1 quotactl ............................................................ 705
13.90 Glibc <sys/random.h> ................................................ 705
13.90.1 getentropy ........................................................ 705
13.90.2 getrandom ......................................................... 706
13.91 Glibc <sys/reboot.h> .................................................. 707
13.91.1 reboot ............................................................. 707
13.92 Glibc Extensions to <sys/resource.h> .................................. 707
13.92.1 prlimit ............................................................ 707
13.93 Glibc Extensions to <sys/sem.h> ..................................... 707
13.93.1 semtimedop ........................................................ 707
13.94 Glibc <sys/sendfile.h> ............................................... 707
13.94.1 sendfile .......................................................... 708
13.95 Glibc <sys/signalfd.h> ................................................. 708
13.95.1 signalfd ........................................................... 708
13.96 Glibc <sys/single_threaded.h> ....................................... 708
13.96.1 __libc_single_threaded ........................................... 708
13.97  Glibc Extensions to `<sys/socket.h>`.................. 709
  13.97.1  accept4 .................................. 709
  13.97.2  isfdtype .................................. 709
  13.97.3  recvmsg .................................. 709
  13.97.4  sendmsg .................................. 709
13.98  Glibc Extensions to `<sys/stat.h>`....................... 710
  13.98.1  getumask .................................. 710
  13.98.2  chmod ..................................... 710
  13.98.3  statx ..................................... 710
13.99  Glibc `<sys/statfs.h>`................................ 711
  13.99.1  fstatfs ................................... 711
  13.99.2  statfs .................................... 711
13.100 Glibc `<sys/swap.h>`................................ 711
  13.100.1  swapoff .................................... 711
  13.100.2  swapon .................................... 712
13.101 Glibc `<sys/sysctl.h>`................................. 712
  13.101.1  sysctl ..................................... 712
13.102 Glibc `<sys/sysinfo.h>`................................ 712
  13.102.1  getavphys_pages .............................. 712
  13.102.2  get_nprocs ................................ 713
  13.102.3  get_nprocs_conf ............................ 713
  13.102.4  get_phys_pages ............................. 713
  13.102.5  sysinfo .................................... 714
13.103 Glibc `<sys/syslog.h>`................................ 714
  13.103.1  vsyslog .................................... 714
13.104 Glibc `<sys/sysmacros.h>`............................... 714
  13.104.1  gnu_dev_major ................................ 714
  13.104.2  gnu_dev_makedev ............................. 715
  13.104.3  gnu_dev_minor ................................ 715
13.105 Glibc Extensions to `<sys/time.h>`...................... 715
  13.105.1  adjtime .................................... 715
  13.105.2  futimes .................................... 716
  13.105.3  futimesat ................................... 716
  13.105.4  lutimes .................................... 716
  13.105.5  settimeofday ................................ 717
13.106 Glibc `<sys/timerfd.h>`................................ 717
  13.106.1  timerfd_create ................................ 717
  13.106.2  timerfd_gettime .............................. 717
  13.106.3  timerfd_settime ............................. 717
13.107 Glibc `<sys/timex.h>`................................ 718
  13.107.1  adjtimex .................................... 718
  13.107.2  ntp_adjtime ................................ 718
  13.107.3  ntp_gettime ................................ 718
  13.107.4  ntp_gettime ................................. 719
13.108 Glibc Extensions to `<sys/uio.h>`...................... 719
  13.108.1  pread ...................................... 719
  13.108.2  preadv2 .................................... 719
13.116.7 daemon.......................................................... 731
13.116.8 dup3............................................................ 731
13.116.9 eaccess......................................................... 731
13.116.10 endusershell.................................................. 731
13.116.11 euidaccess................................................... 732
13.116.12 execveat..................................................... 732
13.116.13 execvpe........................................................ 732
13.116.14 get_current_dir_name....................................... 733
13.116.15 getdomainname................................................. 733
13.116.16 getdtablesize................................................. 733
13.116.17 getpagesize.................................................. 734
13.116.18 getpass........................................................ 734
13.116.19 getresgid..................................................... 735
13.116.20 getresuid...................................................... 735
13.116.21 gettid.......................................................... 735
13.116.22 getusershell.................................................. 735
13.116.23 group_member................................................ 736
13.116.24 pipe2.......................................................... 736
13.116.25 profil.......................................................... 736
13.116.26 revoke........................................................ 737
13.116.27 sbrk........................................................... 737
13.116.28 setlogin....................................................... 737
13.116.29 setdomainname............................................... 737
13.116.30 sethostid...................................................... 737
13.116.31 sethostname.................................................. 738
13.116.32 getresgid..................................................... 738
13.116.33 getresuid...................................................... 739
13.116.34 setusershell.................................................. 739
13.116.35 syncfs........................................................ 739
13.116.36 syscall......................................................... 739
13.116.37 ttyslot......................................................... 740
13.116.38 vhangup....................................................... 740

13.117 Glibc <utmp.h>................................................. 740
13.117.1 endutent....................................................... 740
13.117.2 getutent....................................................... 740
13.117.3 getutent_r..................................................... 741
13.117.4 getutid......................................................... 741
13.117.5 getutid_r....................................................... 741
13.117.6 getutline...................................................... 742
13.117.7 getutline_r.................................................... 742
13.117.8 pututline....................................................... 742
13.117.9 setutent....................................................... 743
13.117.10 updwtmp....................................................... 743
13.117.11 utmpname..................................................... 743
13.117.12 login........................................................ 744
13.117.13 login_tty..................................................... 744

13.118 Glibc Extensions to <utmpx.h>................................. 744
13.119 Glibc Extensions to `<wchar.h>`................................. 745
13.119.1 fgetwc_unlocked ........................................... 745
13.119.2 fgetws_unlocked .......................................... 746
13.119.3 fputwc_unlocked ......................................... 746
13.119.4 fputws_unlocked ......................................... 747
13.119.5 getwc_unlocked ........................................... 747
13.119.6 getwchar_unlocked ....................................... 747
13.119.7 putwc_unlocked .......................................... 748
13.119.8 putwchar_unlocked ....................................... 748
13.119.9 wcschrnul .................................................. 749
13.119.10 wcsftime_l ............................................... 749
13.119.11 wcstod_l .................................................. 749
13.119.12 wcstof_l .................................................. 749
13.119.13 wcstol_l .................................................. 750
13.119.14 wcstold_l ............................................... 750
13.119.15 wcstoll_l ............................................... 750
13.119.16 wcstq ...................................................... 750
13.119.17 wcstoul_l ............................................... 751
13.119.18 wcstoull_l ............................................... 751
13.119.19 wcstouq ................................................... 751
13.119.20 wmempcpy .................................................. 751

14 Native Windows Support ......................................... 753
14.1 Libtool and Windows ........................................... 753
14.2 Large File Support ............................................. 753
14.3 Inode numbers on Windows ................................. 753
14.4 Precise file timestamps on Windows .................. 754
14.5 Avoiding the year 2038 problem ......................... 754
14.6 Windows sockets ............................................... 755
14.6.1 Getaddrinfo and WINVER ................................. 755
14.7 Native Windows Support without MSVC Support .... 756
14.8 Visual Studio Compatibility .............................. 756

15 Multithreading ..................................................... 757
15.1 The three multithreading APIs ............................ 757
15.2 Choosing the right multithreading API .................. 758
15.3 The POSIX multithreading API ............................ 758
15.4 The ISO C multithreading API ................................ 759
15.5 The Gnulib multithreading API ............................ 759
15.6 Optimizations of multithreaded code .................. 759
16  Strings and Characters.......................... 761
  16.1  Strings............................................. 761
    16.1.1  The C string representation.................. 761
    16.1.1.1  Iterating through strings.................. 763
  16.1.2  Strings with NUL characters.................... 763
  16.1.3  Character and String Functions in C Locale.... 763
    16.1.3.1  c-type.................................. 763
    16.1.3.2  c-strease................................ 764
    16.1.3.3  c-strcaseeq............................... 764
    16.1.3.4  c-strcasestr.............................. 765
    16.1.3.5  c-strstr................................ 765
    16.1.3.6  c-strtod................................ 765
    16.1.3.7  c-strtold................................. 765
  16.1.4  Comparison of string APIs...................... 766
  16.2  Characters....................................... 768
    16.2.1  The char type.................................. 769
    16.2.2  The wchar_t type............................. 769
    16.2.3  The char32_t type............................. 770
    16.2.4  The mbchar_t type............................. 770
      16.2.4.1  Reading multibyte strings.................. 770
    16.2.5  Comparison of character APIs.................. 770
17  Particular Modules............................... 772
  17.1  alloca............................................ 772
  17.2  alloca-opt....................................... 772
  17.3  Safe Allocation Macros........................... 773
  17.4  Attributes........................................ 774
  17.5  Compile-time Assertions........................... 774
  17.6  Non-returning Functions........................... 776
  17.7  Integer Properties............................... 776
    17.7.1  Arithmetic Type Properties..................... 777
    17.7.2  Integer Bounds................................ 777
    17.7.3  Checking Integer Overflow...................... 778
    17.7.4  Wraparound Arithmetic with Integers............ 779
    17.7.5  Integer Type Overflow.......................... 781
    17.7.6  Integer Range Overflow......................... 782
  17.8  Static inline functions........................... 784
  17.9  Extern inline functions........................... 784
  17.10  Handling closed standard file descriptors......... 785
  17.11  Handling strings with NUL characters.............. 788
  17.12  Container data types............................. 789
    17.12.1  Ordinary container data types................. 789
    17.12.2  Specialized container data types.............. 792
  17.13  Recognizing Option Arguments..................... 793
  17.14  Quoting........................................... 795
  17.15  programe and getprograme.......................... 796
18 Regular expressions ................................. 803

18.1 Overview ........................................... 803
18.2 Regular Expression Syntax .......................... 803
  18.2.1 Syntax Bits ..................................... 804
  18.2.2 Predefined Syntaxes ......................... 806
  18.2.3 Collating Elements vs. Characters ........... 808
  18.2.4 The Backslash Character ..................... 808
18.3 Common Operators ................................ 809
  18.3.1 The Match-self Operator ( ordinary character ) . 809
  18.3.2 The Match-any-character Operator ( . ) ........ 809
  18.3.3 The Concatenation Operator .................. 809
  18.3.4 Repetition Operators .......................... 810
    18.3.4.1 The Match-zero-or-more Operator ( * ) ...... 810
    18.3.4.2 The Match-one-or-more Operator ( + or \+ ) ... 810
    18.3.4.3 The Match-zero-or-one Operator ( ? or \? ) ... 810
    18.3.4.4 Interval Operators ( .. ) or ( \{ .. \} ) .... 811
  18.3.5 The Alternation Operator ( | or \| ) .......... 811
  18.3.6 List Operators ( [ . . . ] and [ \^ . . . ] ) ........ 812
    18.3.6.1 Collating Symbol Operators ( [ . . . ] ) .... 813
    18.3.6.2 Equivalence Class Operators ( [ = . . . = ] ) ... 813
    18.3.6.3 Character Class Operators ( [ : . . . : ] ) .... 813
    18.3.6.4 The Range Operator ( - ) .................. 814
  18.3.7 Grouping Operators ( ( . . . ) or \( . . . \) ) ........ 814
  18.3.8 The Back-reference Operator ( \digit ) .......... 815
  18.3.9 Anchoring Operators ........................... 816
    18.3.9.1 The Match-beginning-of-line Operator ( ^ ) .... 816
    18.3.9.2 The Match-end-of-line Operator ( $ ) .......... 816
18.4 GNU Operators ..................................... 817
  18.4.1 Word Operators ................................ 817
    18.4.1.1 The Match-word-boundary Operator ( \b ) ....... 817
    18.4.1.2 The Match-within-word Operator ( \B ) .......... 817
    18.4.1.3 The Match-beginning-of-word Operator ( \< ) ...... 817
    18.4.1.4 The Match-end-of-word Operator ( \> ) ........... 817
    18.4.1.5 The Match-word-constituent Operator ( \w ) ....... 817
    18.4.1.6 The Match-non-word-constituent Operator ( \W ) .... 817
  18.4.2 Space Operators ............................... 817
    18.4.2.1 The Match-space Operator ( \s ) ............... 817
    18.4.2.2 The Match-non-space Operator ( \S ) ............ 817
  18.4.3 Whole-string Operators ....................... 817

18.3.1 The Match-beginning-of-string Operator (\`) …… 817
18.3.2 The Match-end-of-string Operator (\') ………. 818
18.5 What Gets Matched? ................................. 818
18.6 Programming with Regex .......................... 818
18.6.1 GNU Regex Functions ............................ 818
18.6.1.1 GNU Pattern Buffers .......................... 818
18.6.1.2 GNU Regular Expression Compiling ........... 819
18.6.1.3 GNU Matching ................................ 819
18.6.1.4 GNU Searching ................................ 820
18.6.1.5 Matching and Searching with Split Data ..... 821
18.6.1.6 Searching with Fastmaps ..................... 821
18.6.1.7 GNU Translate Tables ......................... 822
18.6.1.8 Using Registers ................................ 823
18.6.1.9 Freeing GNU Pattern Buffers .................. 825
18.6.2 BSD Regex Functions ............................. 825
18.6.2.1 BSD Regular Expression Compiling .......... 825
18.6.2.2 BSD Searching ................................ 826
18.7 Regular expression syntaxes ....................... 826
18.7.1 'awk' regular expression syntax .................. 826
18.7.2 'egrep' regular expression syntax ................ 827
18.7.3 'ed' regular expression syntax .................... 827
18.7.4 'emacs' regular expression syntax ................ 829
18.7.5 'gnu-awk' regular expression syntax ............ 830
18.7.6 'grep' regular expression syntax .................. 831
18.7.7 'posix-awk' regular expression syntax ........... 832
18.7.8 'posix-basic' regular expression syntax ........ 832
18.7.9 'posix-egrep' regular expression syntax ......... 833
18.7.10 'posix-extended' regular expression syntax ...... 833
18.7.11 'posix-minimal-basic' regular expression syntax ... 834
18.7.12 'sed' regular expression syntax ................. 834

19 Build Infrastructure Modules ...................... 835
19.1 Searching for Libraries ............................ 835
19.2 Controlling the Exported Symbols of Shared Libraries .... 838
19.3 LD Version Scripts ................................. 840
19.4 configmake ....................................... 841
19.5 warnings ....................................... 841
19.6 manywarnings .................................. 842
19.7 Running self-tests under valgrind ................. 845
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.7.1</td>
<td>Using valgrind without developer intervention</td>
<td>845</td>
</tr>
<tr>
<td>19.7.2</td>
<td>Valgrind options</td>
<td>845</td>
</tr>
<tr>
<td>19.7.3</td>
<td>Using valgrind at the developer’s discretion</td>
<td>846</td>
</tr>
<tr>
<td>19.7.4</td>
<td>How to use Valgrind with shell scripts</td>
<td>846</td>
</tr>
<tr>
<td>19.8</td>
<td>VCS To ChangeLog</td>
<td>847</td>
</tr>
<tr>
<td>20</td>
<td>Build Infrastructure Files</td>
<td>848</td>
</tr>
<tr>
<td>20.1</td>
<td>Recognizing platforms</td>
<td>848</td>
</tr>
<tr>
<td>20.2</td>
<td>Utilities for Makefiles</td>
<td>848</td>
</tr>
<tr>
<td>20.3</td>
<td>Programs for developing in Git checkouts</td>
<td>849</td>
</tr>
<tr>
<td>20.4</td>
<td>Utilities for building documentation</td>
<td>850</td>
</tr>
<tr>
<td>20.5</td>
<td>Utilities for building libraries</td>
<td>850</td>
</tr>
<tr>
<td>20.6</td>
<td>Utilities for running test suites</td>
<td>851</td>
</tr>
<tr>
<td>21</td>
<td>Release Management Files</td>
<td>852</td>
</tr>
<tr>
<td>21.1</td>
<td>Tools for releasing packages with shared libraries</td>
<td>852</td>
</tr>
<tr>
<td>21.2</td>
<td>Tools for uploading release tarballs</td>
<td>852</td>
</tr>
<tr>
<td>Appendix A</td>
<td>GNU Free Documentation License</td>
<td>853</td>
</tr>
<tr>
<td>Index</td>
<td></td>
<td>861</td>
</tr>
</tbody>
</table>
1 Brief Overview

Gnulib is a source code library that provides basic functionality to programs and libraries. Many software packages make use of Gnulib to avoid reinventing the portability wheel.

Resources:
- Gnulib is hosted at Savannah: https://savannah.gnu.org/projects/gnulib. Get the sources through Git from there.

1.1 Gnulib Basics

While portability across operating systems is not one of GNU’s primary goals, it has helped introduce many people to the GNU system, and is worthwhile when it can be achieved at a low cost. This collection helps lower that cost.

Gnulib is intended to be the canonical source for most of the important “portability” and/or common files for GNU projects. These are files intended to be shared at the source level; Gnulib is not a typical library meant to be installed and linked against. Thus, unlike most projects, Gnulib does not normally generate a source tarball distribution; instead, developers grab modules directly from the source repository.

The easiest, and recommended, way to do this is to use the gnulib-tool script. Since there is no installation procedure for Gnulib, gnulib-tool needs to be run directly in the directory that contains the Gnulib source code. You can do this either by specifying the absolute filename of gnulib-tool, or by using a symbolic link from a place inside your PATH to the gnulib-tool file of your preferred Gnulib checkout. For example:

```
$ ln -s $HOME/gnu/src/gnulib.git/gnulib-tool $HOME/bin/gnulib-tool
```

1.2 Git Checkout

Gnulib is available for anonymous checkout. In any Bourne-shell the following should work:

```
$ git clone https://git.savannah.gnu.org/git/gnulib.git
```

For a read-write checkout you need to have a login on ‘savannah.gnu.org’ and be a member of the Gnulib project at https://savannah.gnu.org/projects/gnulib. Then, instead of the URL https://git.savannah.gnu.org/git/gnulib.git, use the URL ‘ssh://user@git.savannah.gnu.org/srv/git/gnulib’ where user is your login name on savannah.gnu.org.

`git` resources:

Overview: https://en.wikipedia.org/wiki/Git_(software)

Homepage: https://git-scm.com/

When you use `git annotate` or `git blame` with Gnulib, it’s recommended that you use the `-w` option, in order to ignore massive whitespace changes that happened in 2009.
1.3 Keeping Up-to-date

The best way to work with Gnulib is to check it out of git. To synchronize, you can use git pull.

Subscribing to the bug-gnulib@gnu.org mailing list will help you to plan when to update your local copy of Gnulib (which you use to maintain your software) from git. You can review the archives, subscribe, etc., via https://lists.gnu.org/mailman/listinfo/bug-gnulib.

Sometimes, using an updated version of Gnulib will require you to use newer versions of GNU Automake or Autoconf. You may find it helpful to join the autotools-announce mailing list to be advised of such changes.

1.4 Contributing to Gnulib

All software here is copyrighted by the Free Software Foundation—you need to have filled out an assignment form for a project that uses the module for that contribution to be accepted here.

If you have a piece of code that you would like to contribute, please email bug-gnulib@gnu.org.

Generally we are looking for files that fulfill at least one of the following requirements:

- If your .c and .h files define functions that are broken or missing on some other system, we should be able to include it.
- If your functions remove arbitrary limits from existing functions (either under the same name, or as a slightly different name), we should be able to include it.
- If your functions define completely new but rarely used functionality, you should probably consider packaging it as a separate library.

1.4.1 Gnulib licensing

Gnulib contains code both under GPL and LGPL. Because several packages that use Gnulib are GPL, the files state they are licensed under GPL. However, to support LGPL projects as well, you may use some of the files under LGPL. The “License:” information in the files under modules/ clarifies the real license that applies to the module source.

Keep in mind that if you submit patches to files in Gnulib, you should license them under a compatible license, which means that sometimes the contribution will have to be LGPL, if the original file is available under LGPL via a “License: LGPL” information in the projects’ modules/ file.

1.4.2 Indent with spaces not TABs

We use space-only indentation in nearly all files. This includes all *.h, *.c, *.y files, except for the regex module. Makefile and ChangeLog files are excluded, since TAB characters are part of their format.

In order to tell your editor to produce space-only indentation, you can use these instructions.

- For Emacs: Add these lines to your Emacs initialization file ($HOME/.emacs or similar):

  ;; In Gnulib, indent with spaces everywhere (not TABs).
Chapter 1: Brief Overview

;; Exceptions: Makefile and ChangeLog modes.
(add-hook 'find-file-hook '(lambda ()
  (if (and buffer-file-name
       (string-match "/gnulib\>" (buffer-file-name))
       (not (string-equal mode-name "Change Log"))
       (not (string-equal mode-name "Makefile"))))
  (setq indent-tabs-mode nil)))

• For vi (vim): Add these lines to your $HOME/.vimrc file:
  " Don't use tabs for indentation. Spaces are nicer to work with.
  set expandtab
For Makefile and ChangeLog files, compensate for this by adding this

to your $HOME/.vim/after/indent/make.vim file, and similarly for your
$HOME/.vim/after/indent/changelog.vim file:

  " Use tabs for indentation, regardless of the global setting.
  set noexpandtab

• For Eclipse: In the “Window|Preferences” dialog (or “Eclipse|Preferences” dialog on
Mac OS),
  1. Under “General|Editors|Text Editors”, select the “Insert spaces for tabs” check-
     box.
  2. Under “C/C++|Code Style”, select a code style profile that has the “Indenta-
     tion|Tab policy” combobox set to “Spaces only”, such as the “GNU [built-in]”
     policy.

If you use the GNU indent program, pass it the option --no-tabs.

1.4.3 How to add a new module

• Add the header files and source files to lib/.
• If the module needs configure-time checks, write an Autoconf macro for it in
  m4/module.m4. See m4/README for details.
• Write a module description modules/module, based on modules/TEMPLATE.
• If the module contributes a section to the end-user documentation, put this docu-
  mentation in doc/module.texi and add it to the “Files” section of modules/module. Most
  modules don’t do this; they have only documentation for the programmer (= Gnulib
  user). Such documentation usually goes into the lib/ source files. It may also go into
doc/; but don’t add it to the module description in this case.
• Add the module to the list in MODULES.html.sh.

You can test that a module builds correctly with:

$ ./gnulib-tool --create-testdir --dir=/tmp/testdir module1 ... moduleN
$ cd /tmp/testdir
$ ./configure && make

Other things:
• Check the license and copyright year of headers.
• Check that the source code follows the GNU coding standards; see https://www.gnu.
  org/prep/standards.
Chapter 1: Brief Overview

- Add source files to `config/srclist*` if they are identical to upstream and should be upgraded in Gnulib whenever the upstream source changes.
- Include header files in source files to verify the function prototypes.
- Make sure a replacement function doesn’t cause warnings or clashes on systems that have the function.
- Autoconf functions can use ‘gl_*’ prefix. The ‘AC_*’ prefix is for autoconf internal functions.
- Build files only if they are needed on a platform. Look at the `alloca` and `fnmatch` modules for how to achieve this. If for some reason you cannot do this, and you have a `.c` file that leads to an empty `.o` file on some platforms (through some big `#if` around all the code), then ensure that the compilation unit is not empty after preprocessing. One way to do this is to `#include <stddef.h>` or `<stdio.h>` before the big `#if`.

1.5 Portability guidelines

Gnulib code is intended to be portable to a wide variety of platforms, not just GNU platforms. Gnulib typically attempts to support a platform as long as it is still supported by its provider, even if the platform is not the latest version. See Section 2.4 [Target Platforms], page 11.

Many Gnulib modules exist so that applications need not worry about undesirable variability in implementations. For example, an application that uses the `malloc` module need not worry about `malloc (0)` returning `NULL` on some Standard C platforms; and `glob` users need not worry about `glob` silently omitting symbolic links to nonexistent files on some platforms that do not conform to POSIX.

Gnulib code is intended to port without problem to new hosts, e.g., hosts conforming to recent C and POSIX standards. Hence Gnulib code should avoid using constructs that these newer standards no longer require, without first testing for the presence of these constructs. For example, because C11 made variable length arrays optional, Gnulib code should avoid them unless it first uses the `vararrays` module to check whether they are supported.

The following subsections discuss some exceptions and caveats to the general Gnulib portability guidelines.

1.5.1 C language versions

Currently Gnulib assumes at least a freestanding C99 compiler, possibly operating with a C library that predates C99; with time this assumption will likely be strengthened to later versions of the C standard. Old platforms currently supported include AIX 6.1, HP-UX 11i v1 and Solaris 10, though these platforms are rarely tested. Gnulib itself is so old that it contains many fixes for obsolete platforms, fixes that may be removed in the future.

Because of the freestanding C99 assumption, Gnulib code can include `<float.h>`, `<limits.h>`, `<stdarg.h>`, `<stddef.h>`, and `<stdint.h>` unconditionally; `<stdbool.h>` is also in the C99 freestanding list but is obsolescent as of C23. Gnulib code can also assume the existence of `<ctype.h>`, `<errno.h>`, `<fcntl.h>`, `<locale.h>`, `<signal.h>`, `<stdio.h>`, `<stdlib.h>`, `<string.h>`, and `<time.h>`. Similarly, many modules include `<sys/types.h>` even though it’s not even in C11; that’s OK since `<sys/types.h>` has been around nearly forever.
Even if the include files exist, they may not conform to the C standard. However, GCC has a `fixincludes` script that attempts to fix most C89-conformance problems. Gnulib currently assumes include files largely conform to C89 or better. People still using ancient hosts should use fixincludes or fix their include files manually.

Even if the include files conform, the library itself may not. For example, `strtod` and `mktime` have some bugs on some platforms. You can work around some of these problems by requiring the relevant modules, e.g., the Gnulib `mktime` module supplies a working and conforming `mktime`.

### 1.5.2 C99 features assumed by Gnulib

Although the C99 standard specifies many features, Gnulib code is conservative about using them, partly because Gnulib predates the widespread adoption of C99, and partly because many C99 features are not well-supported in practice. C99 features that are reasonably portable nowadays include:

- A declaration after a statement, or as the first clause in a `for` statement.
- `long long int`.
- `<stdbool.h>`, although Gnulib code no longer uses it directly, preferring plain `bool` via the `stdbool` module instead. See Section 9.47 [stdbool.h], page 68.
- `<stdint.h>`, assuming the `stdint` module is used. See Section 9.50 [stdint.h], page 69.
- Compound literals and designated initializers.
- Variadic macros.
- `static inline` functions.
- `__func__`, assuming the `func` module is used. See Section 17.20 [func], page 802.
- The `restrict` qualifier, assuming `AC_REQUIRE([AC_C_RESTRICT])` is used. This qualifier is sometimes implemented via a macro, so C++ code that uses Gnulib should avoid using `restrict` as an identifier.
- Flexible array members (however, see the `flexmember` module).

### 1.5.3 C99 features avoided by Gnulib

Gnulib avoids some features even though they are standardized by C99, as they have portability problems in practice. Here is a partial list of avoided C99 features. Many other C99 features are portable only if their corresponding modules are used; Gnulib code that uses such a feature should require the corresponding module.

- Variable length arrays (VLAs) or variably modified types, without checking whether `__STDC_NO_VLA__` is defined. See the `vararrays` and `vla` modules.
- Block-scope variable length arrays, without checking whether either `GNULIB_NO_VLA` or `__STDC_NO_VLA__` is defined. This lets you define `GNULIB_NO_VLA` to pacify GCC when using its `-Wvla-larger-than warnings` option, and to avoid large stack usage that may have security implications. `GNULIB_NO_VLA` does not affect Gnulib’s other uses of VLAs and variably modified types, such as array declarations in function prototype scope.
- `extern inline` functions, without checking whether they are supported. See Section 17.9 [extern inline], page 784.
• Type-generic math functions.
• Universal character names in source code.
• `<iso646.h>`, since GNU programs need not worry about deficient source-code encodings.
• Comments beginning with `’//’`. This is mostly for style reasons.

1.5.4 Other portability assumptions made by Gnulib

The GNU coding standards allow one departure from strict C: Gnulib code can assume that standard internal types like `ptrdiff_t` and `size_t` are no wider than `long`. POSIX requires implementations to support at least one programming environment where this is true, and such environments are recommended for Gnulib-using applications. When it is easy to port to non-POSIX platforms like MinGW where these types are wider than `long`, new Gnulib code should do so, e.g., by using `ptrdiff_t` instead of `long`. However, it is not always that easy, and no effort has been made to check that all Gnulib modules work on MinGW-like environments.

Gnulib code makes the following additional assumptions:

• `int` and `unsigned int` are at least 32 bits wide. POSIX and the GNU coding standards both require this.
• Signed integer arithmetic is two’s complement.
  Previously, Gnulib code sometimes also assumed that signed integer arithmetic wraps around, but modern compiler optimizations sometimes do not guarantee this, and Gnulib code with this assumption is now considered to be questionable. See Section 17.7 [Integer Properties], page 776.
  Although some Gnulib modules contain explicit support for the other signed integer representations allowed by the C standard (ones’ complement and signed magnitude), these modules are the exception rather than the rule. All practical Gnulib targets use two’s complement.
• There are no “holes” in integer values: all the bits of an integer contribute to its value in the usual way. In particular, an unsigned type and its signed counterpart have the same number of bits when you count the latter’s sign bit.
• Objects with all bits zero are treated as 0 or NULL. For example, `memset (A, 0, sizeof A)` initializes an array `A` of pointers to NULL.
• The types `intptr_t` and `uintptr_t` exist, and pointers can be converted to and from these types without loss of information.
• Addresses and sizes behave as if objects reside in a flat address space. In particular:
  • If two nonoverlapping objects have sizes `S` and `T` represented as `ptrdiff_t` or `size_t` values, then `S + T` cannot overflow.
  • A pointer `P` points within an object `O` if and only if `(char *) &O <= (char *) P && (char *) P < (char *) (&O + 1)`.
  • Arithmetic on a valid pointer is equivalent to the same arithmetic on the pointer converted to `uintptr_t`, except that offsets are multiplied by the size of the pointed-to objects. For example, if `P + I` is a valid expression involving a pointer `P` and an integer `I`, then `(uintptr_t) (P + I) == (uintptr_t) ((uintptr_t) P
Similar arithmetic can be done with `intptr_t`, although more care must be taken in case of integer overflow or negative integers.

- A pointer `P` has alignment `A` if and only if `(uintptr_t) P % A` is zero, and similarly for `intptr_t`.
- If an existing object has size `S`, and if `T` is sufficiently small (e.g., 8 KiB), then `S + T` cannot overflow. Overflow in this case would mean that the rest of your program fits into `T` bytes, which can’t happen in realistic flat-address-space hosts.
- Adding zero to a null pointer does not change the pointer. For example, `0 + (char *) NULL == (char *) NULL`.

Some system platforms violate these assumptions and are therefore not GnuLib porting targets. See Section 2.4.3 [Unsupported Platforms], page 12.

### 1.6 High Quality

We develop and maintain a testsuite for GnuLib. The goal is to have a 100% firm interface so that maintainers can feel free to update to the code in git at any time and know that their application will not break. This means that before any change can be committed to the repository, a test suite program must be produced that exposes the bug for regression testing.

#### 1.6.1 Stable Branches

In GnuLib, we don’t use topic branches for experimental work. Therefore, occasionally a broken commit may be pushed in GnuLib. It does not happen often, but it does happen.

To compensate for this, GnuLib offers “stable branches”. These are branches of the GnuLib code that are maintained over some longer period (a year, for example) and include:

- bug fixes,
- portability enhancements (to existing as well as to new platforms),
- updates to `config.guess` and `config.sub`.

Not included in the stable branches are:

- new features, such as new modules,
- optimizations,
- refactorings,
- complex or risky changes in general,
- updates to `texinfo.tex`,
- documentation updates.

So far, we have four stable branches:

**stable-202307**

A stable branch that starts at the beginning of July 2023.

**stable-202301**

A stable branch that starts at the beginning of January 2023.

**stable-202207**

A stable branch that starts at the beginning of July 2022. It is no longer updated.
stable-202201
A stable branch that starts at the beginning of January 2022. It is no longer updated.

The two use-cases of stable branches are thus:
- You want to protect yourself from occasional breakage in Gnulib.
- When making a bug-fix release of your code, you can incorporate bug fixes in Gnulib, by pulling in the newest commits from the same stable branch that you were already using for the previous release.

1.6.2 Writing reliable code

When compiling and testing Gnulib and Gnulib-using programs, certain compiler options can help improve reliability. First of all, make it a habit to use ‘-Wall’ in all compilation commands. Beyond that, the manywarnings module enables several forms of static checking in GCC and related compilers (see Section 19.6 [manywarnings], page 842).

For dynamic checking, you can run configure with CFLAGS options appropriate for your compiler. For example:

```
./configure \
CPPFLAGS='-Wall'\nCFLAGS='-g3 -O2'\n' -D_FORTIFY_SOURCE=2'\n' -fsanitize=undefined'\n' -fsanitize-undefined-trap-on-error'
```

Here:
- `-D_FORTIFY_SOURCE=2` enables extra security hardening checks in the GNU C library.
- `-fsanitize=undefined` enables GCC’s undefined behavior sanitizer (ubsan), and
- `-fsanitize-undefined-trap-on-error` causes ubsan to abort the program (through an “illegal instruction” signal). This measure stops exploit attempts and also allows you to debug the issue.

Without the `-fsanitize-undefined-trap-on-error` option, `-fsanitize=undefined` causes messages to be printed, and execution continues after an undefined behavior situation. The message printing causes GCC-like compilers to arrange for the program to dynamically link to libraries it might not otherwise need. With GCC, instead of `-fsanitize-undefined-trap-on-error` you can use the `-static-libubsan` option to arrange for two of the extra libraries (libstdc++ and libubsan) to be linked statically rather than dynamically, though this typically bloats the executable and the remaining extra libraries are still linked dynamically.

It is also good to occasionally run the programs under valgrind (see Section 19.7 [Running self-tests under valgrind], page 845).

1.7 Join the GNU Project

GNU Gnulib is part of the GNU Operating System, developed by the GNU Project.

If you are the author of an awesome program and want to join us in writing Free (libre) Software, please consider making it an official GNU program and become a GNU Maintainer.
Instructions on how to do this are here (https://www.gnu.org/help/evaluation). We are looking forward to hacking with you!

Don’t have a program to contribute? Look at all the other ways to help (https://www.gnu.org/help/help.html).

And to learn more about Free (libre) Software in general, please read and share this page (https://gnu.org/philosophy/free-sw.html).
2 Philosophy

Gnulib’s design and development philosophy is organized around steady, collaborative, and open development of reusable modules that are suitable for a reasonably wide variety of platforms.

2.1 Benefits of using Gnulib

Gnulib is useful to enhance various aspects of a package:

- Portability: With Gnulib, a package maintainer can program against the POSIX and GNU libc APIs and nevertheless expect good portability to platforms that don’t implement POSIX.
- Maintainability: When a package uses modules from Gnulib instead of code written specifically for that package, the maintainer has less code to maintain.
- Security: Gnulib provides functions that are immune against vulnerabilities that plague the uses of the corresponding commonplace functions. For example, `asprintf`, `canonicalize_file_name` are not affected by buffer sizing problems that affect `sprintf`, `realpath`. `openat` does not have the race conditions that `open` has. Etc.
- Reliability: Gnulib provides functions that combine a call to a system function with a check of the result. Examples are `xalloc`, `xprintf`, `xstrtod`, `xgetcwd`.
- Structure: Gnulib offers a way to structure code into modules, typically one include file, one source code file, and one autoconf macro for each functionality. Modularity helps maintainability.

2.2 Library vs. Reusable Code

Classical libraries are installed as binary object code. Gnulib is different: It is used as a source code library. Each package that uses Gnulib thus ships with part of the Gnulib source code. The used portion of Gnulib is tailored to the package: A build tool, called `gnulib-tool`, is provided that copies a tailored subset of Gnulib into the package.

2.3 Portability and Application Code

One of the goals of Gnulib is to make portable programming easy, on the basis of the standards relevant for GNU (and Unix). The objective behind that is to avoid a fragmentation of the user community into disjoint user communities according to the operating system, and instead allow synergies between users on different operating systems.

Another goal of Gnulib is to provide application code that can be shared between several applications. Some people wonder: "What? glibc doesn’t have a function to copy a file?" Indeed, the scope of a system’s libc is to implement the relevant standards (ISO C, POSIX) and to provide access functions to the kernel’s system calls, and little more.

There is no clear borderline between both areas.

For example, Gnulib has a facility for generating the name of backup files. While this task is entirely at the application level—no standard specifies an API for it—the naïve code has some portability problems because on some platforms the length of file name components is limited to 30 characters or so. Gnulib handles that.
Similarly, Gnulib has a facility for executing a command in a subprocess. It is at the same time a portability enhancement (it works on GNU, Unix, and Windows, compared to the classical `fork/exec` idiom which is not portable to Windows), as well as an application aid: it takes care of redirecting stdin and/or stdout if desired, and emits an error message if the subprocess failed.

2.4 Target Platforms

Gnulib supports a number of platforms that we call the “reasonable portability targets”. This class consists of widespread operating systems, for three years after their last availability, or—for proprietary operating systems—as long as the vendor provides commercial support for it. Already existing Gnulib code for older operating systems is usually left in place for longer than these three years. So it comes that programs that use Gnulib run pretty well also on these older operating systems.

Some operating systems are not very widespread, but are Free Software and are actively developed. Such platforms are also supported by Gnulib, if that OS’s developers community keeps in touch with the Gnulib developers, by providing bug reports, analyses, or patches. For such platforms, Gnulib supports only the versions of the last year or the last few months, depending on the maturity of said OS project, the number of its users, and how often these users upgrade.

Niche operating systems are generally unsupported by Gnulib, unless some of their developers or users contribute support to Gnulib.

The degree of support Gnulib guarantees for a platform depends on the amount of testing it gets from volunteers. Platforms on which Gnulib is frequently tested are the best supported. Then come platforms with occasional testing, then platforms which are rarely tested. Usually, we fix bugs when they are reported. Except that some rarely tested platforms are also low priority; bug fixes for these platforms can take longer.

2.4.1 Supported Platforms

As of 2023, the list of supported platforms is the following:

- glibc systems. With glibc 2.19 or newer, they are frequently tested. About the kernels:
  - glibc on Linux is frequently tested.
  - glibc on kFreeBSD is rarely tested.
  - musl libc on Linux is occasionally tested.
- macOS. In versions 12.5, it’s occasionally tested. In version 10.5, it’s rarely tested.
- FreeBSD 13.0 or newer is occasionally tested.
- OpenBSD 7.0 or newer is occasionally tested.
- NetBSD 9.0 or newer is occasionally tested.
- AIX 7.1 and 7.2 are occasionally tested.
- Solaris 10 and 11.4 are occasionally tested. Solaris 9 is rarely tested and low priority.
- Android is occasionally tested, through the Termux app on Android 11.
- Cygwin 2.9 is occasionally tested. Cygwin 1.7.x is rarely tested.
Native Windows:
- mingw is occasionally tested. Only the latest version of mingw is tested; older versions are not supported.
- MSVC 14 (Microsoft Visual Studio 2015 14.0) is occasionally tested. Only “release” builds (compiler option ‘-MD’) are supported, not “debug” builds (compiler option ‘-MDd’).

Note that some modules are currently unsupported on native Windows: mgetgroups, getgroups, idcache, userspec, openpty, login_tty, forkpty, pt_chown, grantpt, pty, savewd, mkancesdirs, mkdir-p, euidaccess, faccessat. The versions of Windows that are supported are Windows 10 and newer.
- GNU Hurd 0.9 is rarely tested.
- IRIX 6.5 is very rarely tested.
- Minix 3.3.0 is no longer tested.
- Haiku is no longer tested.
- uClibc on Linux is no longer tested.
- QNX is no longer tested.

2.4.2 Formerly Supported Platforms
The following platforms were supported in the past, but are no longer supported:
- glibc versions 2.1.x and older.
- Mac OS X 10.4 and older.
- AIX 6 and older.
- IRIX 6.4 and older.
- OSF/1 5.1.
- Solaris 8 and older.
- Interix.
- BeOS.

Gnulib supports these operating systems only in an unvirtualized environment. When you run an OS inside a virtual machine, you have to be aware that the virtual machine can bring in bugs of its own. For example, floating-point operations on Solaris can behave slightly differently in QEMU than on real hardware. And Haiku’s bash program misbehaves in VirtualBox 3, whereas it behaves fine in VirtualBox 4.

Similarly, running native Windows binaries on GNU/Linux under WINE is rarely tested and low priority: WINE has a set of behaviours and bugs that is slightly different from native Windows.

2.4.3 Unsupported Platforms
Some platforms with C compilers are not supported by Gnulib because the platforms violate Gnulib’s C portability assumptions. See Section 1.5.4 [Other portability assumptions], page 6.
These assumptions are not required by the C or POSIX standards but hold on almost all practical porting targets. If you need to port GnuLib code to a platform where these assumptions are not true, we would appreciate hearing of any fixes. We need fixes that do not increase runtime overhead on standard hosts and that are relatively easy to maintain. These platforms are listed below to illustrate problems that GnuLib and GnuLib-using code would have if it were intended to be portable to all practical POSIX or C platforms.

- Clang’s `-fsanitize=undefined` option causes the program to crash if it adds zero to a null pointer – behavior that is undefined in strict C, but which yields a null pointer on all practical porting targets and which the GnuLib portability guidelines allow. If you use Clang with `-fsanitize=undefined`, you can work around the problem by also using `'-fno-sanitize=pointer-overflow'`, although this may also disable some unrelated and useful pointer checks. Perhaps someday the Clang developers will fix the infelicity.

- The IBM i’s pointers are 128 bits wide and it lacks the two types `intptr_t` and `uintptr_t`, which are optional in the C and POSIX standards. However, these two types are required for the XSI extension to POSIX, and many GnuLib modules use them. To work around this compatibility problem, GnuLib-using applications can be run on the IBM i’s PASE emulation environment. The IBM i’s architecture descends from the System/38 (1978).

- The Unisys ClearPath Dorado’s machine word is 36 bits. Its signed integers use a one’s-complement representation. On these machines, `CHAR_BIT == 9` and `INT_MIN == -INT_MAX`. By default `UINT_MAX` is $2^{36} - 2$, which does not conform to the C requirement that it be one less than a power of two. Although compiler options can raise `UINT_MAX` to be $2^{36} - 1$, this can break system code that uses $-0$ as a flag value. This platform’s architecture descends from the UNIVAC 1103 (1953).

- The Unisys ClearPath Libra’s machine word is 48 bits with a 4-bit tag and a 4-bit data extension. Its `unsigned int` uses the low-order 40 bits of the word, and `int` uses the low-order 41 bits of the word with a signed-magnitude representation. On these machines, `INT_MAX == UINT_MAX`, `INT_MIN == -INT_MAX`, and `sizeof (int) == 6`. This platform’s architecture descends from the Burroughs B5000 (1961).

The following platforms are not supported by GnuLib. The cost of supporting them would exceed the benefit because they are rarely used, or poorly documented, or have been supplanted by other platforms, or diverge too much from POSIX, or some combination of these and other factors. Please don’t bother sending us patches for them.

- Windows 95/98/ME.
- DJGPP and EMX (the 32-bit operating systems running in DOS).
- MSDOS (the 16-bit operating system).
- Windows Mobile, Symbian OS, iOS.

2.5 Modules

GnuLib is divided into modules. Every module implements a single facility. Modules can depend on other modules.

A module consists of a number of files and a module description. The files are copied by `gnumlib-tool` into the package that will use it, usually verbatim, without changes. Source
code files (.h, .c files) reside in the lib/ subdirectory. Autoconf macro files reside in the m4/ subdirectory. Build scripts reside in the build-aux/ subdirectory.

The module description contains the list of files; gnulib-tool copies these files. It contains the module’s dependencies; gnulib-tool installs them as well. It also contains the autoconf macro invocation (usually a single line or nothing at all); gnulib-tool ensures this is invoked from the package’s configure.ac file. And also a Makefile.am snippet; gnulib-tool collects these into a Makefile.am for the tailored Gnulib part. The module description and include file specification are for documentation purposes; they are combined into MODULES.html.

The module system serves two purposes:
1. It ensures consistency of the used autoconf macros and Makefile.am rules with the source code. For example, source code which uses the getopt_long function—this is a common way to implement parsing of command line options in a way that complies with the GNU standards—needs the source code (lib/getopt.c and others), the autoconf macro which detects whether the system’s libc already has this function (in m4/getopt.m4), and a few Makefile.am lines that create the substitute getopt.h if not. These three pieces belong together. They cannot be used without each other. The module description and gnulib-tool ensure that they are copied altogether into the destination package.
2. It allows for scalability. It is well-known since the inception of the MODULA-2 language around 1978 that dissection into modules with dependencies allows for building large sets of code in a maintainable way. The maintainability comes from the facts that:
   • Every module has a single purpose; you don’t worry about other parts of the program while creating, reading or modifying the code of a module.
   • The code you have to read in order to understand a module is limited to the source of the module and the .h files of the modules listed as dependencies. It is for this reason also that we recommend to put the comments describing the functions exported by a module into its .h file.

In other words, the module is the elementary unit of code in Gnulib, comparable to a class in object-oriented languages like Java or C#.

The module system is the basis of gnulib-tool. When gnulib-tool copies a part of Gnulib into a package, it first compiles a module list, starting with the requested modules and adding all the dependencies, and then collects the files, configure.ac snippets and Makefile.am snippets.

2.6 Various Kinds of Modules

There are modules of various kinds in Gnulib. For a complete list of the modules, see in MODULES.html.

2.6.1 Support for ISO C or POSIX functions.

When a function is not implemented by a system, the Gnulib module provides an implementation under the same name. Examples are the ‘snprintf’ and ‘readlink’ modules.

Similarly, when a function is not correctly implemented by a system, Gnulib provides a replacement. For functions, we use the pattern
and implement the `foo` function under the name `rpl_foo`. This renaming is needed to avoid conflicts at compile time (in case the system header files declare `foo`) and at link/run time (because the code making use of `foo` could end up residing in a shared library, and the executable program using this library could be defining `foo` itself).

For header files, such as `stdint.h`, we provide the substitute only if the system doesn’t provide a correct one. The template of this replacement is distributed in a slightly different name, with `.in` inserted before the `.h` extension, so that on systems which do provide a correct header file the system’s one is used.

The modules in this category are supported in C++ mode as well. This means, while the autoconfiguration uses the C compiler, the resulting header files and function substitutes can be used with a matching C++ compiler as well.

**2.6.2 Enhancements of ISO C or POSIX functions**

These are sometimes POSIX functions with GNU extensions also found in glibc—examples: `getopt`, `fnmatch`—and often new APIs—for example, for all functions that allocate memory in one way or the other, we have variants which also include the error checking against the out-of-memory condition.

**2.6.3 Portable general use facilities**

Examples are a module for copying a file—the portability problems relate to the copying of the file’s modification time, access rights, and extended attributes—or a module for extracting the tail component of a file name—here the portability to native Windows requires a different API than the classical POSIX `basename` function.

**2.6.4 Reusable application code**

Examples are an error reporting function, a module that allows output of numbers with K/M/G suffixes, or cryptographic facilities.

**2.6.5 Object oriented classes**

Examples are data structures like `list`, or abstract output stream classes that work around the fact that an application cannot implement an stdio FILE with its logic. Here, while staying in C, we use implementation techniques like tables of function pointers, known from the C++ language or from the Linux kernel.

**2.6.6 Interfaces to external libraries**

Examples are the `iconv` module, which interfaces to the `iconv` facility, regardless whether it is contained in libc or in an external `libiconv`. Or the `readline` module, which interfaces to the GNU readline library.

**2.6.7 Build / maintenance infrastructure**

An example is the `maintainer-makefile` module, which provides extra Makefile tags for maintaining a package.
2.7 Collaborative Development

Gnulib is maintained collaboratively. The mailing list is <bug-gnulib at gnu dot org>. Be warned that some people on the list may be very active at some times and unresponsive at other times.

Every module has one or more maintainers. While issues are discussed collaboratively on the list, the maintainer of a module nevertheless has a veto right regarding changes in his module.

All patches should be posted to the list, regardless whether they are proposed patches or whether they are committed immediately by the maintainer of the particular module. The purpose is not only to inform the other users of the module, but mainly to allow peer review. It is not uncommon that several people contribute comments or spot bugs after a patch was proposed.

Conversely, if you are using Gnulib, and a patch is posted that affects one of the modules that your package uses, you have an interest in proofreading the patch.

2.8 Copyright

Most modules are under the GPL. Some, mostly modules which can reasonably be used in libraries, are under LGPL. Few modules are under other licenses, such as LGPLv2+, unlimited, or public domain.

If the module description file says "GPL", it means "GPLv3+" (GPLv3 or newer, at the licensee’s choice); if it says "LGPL", it means "LGPLv3+" (LGPLv3 or newer, at the licensee’s choice).

The source files, more precisely the files in lib/ and build-aux/, are under a license compatible with the module’s license. Most often, they are under the same license. But files can be shared among several modules, and in these cases it can happen that a source file is under a weaker license than noted in the module description – namely under the weakest license among the licenses of the modules that contain the file.

Different licenses apply to files in special directories:

modules/ Module description files are under this copyright:

Copyright © 20XX–20YY Free Software Foundation, Inc.
Copying and distribution of this file, with or without modification, in any medium, are permitted without royalty provided the copyright notice and this notice are preserved.

m4/ Autoconf macro files are under this copyright:

Copyright © 20XX–20YY Free Software Foundation, Inc.
This file is free software; the Free Software Foundation gives unlimited permission to copy and/or distribute it, with or without modifications, as long as this notice is preserved.

tests/ If a license statement is not present in a test module, the test files are under GPL. Even if the corresponding source module is under LGPL, this is not a problem, since compiled tests are not installed by “make install”.

doc/ Documentation files are under this copyright:
If you want to use some GnuLib modules under LGPL, you can do so by passing the option ‘--lgpl’ to gnu-lib-tool. This will ensure that all imported modules can be used under the LGPL license. Similarly, if you want some GnuLib modules under LGPLv2+ (Lesser GPL version 2.1 or newer), you can do so by passing the option ‘--lgpl=2’ to gnu-lib-tool.

Keep in mind that when you submit patches to files in GnuLib, you should license them under a compatible license. This means that sometimes the contribution will have to be LGPL, if the original file is available under LGPL. You can find out about it by looking at the license header of the file.

2.9 Steady Development

GnuLib modules are continually adapted, to match new practices, to be consistent with newly added modules, or simply as a response to build failure reports.

If you are willing to report an occasional regression, we recommend to use the newest version from git always, except in periods of major changes. Most GnuLib users do this.

2.10 Openness

GnuLib is open in the sense that we gladly accept contributions if they are generally useful, well engineered, and if the contributors have signed the obligatory papers with the FSF.

The module system is open in the sense that a package using GnuLib can
1. locally patch or override files in GnuLib,
2. locally add modules that are treated like GnuLib modules by gnu-lib-tool.

This is achieved by the ‘--local-dir’ option of gnu-lib-tool (see Chapter 5 [Extending GnuLib], page 42).
3 Invoking gnulib-tool

The gnulib-tool command is the recommended way to import GnuLib modules. It is possible to borrow GnuLib modules in a package without using gnulib-tool, relying only on the meta-information stored in the modules/* files, but with a growing number of modules this becomes tedious. gnulib-tool simplifies the management of source files, Makefile.am and configure.ac in packages incorporating GnuLib modules.

gnulib-tool is not installed in a standard directory that is contained in the PATH variable. It needs to be run directly in the directory that contains the GnuLib source code. You can do this either by specifying the absolute filename of gnulib-tool, or you can also use a symbolic link from a place inside your PATH to the gnulib-tool file of your preferred and most up-to-date GnuLib checkout, like this:

$ ln -s $HOME/gnu/src/gnulib.git/gnulib-tool $HOME/bin/gnulib-tool

Run ‘gnulib-tool --help’ for information. To get familiar with gnulib-tool without affecting your sources, you can also try some commands with the option ‘--dry-run’; then gnulib-tool will only report which actions it would perform in a real run without changing anything.

3.1 Finding modules

There are four ways of finding the names of GnuLib modules that you can use in your package:

- You have the complete module list, sorted according to categories, in https://www.gnu.org/software/gnulib/MODULES.html.
- If you are looking for POSIX function replacements that you don’t know about yet, follow the procedure described in section Section 3.7 [Finding POSIX substitutes], page 24.
- If you are looking for a particular POSIX header or function replacement, look in the chapters Chapter 9 [Header File Substitutes], page 52, and Chapter 10 [Function Substitutes], page 85. For headers and functions that are provided by Glibc but not standardized by POSIX, look in the chapters Chapter 12 [Glibc Header File Substitutes], page 491, and Chapter 13 [Glibc Function Substitutes], page 504.
- If you have already found the source file in GnuLib and are looking for the module that contains this source file, you can use the command ‘gnulib-tool --find filename’.

3.2 Initial import

GnuLib assumes that your project uses Autoconf. When using GnuLib, you will need to have Autoconf among your build tools.

GnuLib also assumes that your project’s configure.ac contains the line

AC_CONFIG_HEADERS([config.h])

The config.h file gets generated with platform dependent C macro definitions, and the source files include it (see Section 3.5 [Source changes], page 23).

Unless you use gnulib-tool’s --gnu-make option, GnuLib also assumes that your project uses Automake at least in a subdirectory of your project. While the use of Automake in
Chapter 3: Invoking gnulib-tool

your project’s top level directory is an easy way to fulfil the Makefile conventions of the GNU coding standards, GnuLib does not require it.

Invoking ‘gnulib-tool --import’ will copy source files, create a Makefile.am to build them, generate a file gnulib-comp.m4 with Autoconf M4 macro declarations used by configure.ac, and generate a file gnulib-cache.m4 containing the cached specification of how GnuLib is used.

Our example will be a library that uses Autoconf, Automake and Libtool. It calls strdup, and you wish to use gnuLib to make the package portable to C99 and C11 (which don’t have strdup).

```
~/src/libfoo$ gnulib-tool --import strdup
Module list with included dependencies:
  absolute-header
  extensions
  strdup
  string
File list:
  lib/dummy.c
  lib/strdup.c
  lib/string.in.h
  m4/absolute-header.m4
  m4/extensions.m4
  m4/gnulib-common.m4
  m4/strdup.m4
  m4/string_h.m4
Creating directory ./lib
Creating directory ./m4
Copying file lib/dummy.c
Copying file lib/strdup.c
Copying file lib/string.in.h
Copying file m4/absolute-header.m4
Copying file m4/extensions.m4
Copying file m4/gnulib-common.m4
Copying file m4/gnulib-tool.m4
Copying file m4/strdup.m4
Copying file m4/string_h.m4
Creating lib/Makefile.am
Creating m4/gnulib-cache.m4
Creating m4/gnulib-comp.m4
Finished.

You may need to add #include directives for the following .h files.
  #include <string.h>

Don't forget to
- add "lib/Makefile" to AC_CONFIG_FILES in ./configure.ac,
- mention "lib" in SUBDIRS in Makefile.am,
- mention "-I m4" in ACLOCAL_AMFLAGS in Makefile.am,
- invoke gl_EARLY in ./configure.ac, right after AC_PROG_CC,
- invoke gl_INIT in ./configure.ac.

~/src/libfoo$

By default, the source code is copied into lib/ and the M4 macros in m4/. You can override these paths by using --source-base=DIRECTORY and --m4-base=DIRECTORY. Some modules also provide other files necessary for building. These files are copied into the directory specified by AC_CONFIG_AUX_DIR in configure.ac or by the --aux-dir=DIRECTORY option. If neither is specified, the current directory is assumed.

gnulib-tool can make symbolic links instead of copying the source files. The option to specify for this is --symlink, or -s for short. This can be useful to save a few kilobytes of disk space. But it is likely to introduce bugs when gnulib is updated; it is more reliable to use gnulib-tool --update (see below) to update to newer versions of gnulib. Furthermore it requires extra effort to create self-contained tarballs, and it may disturb some mechanism the maintainer applies to the sources. For these reasons, this option is generally discouraged.

gnulib-tool will overwrite any preexisting files, in particular Makefile.am. It is also possible to separate the generated Makefile.am content (for building the gnulib library) into a separate file, say gnulib.mk, that can be included by your handwritten Makefile.am, but this is a more advanced use of gnulib-tool.

Consequently, it is a good idea to choose directories that are not already used by your projects, to separate gnulib imported files from your own files. This approach is also useful if you want to avoid conflicts between other tools (e.g., gettextize that also copy M4 files into your package. Simon Josefsson successfully uses a source base of gl/, and a M4 base of gl/m4/, in several packages.

After the --import option on the command line comes the list of Gnulib modules that you want to incorporate in your package. The names of the modules coincide with the filenames in Gnuilb’s modules/ directory.

Some Gnulib modules depend on other Gnulib modules. gnulib-tool will automatically add the needed modules as well; you need not list them explicitly. gnulib-tool will also memorize which dependent modules it has added, so that when someday a dependency is dropped, the implicitly added module is dropped as well (unless you have explicitly requested that module).

If you want to cut a dependency, i.e., not add a module although one of your requested modules depends on it, you may use the option --avoid=module to do so. Multiple uses of this option are possible. Of course, you will then need to implement the same interface as the removed module.

A few manual steps are required to finish the initial import. gnulib-tool printed a summary of these steps.

First, you must ensure Autoconf can find the macro definitions in gnulib-comp.m4. Use the ACLOCAL_AMFLAGS specifier in your top-level Makefile.am file, as in:

ACLOCAL_AMFLAGS = -I m4

You are now ready to call the M4 macros in gnulib-comp.m4 from configure.ac. The macro gl_EARLY must be called as soon as possible after verifying that the C compiler is working. Typically, this is immediately after AC_PROG_CC, as in:
The core part of the gnulib checks are done by the macro gl_INIT. Place it further down in the file, typically where you normally check for header files or functions. It must come after other checks which may affect the compiler invocation, such as AC_MINIX. For example:

```
...  
  # For gnulib.
  gl_INIT
  ...
```

`gl_INIT` will in turn call the macros related with the gnulib functions, be it specific gnulib macros, like `gl_FUNC_ALLOCA` or Autoconf or Automake macros like `AC_FUNC_ALLOCA` or `AM_FUNC_GETLINE`. So there is no need to call those macros yourself when you use the corresponding gnulib modules.

You must also make sure that the gnulib library is built. Add the `Makefile` in the gnulib source base directory to `AC_CONFIG_FILES`, as in:

```
AC_CONFIG_FILES(... lib/Makefile ...)
```

You must also make sure that `make` will recurse into the gnulib directory. To achieve this, add the gnulib source base directory to a `SUBDIRS` Makefile.am statement, as in:

```
SUBDIRS = lib
```

Or if you, more likely, already have a few entries in `SUBDIRS`, you can add something like:

```
SUBDIRS += lib
```

Finally, you have to add compiler and linker flags in the appropriate source directories, so that you can make use of the gnulib library. Since some modules (`'getopt'`, for example) may copy files into the build directory, `top_builddir/lib` is needed as well as `top_srcdir/lib`. For example:

```
...  
  AM_CPPFLAGS = -I$(top_builddir)/lib -I$(top_srcdir)/lib
  ...
  LDADD = lib/libgnu.a
  ...
```

Don’t forget to `#include` the various header files. In this example, you would need to make sure that `#include <string.h>` is evaluated when compiling all source code files, that want to make use of `strdup`.

In the usual case where Autoconf is creating a `config.h` file, you should include `config.h` first, before any other include file. That way, for example, if `config.h` defines ‘restrict’ to be the empty string on a non-C99 host, or a macro like ‘_FILE_OFFSET_BITS’ that affects the layout of data structures, the definition is consistent for all include files. Also, on some platforms macros like ‘_FILE_OFFSET_BITS’ and ‘_GNU_SOURCE’ may be ineffective, or may have only a limited effect, if defined after the first system header file is included.

Finally, note that you cannot use `AC_LIBOBJ` or `AC_REPLACE_FUNCS` in your `configure.ac` and expect the resulting object files to be automatically added to
lib/libgnu.a. This is because your AC_LIBOBJ and AC_REPLACE_FUNCS invocations from configure.ac augment a variable @LIBOBJS@ (and/or @LTLIBOBJS@ if using Libtool), whereas lib/libgnu.a is built from the contents of a different variable, usually @gl_LIBOBJS@ (or @gl_LTLIBOBJS@ if using Libtool).

### 3.3 Modified imports

You can at any moment decide to use Gnulib differently than the last time.

There are two ways to change how Gnulib is used. Which one you’ll use, depends on where you keep track of options and module names that you pass to gnulib-tool.

- If you store the options and module names in a file under your own control, such as autogen.sh, bootstrap, bootstrap.conf, or similar, simply invoke gnulib-tool again, with modified options and more or fewer module names.
- gnulib-tool remembers which modules were used last time. If you want to rely on gnulib-tool’s own memory of the last used options and module names, you can use the commands gnulib-tool --add-import and gnulib-tool --remove-import.

So, if you only want to use more Gnulib modules, simply invoke gnulib-tool --add-import new-modules. The list of modules that you pass after `--add-import` is added to the previous list of modules.

Similarly, if you want to use fewer Gnulib modules, simply invoke gnulib-tool --remove-import unneeded-modules. The list of modules that you pass after `--remove-import` is removed from the previous list of modules. Note that if a module is then still needed as dependency of other modules, it will be used nevertheless. If you want to really not use a module any more, regardless of whether other modules may need it, you need to use the `--avoid` option.

For other changes, such as different choices of `--lib`, `--source-base` or `--aux-dir`, the normal way is to modify manually the file gnulib-cache.m4 in the M4 macros directory, then launch ‘gnulib-tool --add-import’.

The only change for which this doesn’t work is a change of the ‘--m4-base’ directory. Because, when you pass a different value of ‘--m4-base’, gnulib-tool will not find the previous gnulib-cache.m4 file any more. A possible solution is to manually copy the gnulib-cache.m4 into the new M4 macro directory.

In the gnulib-cache.m4 file, the macros have the following meaning:

- **gl_MODULES**
  The argument is a space separated list of the requested modules, not including dependencies.

- **gl_AVOID**
  The argument is a space separated list of modules that should not be used, even if they occur as dependencies. Corresponds to the ‘--avoid’ command line argument.

- **gl_SOURCE_BASE**
  The argument is the relative file name of the directory containing the gnulib source files (mostly *.c and *.h files). Corresponds to the ‘--source-base’ command line argument.
Chapter 3: Invoking gnulib-tool

3.4 Simple update

When you want to update to a more recent version of Gnulib, without changing the list of modules or other parameters, a simple call does it:

```bash
$ gnulib-tool --add-import
```

This will create, update or remove files, as needed.

Note: From time to time, changes are made in Gnulib that are not backward compatible. When updating to a more recent Gnulib, you should consult Gnulib’s NEWS file to check whether the incompatible changes affect your project.

3.5 Changing your sources for use with Gnulib

Gnulib contains some header file overrides. This means that when building on systems with deficient header files in /usr/include/, it may create files named string.h, stdlib.h, stdint.h or similar in the build directory. In the other source directories of your package you will usually pass `-I` options to the compiler, so that these Gnulib substitutes are visible and take precedence over the files in /usr/include/.

These Gnulib substitute header files rely on `<config.h>` being already included. Furthermore `<config.h>` must be the first include in every compilation unit. This means that to all your source files and likely also to all your tests source files you need to add an `#include <config.h>` at the top. Which source files are affected? Exactly those whose compilation includes a `-I` option that refers to the Gnulib library directory.
Chapter 3: Invoking gnulib-tool

This is annoying, but inevitable: On many systems, `<config.h>` is used to set system dependent flags (such as `_GNU_SOURCE` on GNU systems), and these flags have no effect after any system header file has been included.

3.6 Changing your link commands for use with Gnulib

When you use Gnulib, you need to augment the set of libraries against which your programs and libraries are linked. This is done by augmenting the Automake variable `LDADD` (for all programs) or `prog_LDADD` (for a single program `prog`) or `library_la_LIBADD` (for a single library `library_la`).

What do you need to add to this Automake variable?

1. The reference to the Gnulib library. In the example of section Section 3.2 [Initial import], page 18, this would be `lib/libgnu.a` for source in the top-level directory, or `../lib/libgnu.a` for source in a sibling directory of `lib/`.

2. References to additional libraries, brought in by some of the Gnulib modules that you use (directly or indirectly). The complete list of such libraries is printed when you invoke `gnulib-tool`. Alternatively, you can retrieve the set of additional libraries required by a specific Gnulib module by running
   
   ```
   ./gnulib-tool --extract-recursive-link-directive module
   ```

   Beware: By looking into the module description file `modules/module` or by running
   
   ```
   ./gnulib-tool --extract-link-directive module
   ```

   you would miss the link dependencies of indirectly used modules.

3.7 Finding recommended ISO C and POSIX function substitutes

Gnulib contains a wealth of portability workarounds for ISO C and POSIX functions. They are listed in detail in the chapter Chapter 10 [Function Substitutes], page 85. If you want to know which function substitutes are recommended for your package, you can search your source code for ISO C and POSIX functions that it uses and read the corresponding sections of said documentation chapter. But this is a tedious task. Here is an alternative approach that makes this task easier.

1. Add the Gnulib module `posixcheck` to the Gnulib imports of your package, as described earlier in this chapter.

2. Do a `make distclean` if you previously built in the top-level directory. Then regenerate the Autotools-generated parts of the package.

3. On a glibc system, build your package. Pay attention to the compiler warnings. Warnings are generated for uses of ISO C and POSIX functions that have portability problems or other important pitfalls and for which you have not yet imported the corresponding Gnulib module. If you get, say, a warning “warning: call to ‘close’ declared with attribute warning: close does not portably work on sockets - use gnulib module close for portability”, put ‘`close`’ on your list of modules to import.

4. Add the modules you noted to the Gnulib imports of your package.

5. Optionally, you can do the same steps again, and make sure that there are no warnings left except those that you want to intentionally ignore.
6. Finally, remove the Gнуліb module ‘posixcheck’ from the Gнуліb imports, and run `make distclean`.

### 3.8 Modifying the build rules of a Gнуліb import directory

In some cases, you may want to set additional compiler options for use within the Gнуліb import directory. For example, the ‘relocatable’ module operates better if you define the C macros `ENABLE_COSTLY_RELOCATABLE` and `INSTALLDIR` during its compilation.

There are two ways to do so: Use of the `gnulib-tool` option `--makefile-name`, and a kitchen-sink module.

With the `gnulib-tool` option `--makefile-name`, you are telling `gnulib-tool` to generate an includable `Makefile.am` portion, rather than a self-contained `Makefile.am`. For example, when you use `--makefile-name=Makefile.gnulib`, `gnulib-tool` will generate `Makefile.gnulib`, and you will provide a hand-written `Makefile.am` that includes `Makefile.gnulib` through a line such as

```makefile
include Makefile.gnulib
```

Before this include, you need to initialize this set of `Makefile.am` variables:

- `AUTOMAKE_OPTIONS`
- `SUBDIRS`
- `noinst_HEADERS`
- `noinst_LIBRARIES`
- `noinst_LTLIBRARIES`
- `pkgdata_DATA` (only with Automake ≥ 1.11.4)
- `EXTRA_DIST`
- `BUILT_SOURCES`
- `SUFFIXES`
- `MOSTLYCLEANFILES`
- `MOSTLYCLEANDIRS`
- `CLEANFILES`
- `DISTCLEANFILES`
- `MAINTAINERCLEANFILES`
- `AM_CPPFLAGS`
- `AM_CFLAGS`

`AUTOMAKE_OPTIONS` should be initialized as described in Section “Changing Automake’s Behavior” in GNU Automake. The other variables can be initialized to empty. However, you will most likely want to initialize some of them with non-empty values, in order to achieve the desired customization.

The other approach, the kitchen-sink module, is more advanced. See chapter Chapter 5 [Extending Gнуліb], page 42.
3.9 Building directly from the top-level directory

By default, the Gnulib import directory will contain a generated `Makefile.am` file. After configuring, this produces a generated `Makefile` in this directory. As a consequence, the build from the top-level directory will use a recursive `make` invocation for this directory.

Some people prefer a build system where the `Makefile` in the top-level directory directly builds the artifacts in the subdirectories, without an intermediate `make` invocation. This is called “non-recursive make” and is supported by Automake. For more details, see https://autotools.io/automake/nonrecursive.html.

Gnulib supports this flavour of build system too. To use it, pass two options to `gnulib-tool`: `--makefile-name` and `--automake-subdir`.

With the `gnulib-tool` option `--makefile-name`, you are telling `gnulib-tool` to generate an includable `Makefile.am` portion in the Gnulib import directory, rather than a self-contained `Makefile.am`. For example, when you use `--makefile-name=Makefile.gnulib`, `gnulib-tool` will generate `Makefile.gnulib`.

With the option `--automake-subdir`, you are telling `gnulib-tool` that you will include the generated file from the `Makefile.am` in the top-level directory, rather than from a `Makefile.am` in the same directory. For example, the top-level `Makefile.am` might contain this directive:

```
include lib/Makefile.gnulib
```

The option `--automake-subdir` is also supported in combination with `--with-tests` (see Section 3.14 [Unit tests], page 31). Note that in this case, however, the generated unit tests directory will contain a `Makefile.am` and thus use a recursive `make` invocation. This is not a problem, since the built artifacts of your package have no dependencies towards the Gnulib unit tests, nor vice versa.

3.10 Using Gnulib for both a library and a program

Your project might build both a library and some accompanying programs in the same source tree. In that case you might want to use different modules for the library than for the programs. Typically the programs might want to make use of `getopt-posix` or `version-etc`, while the library wants to stay clear of these modules for technical or licensing reasons.

Let’s assume that your project contains a `lib` directory where the source of the library resides and a `src` directory for the sources of the programs as follows.

```
|-- configure.ac
|-- lib
| |-- foo.c
| `-- Makefile.am
|-- Makefile.am
`-- src
    |-- bar.c
    `-- Makefile.am
```

You can now add two instances of Gnulib to your project in separate source trees:

```
~/src/libfoo$ gnulib-tool --import --lib=libgnu --source-base=gnulib \
   --m4-base=gnulib/m4 --macro-prefix=gl strndup
```
~/src/libfoo$ gnulib-tool --import --lib=libgnutools \ 
  --source-base=src/gnulib --m4-base=src/gnulib/m4 \ 
  --macro-prefix=gl_tools getopt-gnu

The first one will import the module strndup in gnulib and the second one will import getopt-gnu in src/gnulib and you will end up with the following source tree (many files omitted in the interest of brevity):

|-- configure.ac
|-- gnulib
  |-- m4
  `-- strndup.c
|-- lib
  |-- foo.c
  `-- Makefile.am
|-- Makefile.am
|-- src
  |-- bar.c
  |-- gnulib
    |-- getopt.c
    `-- getopt.in.h
    `-- m4
      `-- Makefile.am

As discussed in Section 3.14 [Unit tests], page 31, you may not use ‘--with-tests’ for this project since the configure.ac is shared.

Integration with your code is basically the same as outlined in Section 3.2 [Initial import], page 18, with the one exception that you have to add both the macro gl_EARLY and the macro gl_tools_EARLY to your configure.ac (and of course also both macros gl_INIT and gl_tools_INIT). Obviously the name of the second macro is dependent on the value of the --macro-prefix option in your gnulib-tool invocation.

    ...
    AC_PROG_CC
    gl_EARLY
    gl_tools_EARLY
    ...
    # For gnulib.
    gl_INIT
    gl_tools_INIT
    ...

Also as outlined in Section 3.2 [Initial import], page 18, you will have to add compiler and linker flags. For the library you might have to add something along the line of the following to your Makefile.am:

    ...
    AM_CPPFLAGS = -I$(top_srcdir)/gnulib -I$(top_builddir)/gnulib
    ...
    libfoo_la_LIBADD = $(top_builddir)/gnulib/libgnu.la
Correspondingly for the programs you will have to add something like this:

```
AM_CPPFLAGS = -I$(top_srcdir)/src/gnulib -I$(top_builddir)/src/gnulib
LDADD = $(top_builddir)/src/gnulib/libgnutools.la
```

The name of the library that you have pass in the linker option depends on the `--lib` option in `gnulib-tool` invocation.

### 3.11 Caveat: gettextize and autopoint users

The programs `gettextize` and `autopoint`, part of GNU `gettext`, import or update the internationalization infrastructure. Some of this infrastructure, namely ca. 20 Autoconf macro files and the `config.rpath` file, is also contained in GnuLib and may be imported by `gnulib-tool`. The use of `gettextize` or `autopoint` will therefore overwrite some of the files that `gnulib-tool` has imported, and vice versa.

Avoiding to use `gettextize` (manually, as package maintainer) or `autopoint` (as part of a script like `autoreconf` or `autogen.sh`) is not the solution: These programs also import the infrastructure in the `po/` and optionally in the `intl/` directory.

The copies of the conflicting files in GnuLib are more up-to-date than the copies brought in by `gettextize` and `autopoint`. When a new `gettext` release is made, the copies of the files in GnuLib will be updated immediately.

The choice of which version of `gettext` to require depends on the needs of your package. For a package that wants to comply to GNU Coding Standards, the steps are:

1. When you run `gettextize`, always use the `gettextize` from the matching GNU `gettext` release. For the most recent GnuLib checkout, this is the newest release found on [https://ftp.gnu.org/gnu/gettext/](https://ftp.gnu.org/gnu/gettext/). For an older GnuLib snapshot, it is the release that was the most recent release at the time the GnuLib snapshot was taken.

2. After running `gettextize`, invoke `gnulib-tool` and import the `gettext` module. Also, copy the latest version of gnuLib’s `build-aux/po/Makefile.in.in` to your `po/` directory (this is done for you if you use gnuLib’s `autogen.sh` script).

3. If you get an error message like *** error: `gettext` infrastructure mismatch: using a `Makefile.in.in` from `gettext` version ... but the Autoconf macros are from `gettext` version ..., it means that a new GNU `gettext` release was made, and its Autoconf macros were integrated into GnuLib and now mismatch the `po/` infrastructure. In this case, fetch and install the new GNU `gettext` release and run `gettextize` followed by `gnulib-tool`.

On the other hand, if your package is not as concerned with compliance to the latest standards, but instead favors development on stable environments, the steps are:

1. Determine the oldest version of `gettext` that you intend to support during development (at this time, gnuLib recommends going no older than version 0.17). Run `autopoint` (not `gettextize`) to copy infrastructure into place (newer versions of `gettext` will install the older infrastructure that you requested).
Chapter 3: Invoking gnu\text{-}lib-tool

2. Invoke gnu\text{-}lib\text{-}tool, and import the gettext-h module.

Regardless of which approach you used to get the infrastructure in place, the following steps must then be used to preserve that infrastructure (gnumib's autogen.sh script follows these rules):

1. When a script of yours run autopoint, invoke gnu\text{-}lib\text{-}tool afterwards.
2. When you invoke autoreconf after gnu\text{-}lib\text{-}tool, make sure to not invoke autopoint a second time, by setting the AUTOPOINT environment variable, like this:

   $ env AUTOPOINT=true autoreconf --install

3.12 Handling Gnumib's own message translations

Gnumib provides some functions that emit translatable messages using GNU gettext. The 'gnumib' domain at the Translation Project (https://translationproject.org/) collects translations of these messages, which you should incorporate into your own programs.

There are two basic ways to achieve this. The first, and older, method is to list all the source files you use from Gnumib in your own po/POTFILES.in file. This will cause all the relevant translatable strings to be included in your POT file. When you send this POT file to the Translation Project, translators will normally fill in the translations of the Gnumib strings from their "translation memory", and send you back updated PO files.

However, this process is error-prone: you might forget to list some source files, or the translator might not be using a translation memory and provide a different translation than another translator, or the translation might not be kept in sync between Gnumib and your package. It is also slow and causes substantial extra work, because a human translator must be in the loop for each language and you will need to incorporate their work on request.

For these reasons, a new method was designed and is now recommended. If you pass the \texttt{--po-base=directory} and \texttt{--po-domain=domain} options to gnu\text{-}lib\text{-}tool, then gnu\text{-}lib\text{-}tool will create a separate directory with its own POTFILES.in. and fetch current translations directly from the Translation Project (using \texttt{rsync} or \texttt{wget}, whichever is available). The POT file in this directory will be called \texttt{domain-gnumib.pot}, depending on the domain you gave to the \texttt{--po-domain} option (typically the same as the package name). This causes these translations to reside in a separate message domain, so that they do not clash either with the translations for the main part of your package nor with those of other packages on the system that use possibly different versions of Gnumib. When you use these options, the functions in Gnumib are built in such a way that they will always use this domain regardless of the default domain set by textdomain.

In order to use this method, you must—in each program that might use Gnumib code—add an extra line to the part of the program that initializes locale-dependent behavior. Where you would normally write something like:

   setlocale (LC\_ALL, "");
   bindtextdomain (PACKAGE, LOCALEDIR);
   textdomain (PACKAGE);

you should add an additional bindtextdomain call to inform gettext of where the MO files for the extra message domain may be found:

   bindtextdomain (PACKAGE "-gnumib", LOCALEDIR);
(This example assumes that the domain that you specified to gnulib-tool is the same as the value of the PACKAGE preprocessor macro.)

Since you do not change the textdomain call, the default message domain for your program remains the same and your own use of gettext functions will not be affected.

### 3.13 Integration with Version Control Systems

If a project stores its source files in a version control system (VCS), such as CVS, Subversion, or Git, one needs to decide which files to commit.

In principle, all files created by gnulib-tool, except gnulib-cache.m4, can be treated like generated source files, like for example a parser.c file generated from parser.y. Alternatively, they can be considered source files and updated manually.

Here are the three different approaches in common use. Each has its place, and you should use whichever best suits your particular project and development methods.

1. In projects which commit all source files, whether generated or not, into their VCS, the gnulib-tool generated files should all be committed. In this case, you should pass the option `--no-vc-files` to gnulib-tool, which avoids alteration of VCS-related files such as .gitignore.

   Gnulib also contains files generated by make (and removed by make clean), using information determined by configure. For a Gnulib source file of the form lib/foo.in.h, the corresponding lib/foo.h is such a make-generated file. These should not be checked into the VCS, but instead added to .gitignore or equivalent.

2. In projects which customarily omit from their VCS all files that are generated from other source files, none of these files and directories are added into the VCS. As described in Section 3.3 [Modified imports], page 22, there are two ways to keep track of options and module names that are passed to gnulib-tool. The command for restoring the omitted files depends on it:
   - If they are stored in a file other than gnulib-cache.m4, such as autogen.sh, bootstrap, bootstrap.conf, or similar, the restoration command is the entire gnulib-tool ... --import ... invocation with all options and module names.
   - If the project relies on gnulib-tool’s memory of the last used options and module names, then the file gnulib-cache.m4 in the M4 macros directory must be added to the VCS, and the restoration command is:

     $ gnulib-tool --update

   The `--update` option operates much like the `--add-import` option, but it does not offer the possibility to change the way Gnulib is used. Also it does not report in the ChangeLogs the files that it had to add because they were missing.

Most packages nowadays use the first among these two approaches. Over time, three ways of handling version control have evolved.

In the cases (A) and (B), a “git submodule” is used to reference the precise commit of the gnulib repository, so that each developer running `./bootstrap --pull` or autopull.sh will get the same version of all gnulib-provided files.

The alternative is to always follow the newest Gnulib automatically. Note that this can cause breakages at unexpected moments, namely when a broken commit is pushed in Gnulib. It does not happen often, but it does happen.
• (A) In this approach, the developers use a git submodule manually.

The location of the submodule can be chosen to fit the package’s needs; here’s how to initially create the submodule in the directory gnulib:

```
$ git submodule add -- https://git.savannah.gnu.org/git/gnulib.git gnulib
```

Thereafter, the developer will run this command to update the submodule to the recorded checkout level:

```
$ git submodule update --init gnulib
```

Use this sequence to update to a newer version of gnulib:

```
$ git submodule update --remote gnulib
$ git add gnulib
$ ./bootstrap --bootstrap-sync
```

If multiple submodules are used, the following may be useful:

```
$ git config alias.syncsub "submodule foreach git pull origin master"
$ git syncsub
```

• (B) In this approach, the build-aux/bootstrap or autopull.sh program (see Section 20.3 [Developer tools], page 849) is used to aid a developer in using this setup. You copy this program (and if it’s autopull.sh, its companion files) into your package and place the copy or copies under version control. The program can be customized using bootstrap.conf which you also put under version control.

• (C) In this approach, you write the autopull.sh and autogen.sh files by hand.

**autopull.sh** is most easily written as a script that invokes

```
./gitsub.sh pull || exit 1
```

where gitsub.sh is described in Section 20.3 [Developer tools], page 849.

**autogen.sh** typically contains an explicit gnulib-tool invocation, followed by

```
aclocal -I m4 \ 
  && autoconf \ 
  && autoheader \ 
  && touch config.h.in \ 
  && automake --add-missing --copy \ 
  && rm -rf autom4te.cache \ 
  || exit $?
```

3. Some projects take a “middle road”: they do commit Gnulib source files as in the first approach, but they do not commit other derived files, such as a Makefile.in generated by Automake. This increases the size and complexity of the repository, but can help occasional contributors by not requiring them to have a full Gnulib checkout to do a build, and all developers by ensuring that all developers are working with the same version of Gnulib in the repository. It also supports multiple Gnulib instances within a project. It remains important not to commit the make-generated files, as described above.

### 3.14 Bundling the unit tests of the Gnulib modules

You can bundle the unit tests of the Gnulib modules together with your package, through the ‘--with-tests’ option. Together with ‘--with-tests’, you also specify the directory for these tests through the ‘--tests-base’ option. Of course, you need to add this directory to the SUBDIRS variable in the Makefile.am of the parent directory.

The advantage of having the unit tests bundled is that when your program has a problem on a particular platform, running the unit tests may help determine quickly if the problem
is on Gnulib’s side or on your package’s side. Also, it helps verifying Gnulib’s portability, of course.

The unit tests will be compiled and run when the user runs `make check`. When the user runs only `make`, the unit tests will not be compiled.

In the `SUBDIRS` variable, it is useful to put the Gnulib tests directory after the directory containing the other tests, not before:

```
SUBDIRS = gnulib-lib src man tests gnulib-tests
```

This will ensure that on platforms where there are test failures in either directory, users will see and report the failures from the tests of your program.

Note: In packages which use more than one invocation of `gnulib-tool` in the scope of the same `configure.ac`, you cannot use `--with-tests`. You will have to use a separate `configure.ac` in this case.

### 3.15 Avoiding unnecessary checks and compilations

In some cases, a module is needed by another module only on specific platforms. But when a module is present, its Autoconf checks are always executed, and its `Makefile.am` additions are always enabled. So it can happen that some Autoconf checks are executed and some source files are compiled, although no other module needs them on this particular platform, just in case some other module would need them.

The option `--conditional-dependencies` enables an optimization of configure checks and `Makefile.am` snippets that avoids this. With this option, whether a module is considered “present” is no longer decided when `gnulib-tool` is invoked, but later, when `configure` is run. This applies to modules that were added as dependencies while `gnulib-tool` was run; modules that were passed on the command line explicitly are always “present”.

For example, the `timegm` module needs, on platforms where the system’s `timegm` function is missing or buggy, a replacement that is based on a function `mktime_internal`. The module `mktime_internal` that provides this function provides it on all platforms. So, by default, the file `mktime_internal.c` will be compiled on all platforms, even on glibc and BSD systems which have a working `timegm` function. When the option `--conditional-dependencies` is given, on the other hand, and if `mktime_internal` was not explicitly required on the command line, the file `mktime_internal.c` will only be compiled on the platforms where the `timegm` needs them.

Conditional dependencies are specified in the module description by putting the condition on the same line as the dependent module, enclosed in brackets. The condition is a boolean shell expression that can assume that the `configure.ac` snippet from the module description has already been executed. In the example above, the dependency from `timegm` to `mktime_internal` is written like this:

```
Depends-on:
...
    mktime_internal [test $HAVE_TIMEGM = 0 || test $REPLACE_TIMEGM = 1]
...
```

Note: The option `--conditional-dependencies` cannot be used together with the option `--with-tests`. It also cannot be used when a package uses `gnulib-tool` for
several subdirectories, with different values of ‘--source-base’, in the scope of a single configure.ac file.
4 Writing modules

This chapter explains how to write modules of your own, either to extend Gnulib for your own package (see Chapter 5 [Extending Gnulib], page 42), or for inclusion in gnulib proper.

The guidelines in this chapter do not necessarily need to be followed for using gnulib-tool. They merely represent a set of good practices. Following them will result in a good structure of your modules and in consistency with gnulib.

4.1 Source code files

Every API (C functions or variables) provided should be declared in a header file (.h file) and implemented in one or more implementation files (.c files). The separation has the effect that users of your module need to read only the contents of the .h file and the module description in order to understand what the module is about and how to use it—not the entire implementation. Furthermore, users of your module don’t need to repeat the declarations of the functions in their code, and are likely to receive notification through compiler errors if you make incompatible changes to the API (like, adding a parameter or changing the return type of a function).

4.2 Header files

The .h file should declare the C functions and variables that the module provides.

The .h file should be stand-alone. That is, it does not require other .h files to be included before. Rather, it includes all necessary .h files by itself.

It is a tradition to use CPP tricks to avoid parsing the same header file more than once, which might cause warnings. The trick is to wrap the content of the header file (say, foo.h) in a block, as in:

```c
#ifndef FOO_H
#define FOO_H
...
body of header file goes here
...
#endif /* FOO_H */
```

Whether to use _FOO_H or _FOO_H is a matter of taste and style. The C99 and C11 standards reserve all identifiers that begin with an underscore and either an uppercase letter or another underscore, for any use. Thus, in theory, an application might not safely assume that _FOO_H has not already been defined by a library. On the other hand, using FOO_H will likely lead the higher risk of collisions with other symbols (e.g., KEY_H, XK_H, BPF_H, which are CPP macro constants, or COFF_LONG_H, which is a CPP macro function). Your preference may depend on whether you consider the header file under discussion as part of the application (which has its own namespace for CPP symbols) or a supporting library (that shouldn’t interfere with the application’s CPP symbol namespace).

Adapting C header files for use in C++ applications can use another CPP trick, as in:

```c
#ifdef __cplusplus
extern "C"
```
# ifndef
...  
body of header file goes here  
...  
# ifdef __cplusplus
}
# endif

The idea here is that __cplusplus is defined only by C++ implementations, which will wrap the header file in an 'extern "C"' block. Again, whether to use this trick is a matter of taste and style. While the above can be seen as harmless, it could be argued that the header file is written in C, and any C++ application using it should explicitly use the 'extern "C"' block itself. Your preference might depend on whether you consider the API exported by your header file as something available for C programs only, or for C and C++ programs alike.

Note that putting a #include in an extern "C" { ... } block yields a syntax error in C++ mode on some platforms (e.g., glibc systems with g++ v3.3 to v4.2, AIX, IRIX). For this reason, it is recommended to place the #include before the extern "C" block.

4.3 Implementation files

The .c file or files implement the functions and variables declared in the .h file.

Include ordering

Every implementation file must start with '#include <config.h>'. This is necessary for activating the preprocessor macros that are defined on behalf of the Autoconf macros. Some of these preprocessor macros, such as _GNU_SOURCE, would have no effect if defined after a system header file has already been included.

Then comes the '#include "..."' specifying the header file that is being implemented. Putting this right after '#include <config.h>' has the effect that it verifies that the header file is self-contained.

Then come the system and application headers. It is customary to put all the system headers before all application headers, so as to minimize the risk that a preprocessor macro defined in an application header confuses the system headers on some platforms.

In summary:
• First comes #include <config.h>.
• Second comes the #include "..." specifying the module being implemented.
• Then come all the #include <...> of system or system-replacement headers, in arbitrary order.
• Then come all the #include "..." of gnulib and application headers, in arbitrary order.

4.4 Specification

The specification of a function should answer at least the following questions:
• What is the purpose of the function?
• What are the arguments?
• What is the return value?
• What happens in case of failure? (Exit? A specific return value? Errno set?)
• Memory allocation policy: If pointers to memory are returned, are they freshly allocated and supposed to be freed by the caller?

Where to put the specification describing exported functions? Three practices are used in gnulib:
• The specification can be as comments in the header file, just above the function declaration.
• The specification can be as comments in the implementation file, just above the function definition.
• The specification can be in texinfo format, so that it gets included in the gnulib manual.

In any case, the specification should appear in just one place, unless you can ensure that the multiple copies will always remain identical.

The advantage of putting it in the header file is that the user only has to read the include file normally never needs to peek into the implementation file(s).

The advantage of putting it in the implementation file is that when reviewing or changing the implementation, you have both elements side by side.

The advantage of texinfo formatted documentation is that it is easily published in HTML or Info format.

Currently (as of 2020), 70% of gnulib uses the first practice, 25% of gnulib uses the second practice, and a small minority uses the texinfo practice.

4.5 Module description

For the module description, you can start from an existing module’s description, or from a blank one: module/TEMPLATE for a normal module, or module/TEMPLATE-TESTS for a unit test module. Some more fields are possible but rarely used. Use module/TEMPLATE-EXTENDED if you want to use one of them.

Module descriptions have the following fields. Absent fields are equivalent to fields with empty contents.

Description
This field should contain a concise description of the module’s functionality. One sentence is enough. For example, if it defines a single function ‘frob’, the description can be ‘frob() function: frobnication.’ Gnulib’s documentation generator will automatically convert the first part to a hyperlink when it has this form.

Status
This field is either empty/absent, or contains the word ‘obsolete’. In the latter case, gnulib-tool will, unless the option --with-obsolete is given, omit it when it used as a dependency. It is good practice to also notify the user about an obsolete module. This is done by putting into the ‘Notice’ section (see below) text like ‘This module is obsolete.’
Chapter 4: Writing modules

Notice
This field contains text that `gnulib-tool` will show to the user when the module is used. This can be a status indicator like ‘This module is obsolete.’ or additional advice. Do not abuse this field.

Applicability
This field is either empty/absent, or contains the word ‘all’. It describes to which `Makefile.am` the module is applied. By default, a normal module is applied to `source_base/Makefile.am` (normally `lib/Makefile.am`), whereas a module ending in `-tests` is applied to `tests_base/Makefile.am` (normally `tests/Makefile.am`). If this field is ‘all’, it is applied to both `Makefile.ams`. This is useful for modules which provide `Makefile.am` macros rather than compiled source code.

Files
This field contains a newline separated list of the files that are part of the module. `gnulib-tool` copies these files into the package that uses the module. This list is typically ordered by importance: First comes the header file, then the implementation files, then other files.

It is possible to have the same file mentioned in multiple modules. That is, if the maintainers of that module agree on the purpose and future of said file.

Depends-on
This field contains a newline separated list of the modules that are required for the proper working of this module. `gnulib-tool` includes each required module automatically, unless it is specified with option `--avoid` or it is marked as obsolete and the option `--with-obsolete` is not given.

A test modules `foo-tests` implicitly depends on the corresponding non-test module `foo`. `foo` implicitly depends on `foo-tests` if the latter exists and if the option `--with-tests` has been given.

Tests modules can depend on non-tests modules. Non-tests modules should not depend on tests modules. (Recall that tests modules are built in a separate directory.)

Each listed required module may be declared a conditional dependency. This is indicated by placing the condition for the dependency on the same line, enclosed in brackets, after the name of the required module. The condition is a shell expression that is run after the module’s `configure.ac` statements. For example:

```
strtoull [test $ac_cv_func_strtoumax = no]
```

Lines starting with `#` are recognized as comments and are ignored.

configure.ac-early
This field contains `configure.ac` stuff (Autoconf macro invocations and shell statements) that are logically placed early in the `configure.ac` file: right after the `AC_PROG_CC` invocation. This section is adequate for statements that modify `CPPFLAGS`, as these can affect the results of other Autoconf macros.

configure.ac
This field contains `configure.ac` stuff (Autoconf macro invocations and shell statements).
It is forbidden to add items to the `CPPFLAGS` variable here, other than temporarily, as these could affect the results of other Autoconf macros. We avoid adding items to the `LIBS` variable, other than temporarily. Instead, the module can export an Autoconf-substituted variable that contains link options. The user of the module can then decide to which executables to apply which link options. Recall that a package can build executables of different kinds and purposes; having all executables link against all libraries is inappropriate.

If the statements in this section grow larger than a couple of lines, we recommend moving them to a `.m4` file of their own.

**Makefile.am**

This field contains `Makefile.am` statements. Variables like `lib_SOURCES` are transformed to match the name of the library being built in that directory. For example, `lib_SOURCES` may become `libgnu_a_SOURCES` (for a plain library) or `libgnu_la_SOURCES` (for a libtool library). Therefore, the normal way of having an implementation file `lib/foo.c` compiled unconditionally is to write

```
lib_SOURCES += foo.c
```

**Include**

This field contains the preprocessor statements that users of the module need to add to their source code files. Typically it’s a single include statement. A shorthand is allowed: You don’t need to write the word “`#include`”, just the name of the include file in the way it will appear in an include statement.

Example:

```
"foo.h"
```

**Link**

This field contains the set of libraries that are needed when linking libraries or executables that use this module. Often this will be written as a reference to a Makefile variable. Please write them one per line, so that `gnulib-tool` can remove duplicates when presenting a summary to the user.

Example:

```
$(POW_LIBM)

$(LTLIBICONV) when linking with libtool, $(LIBICONV) otherwise
```

When this field is omitted, it defaults to the union of the Link field of the dependencies.

**License**

This field specifies the license that governs the source code parts of this module. See Section 2.8 [Copyright], page 16, for details. Be sure to place, in every source code file, a copyright notice and the appropriate license notice, taken from the `etc/license-notices/` directory.

**Maintainer**

This field specifies the persons who have a definitive say about proposed changes to this module. You don’t need to mention email addresses here: they can be inferred from the `ChangeLog` file.

Please put at least one person here. We don’t like unmaintained modules.

### 4.6 Autoconf macros

For a module `foo`, an Autoconf macro file `m4/foo.m4` is typically created when the Autoconf macro invocations for the module are longer than one or two lines.
The name of the main entry point into this Autoconf macro file is typically `gl_FOO`. For modules outside GnuLib that are not likely to be moved into GnuLib, please use a prefix specific to your package: `gt_` for GNU gettext, `cu_` for GNU coreutils, etc.

For modules that define a function `foo`, the entry point is called `gl_FUNC_FOO` instead of `gl_FOO`. For modules that provide a header file with multiple functions, say `foo.h`, the entry point is called `gl_FOO_H` or `gl_HEADER_FOO_H`. This convention is useful because sometimes a header and a function name coincide (for example, `fcntl` and `fcntl.h`).

For modules that provide a replacement, it is useful to split the Autoconf macro into two macro definitions: one that detects whether the replacement is needed and requests the replacement by setting a `HAVE_FOO` variable to 0 or a `REPLACE_FOO` variable to 1 (this is the entry point, say `gl_FUNC_FOO`), and one that arranges for the macros needed by the replacement code `lib/foo.c` (typically called `gl_PREREQ_FOO`). The reason of this separation is

1. to make it easy to update the Autoconf macros when you have modified the source code file: after changing `lib/foo.c`, all you have to review is the `Depends-on` section of the module description and the `gl_PREREQ_FOO` macro in the Autoconf macro file.
2. The Autoconf macros are often large enough that splitting them eases maintenance.

### 4.7 Making proper use of AC_LIBOBJ

Source files that provide a replacement should be only compiled on the platforms that need this replacement. While it is actually possible to compile a `.c` file whose contents is entirely `#ifdef`'ed out on the platforms that don’t need the replacement, this practice is discouraged because

- It makes the build time longer than needed, by invoking the compiler for nothing.
- It produces a `.o` file that suggests that a replacement was needed.
- Empty object files produce a linker warning on some platforms: MSVC.

The typical idiom for invoking `AC_LIBOBJ` is thus the following, in the module description:

```bash
if test $HAVE_FOO = 0 || test $REPLACE_FOO = 1; then
    AC_LIBOBJ([foo])
    gl_PREREQ_FOO
fi
```

Important: Do not place `AC_LIBOBJ` invocations in the Autoconf macros in the `.m4/` directory. The purpose of the Autoconf macros is to determine what features or bugs the platform has, and to make decisions about which replacements are needed. The purpose of the `configure.ac` and `Makefile.am` sections of the module descriptions is to arrange for the replacements to be compiled. **Source file names do not belong in the `.m4/` directory.**

When an `AC_LIBOBJ` invocation is unconditional, it is simpler to just have the source file compiled through an Automake variable augmentation: In the `Makefile.am` section write

```bash
lib_SOURCES += foo.c
```

When a module description contains an `AC_LIBOBJ([foo])` invocation, you **must** list the source file `lib/foo.c` in the `Files` section. This is needed even if the module depends on another module that already lists `lib/foo.c` in its `Files` section – because your module might be used among the test modules (in the directory specified through `--tests-base`) and the other module among the main modules (in the directory specified
through ‘--source-base’), and in this situation, the AC_LIBOBJ([foo]) of your module
can only be satisfied by having foo.c be present in the tests source directory as well.

4.8 Unit test modules

A unit test that is a simple C program usually has a module description as simple as this:

Files:
  tests/test-foo.c
  tests/macros.h

Depends-on:
  configure.ac:

  Makefile.am:
  TESTS += test-foo
  check_PROGRAMS += test-foo

The test program tests/test-foo.c often has the following structure:

• First comes the obligatory ‘#include <config.h>’.
• Second comes the include of the header file that declares the API being tested. Including it here verifies that said header file is self-contained.
• Then come other includes. In particular, the file macros.h is often used here. It contains a convenient ASSERT macro.

The body of the test, then, contains many ASSERT invocations. When a test fails, the ASSERT macro prints the line number of the failing statement, thus giving you, the developer, an idea of which part of the test failed, even when you don’t have access to the machine where the test failed and the reporting user cannot run a debugger.

Sometimes it is convenient to write part of the test as a shell script. (For example, in areas related to process control or interprocess communication, or when different locales should be tried.) In these cases, the typical module description is like this:

Files:
  tests/test-foo.sh
  tests/test-foo.c
  tests/macros.h

Depends-on:
  configure.ac:

  Makefile.am:
  TESTS += test-foo.sh
  TESTS_ENVIRONMENT += FOO_BAR='@FOO_BAR@
  check_PROGRAMS += test-foo

Here, the TESTS_ENVIRONMENT variable can be used to pass values determined by configure or by the Makefile to the shell script, as environment variables. The Autoconf values EXEEXT and srcdir are already provided as environment variables, through an initial value of TESTS_ENVIRONMENT that gnuconf-tool puts in place.

Regardless of the specific form of the unit test, the following guidelines should be respected:
• A test indicates success by exiting with exit code 0. It should normally not produce output in this case. (Output to temporary files that are cleaned up at the end of the test are possible, of course.)

• A test indicates failure by exiting with an exit code different from 0 and 77, typically 1. It is useful to print a message about the failure in this case. The `ASSERT` macro already does so.

• A test indicates "skip", that is, that most of its interesting functionality could not be performed, through a return code of 77. A test should also print a message to stdout or stderr about the reason for skipping. For example:
  ```c
  fputs ("Skipping test: multithreading not enabled\n", stderr);
  return 77;
  ```

  Such a message helps detecting bugs in the autoconf macros: A simple message ‘SKIP: test-foo’ does not sufficiently catch the attention of the user.

4.9 Incompatible changes

Incompatible changes to Gnulib modules should be mentioned in Gnulib’s `NEWS` file. Incompatible changes here mean that existing source code may not compile or work any more.

We don’t mean changes in the binary interface (ABI), since

1. Gnulib code is used in source-code form.

2. The user who distributes libraries that contain Gnulib code is supposed to bump the version number in the way described in the Libtool documentation before every release.
5 Extending Gnulib

Gnulib modules are intended to be suitable for widespread use. Most problems with Gnulib can and should be fixed in a generic way, so that all of Gnulib’s users can benefit from the change. But occasionally a problem arises that is difficult or undesirable to fix generically, or a project that uses Gnulib may need to work around an issue before the Gnulib maintainers commit a final fix. Maintainers may also want to add their own pools of modules to projects as Gnulib “staging areas.”

The obvious way to make local changes to Gnulib modules is to use gnulib-tool to check out pristine modules, then to modify the results in-place. This works well enough for short-lived experiments. It is harder to keep modified versions of Gnulib modules for a long time, even though Git (or another distributed version control systems) can help out a lot with this during the development process.

Git, however, doesn’t address the distribution issue. When a package “foobar” needs a modified version of, say, stdint.h, it either has to put a comment into foobar/autogen.sh saying “Attention! This doesn’t work with a pristine Gnulib, you need this and that patch after checking out Gnulib,” or it has to use the ‘--avoid=stdint’ option and provide the modified stdint module in a different directory.

The --local-dir option to gnulib-tool solves this problem. It allows the package to override or augment Gnulib. This means:

- You can store files that are to override Gnulib files or modules.
- You can store context diffs to be applied to Gnulib files.
- You can add modules of your own, that are not (yet) in Gnulib.
- You can also add unstructured amounts of code to the library, by grouping the non-Gnulib files of the library in a single kitchen-sink “module.” (This kind of kitchen-sink module is not needed when you use the gnulib-tool option --makefile-name.)

In a release tarball, you can distribute the contents of this --local-dir directory that will be combinable with newer versions of Gnulib, barring incompatible changes to Gnulib.

If the --local-dir=directory option is specified, then gnulib-tool looks in directory whenever it reads a file from the Gnulib directory. Suppose gnulib-tool is looking for file. Then:

- If directory/file exists, then gnulib-tool uses it instead of the file included in Gnulib.
- Otherwise, if directory/file.diff exists, then gnulib-tool uses the file from Gnulib after applying the diff using the patch program.
- Otherwise, gnulib-tool uses the file included in Gnulib.

You can specify the --local-dir multiple times. In this case, the first specified directory has the highest precedence. That is, a file found in one directory will shadow any file and file.diff in the later directories and in the Gnulib directory. And a file file.diff found in one directory will be applied on top of the combination of file and file.diff files found in the later directories and in the Gnulib directory.

Please make wise use of this option. It also allows you to easily hold back modifications you make to Gnulib macros in cases it may be better to share them.
6 Miscellaneous Notes

6.1 Out of memory handling

The gnulib API does not have a standard error code for the out of memory error condition. Instead of adding a non-standard error code, gnulib has chosen to adopt a different strategy. Out of memory handling happens in rare situations, but performing the out of memory error handling after almost all API function invocations pollute your source code and might make it harder to spot more serious problems. The strategy chosen improves code readability and robustness.

For most applications, aborting the application with an error message when the out of memory situation occurs is the best that can be wished for. This is how the library behaves by default (using the ‘xalloc-die’ module).

However, we realize that some applications may not want to abort execution in any situation. Gnulib supports a hook to let the application regain control and perform its own cleanups when an out of memory situation has occurred. The application can define a function (having a void prototype, i.e., no return value and no parameters) and set the library variable xalloc_die to that function. The variable should be declared as follows.

```c
extern void (*xalloc_die) (void);
```

Gnulib will invoke this function if an out of memory error occurs. Note that the function should not return. Of course, care must be taken to not allocate more memory, as that will likely also fail.

6.2 Obsolete modules

Modules can be marked obsolete. This means that the problems they fix don’t occur any more on the platforms that are reasonable porting targets now. gnulib-tool warns when obsolete modules are mentioned on the command line, and by default ignores dependencies from modules to obsolete modules. When you pass the option --with-obsolete to gnulib-tool, dependencies to obsolete modules will be included, however, unless blocked through an --avoid option. This option is useful if your package should be portable even to very old platforms.

In order to mark a module obsolete, you need to add this to the module description:

```plaintext
Status:
obsolete

Notice:
This module is obsolete.
```

6.3 Extra tests modules

Test modules can be marked with some special status attributes. When a test module has such an attribute, gnulib-tool --import will not include it by default.

The supported status attributes are:

- **c++-test** Indicates that the test is testing C++ interoperability. Such a test is useful in a C++ or mixed C/C++ package, but is useless in a C package.
**longrunning-test**
Indicates that the test takes a long time to compile or execute (more than five minutes or so). Such a test is better avoided in a release that is made for the general public.

**privileged-test**
Indicates that the test will request special privileges, for example, ask for the superuser password. Such a test may hang when run non-interactively and is therefore better avoided in a release that is made for the general public.

**unportable-test**
Indicates that the test is known to fail on some systems, and that there is no workaround about it. Such a test is better avoided in a release that is made for the general public.

`gnulib-tool --import --with-tests` will not include tests marked with these attributes by default. When `gnulib-tool` is invoked with one of the options `--with-c++-tests`, `--with-longrunning-tests`, `--with-privileged-tests`, `--with-unportable-tests`, it will include tests despite the corresponding special status attribute. When `gnulib-tool` receives the option `--with-all-tests`, it will include all tests regardless of their status attributes.

`gnulib-tool --create-testdir --with-tests` and `gnulib-tool --create-megatestdir --with-tests` by default include all tests of modules specified on the command line, regardless of their status attributes. Tests of modules occurring as dependencies are not included by default if they have one of these status attributes. The options `--with-c++-tests`, `--with-longrunning-tests`, `--with-privileged-tests`, `--with-unportable-tests` are recognized here as well. Additionally, `gnulib-tool` also understands the options `--without-c++-tests`, `--without-longrunning-tests`, `--without-privileged-tests`, `--without-unportable-tests`.

In order to mark a module with a status attribute, you need to add it to the module description, like this:

```
Status:
longrunning-test
```

If only a part of a test deserves a particular status attribute, you can split the module into a primary and a secondary test module, say `foo-tests` and `foo-extra-tests`. Then add a dependency from `foo-tests` to `foo-extra-tests`, and mark the `foo-extra-tests` with the particular status attribute.

### 6.4 Modules that modify the way other modules work

The normal way to design modules is that each module has its own code, and the module dependencies provide the facilities on which this code can rely. But sometimes it is necessary to use more advanced techniques. For example:

- You may want to have optional module dependencies: Let module A use facilities provided by module B, if module B is present, but without requiring that module B is present.
- A module can indicate support for particular behaviours. For example, Gnulib has a module `sigpipe` that requests POSIX compatible SIGPIPE behaviour from all other
modules – something that is not enabled by default. Or consider the ‘nonblocking’ module, that is an indicator that all I/O functions should handle non-blocking file descriptors – something that, equally, is not enabled by default.

- A module can indicate to other modules that they can rely on certain guarantees, and thus omit specific code. For example, when Gnilib’s ‘malloc-gnu’ module is present, you can omit code that test n against zero when you call malloc(n).

Be aware that these advanced techniques likely cause breakage in the situation of multiple gnulib-tool invocations in the scope of a single configure file. This is because the question “is module B present?” does not have a unique answer in such situations. gnulib-tool has support for these techniques in the situation of --create-testdir --single-configure, which basically has two gnulib-tool invocations, one for a set of modules that end up in glib, and one for the set of modules that end up in gltests. But you should be aware that this does not cover the general situation.

Which technique to use, depends on the answer to the question: “If my module occurs among the modules of gltests, should it have an effect on the modules in gllib?”

If the answer is “no”, your module description should invoke the Autoconf macro gl_MODULE_INDICATOR. This Autoconf macro takes one argument: the name of your module. The effect of gl_MODULE_INDICATOR([my-module]) is to define, in config.h, a C macro GNULIB_MY_MODULE that indicates whether your macro is considered to be present. This works even when your macro is used in gltests: GNULIB_MY_MODULE will then evaluate to 1 in gltests but to 0 in gllib.

If the answer is “yes”, you have two techniques available. The first one is to invoke a similar Autoconf macro, named gl_MODULE_INDICATOR_FOR_TESTS. It works similarly. However, when your macro is used in gltests, GNULIB_MY_MODULE will evaluate to 1 both in gltests and in gllib.

The second one is to define a shell variable in the configure file that tells whether your module is present, through use of m4_divert_text. The Autoconf macros of a dependency module will initialize this shell variable, through ‘m4_divert_text([DEFAULTS], [my_shell_var=no])’. The Autoconf macros of your module will override this value, through ‘m4_divert_text([INIT_PREPARE], [my_shell_var=yes])’. Then you can use my_shell_var in the Autoconf macros of both modules. You can find more details about this technique in the Gnilib module getopt-gnu.

Reminder: These techniques are advanced. They have the potential to cause lots of headaches if you apply them incorrectly.

6.5 A C++ namespace for gnulib

The function definitions provided by Gnilib (.c code) are meant to be compiled by a C compiler. The header files (.h files), on the other hand, can be used in either C or C++.

By default, when used in a C++ compilation unit, the .h files declare the same symbols and overrides as in C mode, except that functions defined by Gnilib or by the system are declared as ‘extern ”C”’.

It is also possible to indicate to Gnilib to provide many of its symbols in a dedicated C++ namespace. If you define the macro GNULIB_NAMESPACE to an identifier, many functions will
be defined in the namespace specified by the identifier instead of the global namespace. For example, after you have defined

```
#define GNULIB_NAMESPACE gnilib
```

at the beginning of a compilation unit, Gnulib’s <fcntl.h> header file will make available the `open` function as `gnulib::open`. The symbol `open` will still refer to the system’s `open` function, with its platform specific bugs and limitations.

The symbols provided in the Gnulib namespace are those for which the corresponding header file contains a `_GL_CXXALIAS_RPL` or `_GL_CXXALIAS_SYS` macro invocation.

The benefits of this namespace mode are:

- Gnulib defines fewer symbols as preprocessor macros. For example, on a platform where `open` has to be overridden, Gnulib normally does `#define open rpl_open`. If your package has a class with a member `open`, for example a class `foo` with a method `foo::open`, then if you define this member in a compilation unit that includes `<fcntl.h>` and use it in a compilation unit that does not include `<fcntl.h>`, or vice versa, you will get a link error. Worse: You will not notice this problem on the platform where the system’s `open` function works fine. This problem goes away in namespace mode.

- It provides a safety check whether the set of modules your package requests from Gnulib is sufficient. For example, if you use the function `gnulib::open` in your code, and you forgot to request the module ‘`open`’ from Gnulib, you will get a compilation error (regardless of the platform).

The drawback of this namespace mode is that the system provided symbols in the global namespace are still present, even when they contain bugs that Gnulib fixes. For example, if you call `open (...)` in your code, it will invoke the possibly buggy system function, even if you have requested the module ‘`open`’ from gnulib-tool.

You can turn on the namespace mode in some compilation units and keep it turned off in others. This can be useful if your package consists of an application layer that does not need to invoke POSIX functions and an operating system interface layer that contains all the OS function calls. In such a situation, you will want to turn on the namespace mode for the application layer—to avoid many preprocessor macro definitions—and turn it off for the OS interface layer—to avoid the drawback of the namespace mode, mentioned above.

### 6.6 License Texinfo sources

Gnulib provides copies of the GNU GPL, GNU LGPL, GNU Affero GPL, and GNU FDL licenses in Texinfo form. (The master location is [https://www.gnu.org/licenses/](https://www.gnu.org/licenses/)). These Texinfo documents do not have any node names and structures built into them; for your manual, you should `@include` them in an appropriate `@node`.

The conventional name for the GPL node is ‘Copying’ and for the FDL ‘GNU Free Documentation License’. The LGPL doesn’t seem to have a conventional node name.

Of course the license texts themselves should not be changed at all.

The recommended way to make use of these license files, consistently with current practice, is as follows:

- The code license (GNU GPL, GNU LGPL, or GNU Affero GPL) is usually present as a file in the top-level directory. This is true not only for the release tarballs,
but also in the VCS repository. The file is typically named ‘COPYING’ for the GNU GPL, or ‘COPYING.LIB’ or ‘COPYING.LESSER’ for the GNU LGPL. The presence of this file fulfills a legal obligation; see https://www.gnu.org/licenses/gpl-faq.html#WhyMustIInclude.

To make use of the code license in your documentation, you may request one of the modules gpl-3.0, gpl-2.0, lgpl-3.0, lgpl-2.1, agpl-3.0, through a gnulib-tool invocation. Or you may copy the relevant Texinfo file directly into your VCS repository. Both approaches are equally good. The Texinfo file changes very rarely.

- The documentation license file (GNU FDL) is usually not present as a file in the top-level directory, because that would be ambiguous: When you use the GNU FDL, you need to specify the Invariant Sections, the Front-Cover Texts, and the Back-Cover Texts.

To make use of this documentation license, copy the relevant Texinfo file (doc/fdl-1.3.texi) into your VCS repository. This makes sure that anyone who receives a copy of your VCS repository has also received a copy of the documentation license. In the documentation, also state what are the Invariant Sections, the Front-Cover Texts, and the Back-Cover Texts.

We recommend to place the licenses as appendices at the end of the manual, right before any indices. For the FDL, we suggest the following @menu entry:

* GNU Free Documentation License:: License for copying this manual

For any @detailmenu entries, we suggest the following:

Copying This Manual

* GNU Free Documentation License:: Copying and sharing this manual

And for actual inclusion of the FDL itself, we suggest the following:

@include fdl.texi

6.7 Building gnulib

If you wish to help the gnulib development effort with build logs for your favorite platform, you may perform these steps:

1. Prerequisites tools

Install the proper development tools. To build and test all of Gnulib, you will need development tools for the programming languages C, C++, Java, and Perl, along with standard POSIX utilities such as awk, make and sh. You will also need development tools that include Autoconf, Automake, Bison, Gettext, Git, GNU M4, Gperf, Libtool, and Texinfo. Some of these tools are needed only by some modules. More details can be found in GnuLib’s DEPENDENCIES file.

2. Obtain Gnulib

See https://www.gnu.org/software/gnulib/ for how to get the current GnuLib sources via Git.
3. Create gnulib directory
   On a machine with GNU development tools installed and with a gnulib git checkout, use
   
   `gnulib-tool --create-megatestdir --with-tests --dir=...`
   
   Note: The created directory uses ca. 512 MB on disk.

4. Transfer gnulib directory
   Transfer this directory to a build machine (HP-UX, Cygwin, or whatever). Often it is easier to transfer one file, and this can be achieved by running, inside the directory the following commands:
   
   `./configure`
   `make dist`
   
   And then transferring the `dummy-0.tar.gz` file.

5. Build modules
   On the build machine, run `./do-autobuild` (or `nohup ./do-autobuild`). It creates a directory `logs/` with a log file for each module.
7 Building the ISO C and POSIX Substitutes

This section shows a radically different way to use GnuLib.

You can extract the ISO C / POSIX substitutes part of gnuLib by running the command

```
gnulib-tool --create-testdir --source-base=lib \n   --dir=/tmp/posixlib `posix-modules`
```

The command `posix-modules` is found in the same directory as `gnulib-tool`.

The resulting directory can be built on a particular platform, independently of the
program being ported. Then you can configure and build any program, by setting `CPPFLAGS`
and `LDFLAGS` at configure time accordingly: set `CPPFLAGS="-I.../posixlib/lib"`, plus
any essential type definitions and flags that you find in `.../posixlib/config.h`, and set
`LDFLAGS=".../posixlib/lib/libgnu.a"`.

This way of using GnuLib is useful when you don’t want to modify the program’s source
code, or when the program uses a mix between C and C++ sources (requiring separate builds
of the `posixlib` for the C compiler and for the C++ compiler).
8 ISO C Keyword Substitutes

This chapter describes which keywords specified by ISO C are substituted by Gnulib.

8.1 alignof and alignas

Gnulib module: alignasof

The alignasof module arranges for alignas and alignof to be more like standard C.

Portability problems fixed by Gnulib:
- Pre-C11 platforms lack alignas and alignof.
- On pre-C23 platforms, <stdalign.h> must be included before using alignas or alignof. See Section 9.44 [stdalign.h], page 66.

Portability problems not fixed by Gnulib:
- On pre-C23 platforms, alignas and alignof are macros.

8.2 bool

Gnulib module: stdbool

Portability problems fixed by Gnulib:
- The keywords bool, true, and false are not available: gcc 12 and other compilers predating C23.

Portability problems not fixed by Gnulib:
- On pre-C23 platforms, the keyword substitutes are macros.
- On pre-C23 platforms, the keyword substitutes assume C99 or later.

8.3 nullptr

Gnulib module: nullptr

The nullptr module arranges for nullptr to act like standard C and C++.

The nullptr keyword yields a null pointer. It differs from the NULL macro, in that NULL might be an integer whereas nullptr is of a special nullptr_t type with only one value, namely nullptr itself. Using nullptr can help some compilers emit more sensible warnings, can avoid the need to cast a null pointer passed to a function prototyped with an ellipsis, and removes the need to include <stddef.h> merely to define NULL.

Portability problems fixed by Gnulib:
- Some platforms lack nullptr: For C: GCC 12, Clang 15, and other pre-2023 C compilers. For C++: pre-2011 C++ compilers.

Portability problems not fixed by Gnulib:
- On older platforms, nullptr is a macro instead of a keyword.
- On older platforms, nullptr does not have the type nullptr_t. In C, it has type void *; in C++ it has an integer type.
- On older platforms Gnulib cannot easily emulate nullptr_t, so null pointer type checking is more error prone. In C, _Generic expressions cannot reliably distinguish the type of nullptr from integer or void * types. C++ overloading has similar limitations.
8.4 static_assert

Gnulib module: assert-h

The assert-h module arranges for both static_assert and <assert.h> to be like standard C. See Section 9.3 [assert.h], page 52.

Portability problems fixed by Gnulib:
• Pre-C11 platforms lack static_assert.
• On pre-C23 platforms, <assert.h> must be included before using static_assert.

Portability problems not fixed by Gnulib:
• On pre-C23 platforms, static_assert is a macro.
9 ISO C and POSIX Header File Substitutes

This chapter describes which header files specified by ISO C or POSIX are substituted by Gnulib, which portability pitfalls are fixed by Gnulib, and which (known) portability problems are not worked around by Gnulib.

The notation “Gnulib module: —” means that Gnulib does not provide a module providing a substitute for the header file. When the list “Portability problems not fixed by Gnulib” is empty, such a module is not needed: No portability problems are known. Otherwise, it indicates that such a module would be useful but is not available: No one so far found this header file important enough to contribute a substitute for it. If you need this particular header file, you may write to <bug-gnulib at gnu dot org>.

9.1 aio.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/aio.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This header file is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin, mingw, MSVC 14, Android 9.0.

9.2 arpa/inet.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/arpa_inet.h.html

Gnulib module: arpa_inet

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This header file is missing on some platforms: mingw, MSVC 14.

9.3 assert.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/assert.h.html

Gnulib module: assert-h

See also the Gnulib modules assert and verify.

Portability problems fixed by Gnulib:

• On older C platforms <assert.h> must be included before using static_assert. For example, GCC versions before 13 do not support the static_assert keyword that was standardized by C23.

• On older platforms static_assert does not allow the second string-literal argument to be omitted. For example, GCC versions before 9.1 do not support the single-argument static_assert that was standardized by C23 and C++17.
• Even-older platforms do not support `static_assert` at all. For example, GCC versions before 4.6 and C++ versions before 4.3 do not support the two-argument form, which was standardized by C11 and C++11.

• Older C platforms might not support the obsolescent `_Static_assert` keyword or macro. This portability problem should not matter with code using this module, as such code should use `static_assert` instead.

Portability problems not fixed by GnuLib:

• A `static_assert` can also be used within a `struct` or `union` specifier, in place of an ordinary declaration of a member of the struct or union. The GnuLib substitute can be used only as an ordinary declaration in code intended to be portable to C99 or earlier.

• In C23 and C++11 and later, `static_assert` is a keyword. In C11 and C17 it is a macro. Any GnuLib substitute is also a macro.

• In C99 and later, `assert` can be applied to any scalar expression. In C89, the argument to `assert` is of type `int`.

9.4 complex.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/complex.h.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

• This header file is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.7, mingw, MSVC 9.

9.5 cpio.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/cpio.h.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

• This header file is missing on some platforms: Minix 3.1.8, Cygwin 2.4.x, mingw, MSVC 14.

9.6 ctype.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/ctype.h.html

GnuLib module: ctype

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:
9.7 dirent.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/dirent.h.html

Gnulib module: dirent

Portability problems fixed by Gnulib:
- This header file is missing on some platforms: MSVC 14.
- The type ino_t is missing on some platforms: glibc 2.23 and others.

Portability problems not fixed by Gnulib:
- Although many systems define a struct dirent member named d_type and directory entry type macros like DT_DIR and DT_LNK, some do not: Minix 3.1.8, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw.
- On systems with d_type, not every filesystem supports d_type, and those lacking support will set it to DT_UNKNOWN.
- Some systems define a struct dirent member named d_namlen containing the string length of d_name, but others do not: glibc 2.23 on Linux, Minix 3.1.8, Solaris 11.4, Cygwin. All of these, except Cygwin, have a member d_reclen instead, that has a different semantics.
- Some systems define a struct dirent member named d_off containing a magic cookie suitable as an argument to seekdir, but others do not: glibc 2.23 on Hurd, macOS 11.1, FreeBSD 11.0, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, HP-UX 11, Cygwin, mingw.
- Some systems define a struct dirent member named d_reclen containing the number of bytes in the directory entry record, but others do not. This member has limited utility, as it is an implementation detail.

9.8 dlfcn.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/dlfcn.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This header file is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

9.9 errno.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/errno.h.html

Gnulib module: errno

Portability problems fixed by Gnulib:
- The macro EOVERFLOW is not defined on some platforms: OpenBSD 4.0, mingw, MSVC 9.
- The macro ENOLINK is not defined on some platforms: OpenBSD 6.7, mingw, MSVC 9.
• The macro `EMULTIHOP` is not defined on some platforms: OpenBSD 6.7, mingw, MSVC 14.
• The macro `ECANCELED` is not defined on some platforms: OpenBSD 4.0, Cygwin, mingw, MSVC 9.
• The macros `ENOMSG`, `EIDRM`, `EPROTO`, `EBADMSG`, `ENOTSUP` are not defined on some platforms: OpenBSD 4.0, mingw, MSVC 9.
• The macro `ESTALE` is not defined on some platforms: mingw, MSVC 14.
• The macro `EDQUOT` is not defined on some platforms: NonStop Kernel, mingw, MSVC 14.
• The macros `ENETRESET`, `ECONNABORTED` are not defined on some platforms: Minix 3.1.8, mingw, MSVC 9.
• The macros `EWOULDBLOCK`, `ETXTBSY`, `ELOOP`, `ENOTSOCK`, `EDESTADDRREQ`, `EMSGSIZE`, `EPROTOTYPE`, `ENOPROTOOPT`, `EPROTONOSUPPORT`, `EAFNOSUPPORT`, `EADDRINUSE`, `EADDRNOTAVAIL`, `ENETDOWN`, `ENETUNREACH`, `ECONNRESET`, `ENOBUFS`, `EISCONN`, `ENOTCONN`, `ETIMEOUT`, `ECONNREFUSED`, `EHOSTUNREACH`, `EALREADY`, `EINPROGRESS` are not defined on some platforms: mingw, MSVC 9.
• The macros `EOWNERDEAD`, `ENOTRECOVERABLE` are not defined on some platforms: glibc/Linux 2.3.6, glibc/Hurd 2.15, glibc/kFreeBSD 2.15, Mac OS X 10.5, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin, mingw without pthreads-win32, MSVC 9.
• The macro `EILSEQ` is not defined on some platforms: LynxOS 178 2.2.2.

Portability problems not fixed by Gnulib:

9.10 `fcntl.h`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/fcntl.h.html

Gnulib module: fcntl-h

Portability problems fixed by Gnulib:

• The type `pid_t` is not defined on some platforms: MSVC 14.
• The type `mode_t` is not defined on some platforms: MSVC 14.
• `O_CLOEXEC` is not defined on some platforms: Mac OS X 10.6, FreeBSD 8.4, NetBSD 5.1, OpenBSD 4.9, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 10, Cygwin 1.7.1, mingw, MSVC 14.
• `O_DIRECTORY`, `O_DSYNC`, `O_NOCTTY`, `O_NOFOLLOW`, `O_RSYNC`, `O_SYNC`, and `O_TTY_INIT` are not defined on some platforms. When not otherwise defined, Gnulib defines these macros to 0, which is generally safe.
• `O_NONBLOCK` is not defined on some platforms. If the `nonblocking` module is in use, gnulib guarantees a working non-zero value; otherwise, the gnulib replacement is 0.
• `O_EXEC` and `O_SEARCH` are not defined on some platforms. Gnulib defines these macros to `O_RDONLY`, which is typically 0. The `O_PATH` macro of GNU/Linux is not a suitable substitute, as fchmod fails with `errno==EBADF` when invoked on a file descriptor that was opened with `O_PATH`. 
• 'O_ACCMODE' is not defined on some platforms: MSVC 14.

• The 'O_ACCMODE' mask mistakenly omits 'O_SEARCH' and 'O_EXEC' on some platforms: Cygwin.

• 'O_BINARY', 'O_TEXT' (not specified by POSIX, but essential for portability to native Windows platforms) are defined on some platforms but not on others. Gnulib defines these macros to 0 on GNU and other platforms that do not distinguish between text and binary I/O.

• 'O_CLOEXEC', 'O_NOFOLLOW', and 'O_TTY_INIT' are defined to values that are too large for an int on some platforms: AIX 7.1 with XL C 12.1.

• 'O_DIRECT', 'O_IGNORE_CTTY', 'O_NDELAY', 'O_NOATIME', 'O_NOLINK', 'O_NOLINKS', and 'O_NOTRANS' (not specified by POSIX) are defined on some platforms but not on others. When not otherwise defined, Gnulib defines these macros to 0, which is generally safe.

• 'FD_CLOEXEC', 'F_DUPFD', and 'F_GETFD' are not defined on some platforms: mingw, MSVC 14.

• 'F_DUPFD_CLOEXEC' is not defined on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11 2010-11, Cygwin 1.7.1, mingw, MSVC 14.

• 'AT_FDCWD', 'AT_EACCESS', 'AT_SYMLINK_NOFOLLOW', 'AT_SYMLINK_FOLLOW', and 'AT_REMOVEDIR' are not defined on many platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14.

• 'AT_FDCWD' is defined with a value too large for an int on some platforms: Solaris 11.3.

Portability problems not fixed by Gnulib:

• 'O_PATH' is not defined on some platforms: glibc 2.13, macOS 13, FreeBSD 13.0, NetBSD 9.2, OpenBSD 7.1, Minix 3.3.0, AIX 7.3, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

• 'F_SETFD', 'F_GETFL', 'F_SETFL', 'F_GETLK', 'F_SETLK', 'F_SETLKW', 'F_GETOWN', and 'F_SETOWN' are not defined on some platforms: mingw, MSVC 14.

• 'POSIX_FADV_DONTNEED', 'POSIX_FADV_NOREUSE', 'POSIX_FADV_NORMAL', 'POSIX_FADV_RANDOM', 'POSIX_FADV_SEQUENTIAL', and 'POSIX_FADV_WILLNEED' are not defined on some platforms.

9.11 fenv.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/fenv.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This header file is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, AIX 5.1, IRIX 6.5, Cygwin 1.7.7, MSVC 9.
9.12 float.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/float.h.html

Gnulib module: float

Portability problems fixed by Gnulib:
- The conversion from int to long double is incorrect on some platforms: glibc 2.7 on Linux/SPARC64.
- The values of LDBL_* macros are incorrect on some platforms: On OpenBSD 4.0 and MirBSD 10, they are the same as the values of the DBL_* macros, although ‘long double’ is a larger type than ‘double’. On FreeBSD/x86 6.4, they represent the incorrect 53-bit precision assumptions in the compiler, not the real 64-bit precision at runtime. On Linux/PowerPC with GCC 4.4, on AIX 7.1 with GCC 4.2, and on IRIX 6.5, they don’t reflect the “double double” representation of long double correctly.

Portability problems not fixed by Gnulib:
- The macro FLT_ROUNDS is a constant expression and does not represent the current rounding mode on some platforms: glibc 2.11, HP-UX 11, mingw.

9.13 fmtmsg.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/fmtmsg.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This header file is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin, mingw, MSVC 14, Android 9.0.

9.14 fnmatch.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/fnmatch.h.html

Gnulib module: fnmatch-h

Portability problems fixed by Gnulib:
- This header file is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

9.15 ftw.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/ftw.h.html

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This header file is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, Minix 3.1.8, mingw, MSVC 14.

### 9.16 glob.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/glob.h.html

Gnulib module: glob-h

Portability problems fixed by Gnulib:

• This header file is missing on some platforms: mingw, MSVC 14.

### 9.17 grp.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/grp.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

• This header file is missing on some platforms: mingw, MSVC 14.

### 9.18 iconv.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/iconv.h.html

Gnulib module: iconv

Portability problems fixed by Gnulib:

• The `<iconv.h>` from GNU libiconv is not found if installed in `${PREFIX}/include`.

Portability problems not fixed by Gnulib:

• This header file is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, when GNU libiconv is not installed.

### 9.19 inttypes.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/inttypes.h.html

Gnulib module: inttypes

Portability problems fixed by Gnulib:

• This header file is missing on some platforms: MSVC 9.

• This header file is very incomplete on some platforms.
• The declarations of `imaxabs` and `imaxdiv` are missing on some platforms: NetBSD 3.0, OpenBSD 6.7, AIX 5.1, HP-UX 11, IRIX 6.5.
• The declarations of `strtoimax` and `strtoumax` are missing on some platforms: OpenBSD 6.7, AIX 5.1 (missing only `strtoumax`).
• On some hosts that predate C++11, when using C++ one must define `__STDC_FORMAT_MACROS` to make visible the declarations of format macros such as `PRIIdMAX`.

Portability problems not fixed by Gnulib:

9.20 `iso646.h`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/iso646.h.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This header file is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin, mingw.

9.21 `langinfo.h`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/langinfo.h.html

Gnulib module: langinfo
Portability problems fixed by Gnulib:
• This header file is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
• The constant `CODESET` is not defined on some platforms: OpenBSD 6.7.
• The constants `ALTMON_1` to `ALTMON_12` are not defined on some platforms: glibc 2.26, musl libc, macOS 11.1, NetBSD 8.0, OpenBSD 6.5, AIX 7.2, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Haiku, Cygwin 2.9.
• The constants `ERA`, `ERA_D_FMT`, `ERA_D_T_FMT`, `ERA_T_FMT`, `ALT_DIGITS` are not defined on some platforms: OpenBSD 6.7.
Portability problems not fixed by Gnulib:

9.22 `libgen.h`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/libgen.h.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This header file is missing on some platforms: mingw, MSVC 14.

The Gnulib module `dirname` provides similar API, with functions `base_name` and `dir_name` that also work with Windows file names.
Chapter 9: ISO C and POSIX Header File Substitutes

9.23 limits.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/limits.h.html

Gnulib module: limits-h or gethostname

Portability problems fixed by Gnulib module limits-h:

- The macros LLONG_MIN, LLONG_MAX, ULLONG_MAX are not defined on some platforms: older glibc systems (e.g. Fedora 1), AIX 5.1, HP-UX 11, IRIX 6.5, OpenVMS.
- The macro MB_LEN_MAX is not defined on some platforms: pcc 1.2.0.DEVEL 20220331.
- The macros WORD_BIT, LONG_BIT are not defined on some platforms: glibc 2.11 without -D_GNU_SOURCE, Cygwin, mingw, MSVC 14.
- Macros like CHAR_WIDTH are not defined on some platforms: glibc 2.24, NetBSD 9.0, many others.
- The macros BOOL_MAX and BOOL_WIDTH are not defined on some platforms: glibc 2.32, many others.
- The macro BOOL_MAX is not defined with some compilers: clang 15.0.6.
- The macro SSIZE_MAX is not defined on some platforms: MSVC 14.

Portability problems fixed by Gnulib module gethostname:

- The HOST_NAME_MAX macro is not defined on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- The macro SSIZE_MAX has the wrong type, albeit with the correct value: 32-bit glibc 2.24 (on some architectures), Cygwin 2.5.2.

For PATH_MAX, Gnulib provides a module pathmax with a header file "pathmax.h". It defines PATH_MAX to a constant on platforms with a file name length limit.

9.24 locale.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/locale.h.html

Gnulib module: locale

Portability problems fixed by Gnulib:

- The definition of ‘LC_MESSAGES’ is missing on some platforms: mingw, MSVC 14.
- The locale_t type is not defined on some platforms: glibc 2.11, macOS 11.1.
- The struct lconv type does not contain any members on some platforms: Android up to 2014.
- The struct lconv type does not contain the members int_p_cs_precedes, int_p_sign_posn, int_p_sep_by_space, int_n_cs_precedes, int_n_sign_posn, int_n_sep_by_space on some platforms: glibc, OpenBSD 4.9, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
• Some platforms provide a **NULL** macro that cannot be used in arbitrary expressions:
  NetBSD 5.0

Portability problems not fixed by Gnulib:

### 9.25 `math.h`

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/math.h.html

Gnulib module: *math*

Portability problems fixed by Gnulib:

- The conversion from `int` to `long double` is incorrect on some platforms: glibc 2.7 on Linux/SPARC64.
- The macro **NAN** is not defined on some platforms: OpenBSD 4.0, AIX 5.1, IRIX 6.5.
- The macro **NAN** is not exposed outside of C99 compilation on some platforms: glibc.
- The macros **NAN** and **HUGE_VAL** expand to a function address rather than a floating point constant on some platforms: Solaris 10.
- The macros **HUGE_VALF** and **HUGE_VALL** are not defined on some platforms: glibc/HPPA, glibc/SPARC, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.
- The macros **FP_ILOGB0** and **FP_ILOGBNAN** are not defined on some platforms: NetBSD 5.1, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.
- The macros **FP_ILOGB0** and **FP_ILOGBNAN** have wrong values on some platforms: Haiku 2022.
- The macros **NAN**, **HUGE_VALL**, and **INFINITY** are not defined on some platforms: OpenVMS.

Portability problems not fixed by Gnulib:

- **NAN** is not a compile time constant with some compilers: OpenVMS.
- The macro or variable **math_errhandling** is not defined on some platforms: glibc 2.11, OpenBSD 4.9, NetBSD 5.1, UP-UX 11, IRIX 6.5, Cygwin 1.7.9, mingw, MSVC 9.

### 9.26 `monetary.h`

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/monetary.h.html

Gnulib module: *monetary*

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.7.1, mingw, MSVC 14, Android 9.0.
- This header file has a syntax error in C++ mode on some platforms: NetBSD 8.0.
9.27 mqueue.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/mqueue.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

9.28 ndbm.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/ndbm.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14, Android 9.0.

9.29 net/if.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/net_if.h.html

Gnulib module: net_if

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.
- This header file is not self-contained on some platforms (needing <sys/socket.h> to be included first): Mac OS X 10.5, FreeBSD 8.2, OpenBSD 5.2.

Portability problems not fixed by Gnulib:

9.30 netdb.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/netdb.h.html

Gnulib module: netdb

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.
- This header file is incomplete on some platforms: Cygwin 1.5.x, Haiku.
- This header file does not define the type socklen_t on some platforms: IRIX 6.5.
- This header file does not define AI_ALL, AI_V4MAPPED on some platforms: NetBSD 9.0.
- This header file does not define AI_ADDRCONFIG on some platforms: NetBSD 5.0.

Portability problems not fixed by Gnulib:
9.31 netinet/in.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/netinet_in.h.html

Gnulib module: netinet_in

Portability problems fixed by Gnulib:

• This header file is missing on some platforms: mingw, MSVC 14.
• This header file is not self-contained on some platforms (it requires <sys/types.h> to be included first): OpenBSD 4.6.

Portability problems not fixed by Gnulib:

9.32 netinet/tcp.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/netinet_tcp.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This header file is missing on some platforms: mingw, MSVC 14.

9.33 nl_types.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/nl_types.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This header file is missing on some platforms: Minix 3.1.8, Cygwin, mingw, MSVC 14, Android 9.0.

9.34 poll.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/poll.h.html

Gnulib module: poll-h

Portability problems fixed by Gnulib:

• This header file is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
9.35 **pthread.h**

POSIX specification:
[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/pthread.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/pthread.h.html)

Gnulib module: pthread-h

Portability problems fixed by Gnulib:

- This header file is missing on some platforms. Minix 3.1.8, mingw 2.x, MSVC 14. But the provided replacement covers only the essential POSIX threads API. Furthermore it is just a dummy on some of these platforms: Minix 3.1.8.
- This header pollutes the namespace with some broken macro implementations for various functions such as `strtok_r` and `gmtime_r`: mingw 3.0.

Portability problems not fixed by Gnulib:

- This header file lacks the declaration of `pthread_atfork` on some platforms: IRIX 6.5.

9.36 **pwd.h**

POSIX specification:
[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/pwd.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/pwd.h.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

9.37 **regex.h**

POSIX specification:
[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/regex.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/regex.h.html)

Gnulib module: regex

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- This header file is not self-contained on some platforms: it requires `<sys/types.h>` to be included first.

9.38 **sched.h**

POSIX specification:
[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sched.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sched.h.html)

Gnulib module: sched

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- This header file does not define the type `pid_t` on some platforms: glibc 2.11, macOS 11.1.
• **struct sched_param** is not defined on some platforms: Haiku.
• **SCHED_FIFO, SCHED_RR, SCHED_OTHER** are not defined on some platforms: Haiku.

Portability problems not fixed by Gnulib:

### 9.39 search.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/search.h.html

Gnulib module: search
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This header file is missing on some platforms: Minix 3.1.8.

### 9.40 semaphore.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/semaphore.h.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This header file is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 9.41 setjmp.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/setjmp.h.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:

### 9.42 signal.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/signal.h.html

Gnulib module: signal-h
Portability problems fixed by Gnulib:
• **volatile sig_atomic_t** is rejected by older compilers on some platforms: AIX.
• **sigset_t** is missing on some platforms: MSVC 14.
• **sigset_t** is only declared in <sys/types.h> on some platforms: mingw.
• **struct sigaction** and **siginfo_t** are missing on some platforms: mingw, MSVC 14.
• The type **pid_t** is not defined on some platforms: MSVC 14.
• The signal **SIGPIPE** is not defined on some platforms: mingw, MSVC 14.
The macros `SA_RESETHAND` and `SA_RESTART` are not defined on some platforms: Non-Stop.

The type `sighandler_t` (a GNU extension) is not defined on most non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- Many signals are not defined on some platforms: mingw, MSVC 14.
- The macro `SIGBUS` is set to the same value as `SIGSEGV`, rather than being a distinct signal, on some platforms: Haiku.

### 9.43 spawn.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/spawn.h.html

Gnulib module: spawn

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.25, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 9.44 stdalign.h

POSIX specification:
Not in POSIX yet, but we expect it will be, at least temporarily until it becomes obsolete due to its phasing out starting in C23. ISO C23 (latest free draft http://www.open-std.org/jtc1/sc22/wg14/www/docs/n3047.pdf) sections 6.5.3.4, 6.7.5, 7.15. C++11 (latest free draft http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2011/n3242.pdf) section 18.10.

Gnulib module: alignasof

Portability problems fixed by Gnulib:

- On older C platforms `<stdalign.h>` must be included before using `alignas` or `alignof`. For example, GCC versions before 13 do not support these keywords, which were standardized by C23. On C23 and later platforms, `<stdalign.h>` has no effect and need not be included. (Gnulib-using code should not include `<stdalign.h>` without also employing Gnulib’s now-deprecated `stdalign` module.)
- This header file is missing on many platforms: FreeBSD 6.4, NetBSD 7.1, OpenBSD 6.7, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, mingw, MSVC 14, Android 9.0.
- Clang 3.0’s `<stdalign.h>` does not define `alignof`.
- The `alignof` macro returns too large values for the types `double` and `long long` in GCC 4.7.0.
- Older C platforms might not support the obsolescent `_Alignas` and `_Alignof` keywords or macros. This portability problem should not matter with code using this module, as such code should use `alignas` and `alignof` instead.
• In C11 and C17, `<stdalign.h>` defines the macros `__alignas_is_defined` and `__alignof_is_defined` to 1. In C23, these macros are not defined. This portability problem should not matter with code using Gnulib’s `alignasof` module, as such code should use `alignas` and `alignof` without checking these two macros. (Gnulib’s now-deprecated `stdalign` module defines these two macros.)

Portability problems not fixed by Gnulib:
• In C11 and later, the operand of `alignof` must be a parenthesized type. Recent versions of GCC support an extension in which the operand can also be a unary expression, as with `sizeof`. The Gnulib substitute does not support this extension.
• On most pre-C11 platforms, the operand of `alignof` cannot be a structure type containing a flexible array member.
• The `alignas` keyword or macro is not always supported. Supported compilers include any compiler supporting C11 or later, which includes GCC, IBM C, Sun C 5.9 and later, and MSVC 7.0 and later.
• Some compilers do not support alignment via `alignas` of `auto` variables (i.e., variables on the stack). They diagnose and ignore the alignment: Sun C 5.11.
• Some linkers do not support operands of `alignas` that are greater than 8: mingw.
• Some compilers require the operand of `alignas` to be a single integer constant, not an expression: MSVC 7.0 through at least 10.0.
• The Sun C 5.13 (2014) compiler sometimes mishandles the alignment of multiple external variables that are declared close together with `alignas`. The bug is fixed in Sun C 5.15, also known as Oracle Developer Studio 12.6 (2017).
• You cannot assume that `alignas` and `alignof` are reserved words; they might be macros.

9.45 `stdarg.h`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/stdarg.h.html

Gnulib module: stdarg

Portability problems fixed by Gnulib:
• Some compilers (e.g., AIX 5.3 cc) need to be in c99 mode for the builtin `va_copy` to work.

Portability problems not fixed by Gnulib:

9.46 `stdatomic.h`

POSIX specification:
Not in POSIX yet, but we expect it will be. ISO C11 (latest free draft http://www.open-std.org/jtc1/sc22/wg14/www/docs/n1570.pdf) section 7.17.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This header file is missing on many platforms: glibc with GCC 4.8.x or clang 2.8, FreeBSD 6.4, NetBSD 7.0, OpenBSD 6.5, OpenBSD 6.9 with gcc, Minix 3.3.0, AIX 7.2 with xlc or xlc-lang, HP-UX 11.31, IRIX 6.5, Solaris 11.3 with Oracle Studio 12.4 (Sun C 5.13), Cygwin 1.5.19, mingw, MSVC 14.

9.47 stdbool.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/stdio.h.html

Gnulib module: stdbool-c99

The stdbool-c99 module is present only for programs that formerly used the old stdbool module for C99 compatibility, and that for some reason cannot use the current stdbool module for C23 compatibility.

Portability problems fixed by Gnulib:
• This header file is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5.
• This header file is not usable in C++ mode with the vendor compiler on Solaris 10.
• Some compilers have bugs relating to ‘bool’.
• This header file defines true incorrectly on some platforms: OpenBSD 4.7 with gcc 2.95.

Portability problems not fixed by Gnulib:
• ‘_Bool’ cannot be used before <stdbool.h> is included, or if the program is intended to be compiled by a C++ compiler. (With the advent of C23, ‘_Bool’ is obsolescent anyway.)
• You cannot assume that _Bool is a typedef; it might be a macro. For example, C23 allows _Bool to be a macro.
• Bit-fields of type ‘bool’ are not supported. Portable code should use ‘unsigned int foo : 1;’ rather than ‘bool foo : 1;’.
• Casts and automatic conversions to ‘bool’ don’t test against the zero value or the null pointer, as they should. Such casts should only be used if the value is known to be equal to 0 or 1.
• You cannot assume that casting a floating point literal to ‘bool’ will result in a constant expression.

9.48 stdckdint.h

POSIX specification:
Not in POSIX yet, but we expect it will be. ISO draft C23 (https://www.open-std.org/jtc1/sc22/wg14/www/docs/n3047.pdf) section 7.20.

Gnulib module: stdckdint

Portability problems fixed by Gnulib:
• This header file is missing on many platforms.

Portability problems not fixed by Gnulib:
• In draft C23, arguments of stdckdint.h macros can have side effects.
9.49 stddef.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/stddef.h.html

Gnulib module: stddef

Portability problems fixed by Gnulib:
- Some platforms fail to provide unreachable, which was added in C23: GCC 13, clang 15, AIX with xlc 12.1, Solaris with Sun C 5.15, and others.
- Some platforms fail to provide max_align_t, which was added in C11: NetBSD 8.0, Solaris 11.0, and others.
- max_align_t does not have the expected alignment on some platforms: NetBSD 8.0/x86, AIX 7.2 with xlc in 64-bit mode.
- Some old platforms fail to provide wchar_t.
- Some platforms provide a NULL macro that cannot be used in arbitrary expressions: NetBSD 5.0
- Some platforms provide a NULL macro whose value does not have the size of a pointer: AIX 7.2 with xlc in 64-bit mode.
- When this header file is provided by TinyCC 0.9.27 on glibc or macOS systems, it does not fulfil the expectations of other system header files.

Portability problems not fixed by Gnulib:
- Some platforms fail to provide nullptr_t, which Gnulib cannot usefully emulate: GCC 12, Clang 15, and other pre-2023 C compilers.
- Some platforms provide an offsetof macro that cannot be used in arbitrary expressions: Solaris 11.4 This problem can be worked around by parenthesizing the offsetof expression in the unlikely case you use it with sizeof or ‘[]’.

9.50 stdint.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/stdio.h.html

Gnulib module: stdint

Portability problems fixed by Gnulib:
- This header file is missing on some platforms: OpenBSD 3.8, AIX 5.1, HP-UX 11.11, IRIX 6.5, MSVC 14.
- This header file is very incomplete on some platforms.
- The values of SIG_ATOMIC_MIN and SIG_ATOMIC_MAX are incorrect on some platforms: FreeBSD 6.2/ia64, FreeBSD 13.0/arm64.
- The value of INT_MAX is incorrect on some platforms: mingw.
- The values of INT8_MAX, UINT8_MAX etc. are not usable in preprocessor expressions on some platforms: HP-UX 11.23.
- The values of INTPTR_MAX and UINTPTR_MAX, although correctly defined in <stdint.h>, are replaced by empty values when <limits.h> or <inttypes.h> gets included later on some platforms: Solaris 9 with GCC 4.5 or newer.
- The macros `WCHAR_MIN` and `WCHAR_MAX` are not defined in `<stdint.h>` (only in `<wchar.h>`) on some platforms: Dragonfly.
- On some hosts that predate C++11, when using C++ one must define `__STDC_CONSTANT_MACROS` to make visible the definitions of constant macros such as `INTMAX_C`, and one must define `__STDC_LIMIT_MACROS` to make visible the definitions of limit macros such as `INTMAX_MAX`.
- The macro `SIZE_MAX` has the wrong type, albeit with the correct value: 32-bit glibc 2.24 (on s390 architecture), Mac OS X 10.7.
- Macros like `INTMAX_WIDTH` are not defined on some platforms: glibc 2.24, NetBSD 9.0, many others.

Portability problems not fixed by Gnulib:
- `{uint,int}_fast{8,16,32,64}_t` may not correspond to the fastest types available on the system. Other `<stdint.h>` substitutes may define these types differently, so public header files should avoid these types.
- Macros are used instead of typedefs.
- Some C preprocessors mishandle constants that do not fit in `long int`. For example, as of 2007, Sun C mishandled `#if LLONG_MIN < 0` on a platform with 32-bit `long int` and 64-bit `long long int`; this bug was fixed on or before Oracle Developer Studio 12.6 (Sun C 5.15 SunOS sparc 2017/05/30). Some older preprocessors mishandle constants ending in LL. To work around these problems, compute the value of expressions like `LONG_MAX < LLONG_MAX` at `configure-time` rather than at `#if-time`.

The `stdint` module uses `#include_next`. If you wish to install the generated `stdint.h` file under another name, typically in order to be able to use some of the types defined by `stdint.h` in your public header file, you could use the following Makefile.am-snippet:

```makefile
BUILT_SOURCES += idn-int.h
DISTCLEANFILES += idn-int.h
nodist_include_HEADERS += idn-int.h

idn-int.h:
  if test -n "$(STDINT_H)"; then \
    sed -e s/include_next/include/ gl/stdint.h > idn-int.h; \
  else \n    echo '#include <stdint.h>' > idn-int.h; \
  fi
```

### 9.51 stdio.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/stdio.h.html

Gnulib module: stdio

Portability problems fixed by Gnulib:
- The type `off_t` is missing on some platforms: glibc 2.8, eglibc 2.11.2 and others.
• The type `ssize_t` is missing on some platforms: glibc 2.8, Mac OS X 10.5, Solaris 10, MSVC 14, and others.
• The type `va_list` is missing on some platforms: glibc 2.8, OpenBSD 4.0, Solaris 11.4, and others.
• Some platforms provide a `NULL` macro that cannot be used in arbitrary expressions: NetBSD 5.0

Portability problems not fixed by Gnulib:

9.52 stdlib.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/stdlib.h.html
Gnulib module: stdlib, system-posix

Portability problems fixed by the Gnulib module `stdlib`:
• The macros `EXIT_SUCCESS` and `EXIT_FAILURE` are not defined on some platforms.
• Some platforms provide a `NULL` macro that cannot be used in arbitrary expressions: NetBSD 5.0
• The value of `MB_CUR_MAX` is too small (3 instead of 4) in UTF-8 locales on some platforms: Solaris 10.

Portability problems fixed by the Gnulib module `system-posix`:
• The macros `WIFSIGNALED`, `WIFEXITED`, `WIFSTOPPED`, `WTERMSIG`, `WEXITSTATUS`, `WNOHANG`, `WUNTRACED`, `WSTOPSIG` are not defined in this header file (only in `<sys/wait.h>`) on some platforms: MirBSD 10.

Portability problems not fixed by Gnulib:
• The definition of the type `once_flag`, of the macro `ONCE_FLAG_INIT`, and the declaration of the function `call_once`, that are required by ISO C 23, are not provided. To get them, import Gnulib module `call_once` and include `<threads.h>` rather than `<stdlib.h>`.
• System status macros such as `WEXITSTATUS` require an lvalue argument on some platforms. macOS 11.1.

9.53 stdnoreturn.h

POSIX specification:
Not in POSIX yet, but we expect it will be. ISO C11 (latest free draft http://www.open-std.org/jtc1/sc22/wg14/www/docs/n1570.pdf) sections 7.23.

Gnulib module: stdnoreturn

Portability problems fixed by Gnulib:
• This header file is missing on many platforms: FreeBSD 6.4, NetBSD 7.1, OpenBSD 6.7, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9.0, mingw, MSVC 14, Android 9.0.
• This file conflicts with some system header files, such as `<stdlib.h>` and `<process.h>`, on some platforms: MSVC/clang.
Portability problems not fixed by Gnulib:

- `<stdnoreturn.h>` and the `noreturn` macro are obsolescent in C23.
- `<stdnoreturn.h>` cannot be `#`included in C++ mode on some platforms: FreeBSD 13.1.
- `<stdnoreturn.h>` should be `#`included before `'_Noreturn'` is used.
- You cannot assume that `_Noreturn` is a reserved word; it might be a macro.
- When the macro `lint` is defined, standard headers define `_Noreturn` (and therefore `noreturn`) to be a macro that expands to the empty token sequence on some platforms: Cygwin 2.5.1, FreeBSD 10.3.
- On Cygwin 1.7.30 and MSVC 14, `noreturn` expands to the empty token sequence, to avoid problems with standard headers that use `noreturn` in combination with `__attribute__` or `__declspec`. Although the resulting code operates correctly, the compiler is not informed whether `noreturn` functions do not return, so it may generate incorrect warnings at compile-time, or code that is slightly less optimized. This problem does not occur with `_Noreturn`.
- Circa 2012 bleeding-edge GCC with `-Werror=old-style-declaration` requires `_Noreturn` or `noreturn` before the returned type in a declaration, and therefore rejects valid but unusually-worded declarations such as `void _Noreturn foo (void);`

### 9.54 `string.h`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/string.h.html

Gnulib module: string

Portability problems fixed by Gnulib:

- Some platforms provide a `NULL` macro that cannot be used in arbitrary expressions: NetBSD 5.0

Portability problems not fixed by Gnulib:

### 9.55 `strings.h`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/strings.h.html

Gnulib module: strings

Portability problems fixed by Gnulib:

- This header file is not self-contained on some platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: MSVC 14.
- This header file defines symbols, such as ‘`index`’, often used for variables, making debugging harder.
9.56 stropts.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/stropts.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin, mingw, MSVC 14, Android 9.0.

9.57 sys/ipc.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_ipc.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

9.58 sys/mman.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_mman.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

9.59 sys/msg.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_msg.h.html

Gnulib module: sys_msg

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
9.60 sys/resource.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_resource.h.html

Gnulib module: sys_resource

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.
- On some platforms, this header file requires that <sys/types.h> and <sys/time.h> already be included: FreeBSD 5.0.
- On some platforms, this header file does not define the RUSAGE_SELF and RUSAGE_CHILDREN constants: OpenVMS.

Portability problems not fixed by Gnulib:

- On some platforms, this header does not define some or all of the symbolic constants required by POSIX. For example, OpenVMS and Android do not define RLIM_SAVED_CUR or RLIM_SAVED_MAX.

9.61 sys/select.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_select.h.html

Gnulib module: sys_select

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: HP-UX 11.11, NonStop Kernel, mingw, MSVC 14.
- This header file is not self-contained on some platforms: it requires <sys/types.h> to be included first.
- This header file is not self-contained—it requires <string.h> before FD_ZERO can be used—on some platforms: AIX 7.1, Solaris 11.4.

Portability problems not fixed by Gnulib:

9.62 sys/sem.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_sem.h.html

Gnulib module: sys_sem

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.
9.63 sys/shm.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_shm.h.html

Gnulib module: sys.shm

Portability problems fixed by Gnulib:
- This header file is missing on some platforms: mingw, MSVC 14.

9.64 sys/socket.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_socket.h.html

Gnulib module: sys.socket

Portability problems fixed by Gnulib:
- This header file is missing on some platforms: mingw, MSVC 14.
- This header file is not self-contained on some platforms: it requires <sys/types.h> to be included first.
- This header file does not define the type socklen_t on some platforms: IRIX 6.5.
- This header file does not define the type struct iovec on some platforms: OpenBSD 4.4.
- This header file is lacking the SHUT_RD, SHUT_WR, SHUT_RDWR macros on some platforms, despite having the shutdown functions: emx+gcc.
- The struct sockaddr_storage type does not have a member ss_family on some platforms: AIX 7.1.
- The CMSG_SPACE and CMSG_LEN macros are not provided on some platforms: OpenVMS.
- This header file does not define the SO_REUSEPORT macro on some platforms: Minix 3.1.8, Solaris 10, Cygwin, mingw, MSVC 14.

Portability problems not fixed by Gnulib:
- This header file does not declare the msg_control and msg_controllen members of struct msghdr on some platforms. This can be detected by the absence of the CMSG_FIRSTHDR macro: gnulib replacement header, old BSD

9.65 sys/stat.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_stat.h.html

Gnulib module: sys.stat

Portability problems fixed by Gnulib module sys.stat:
- The type mode_t is not defined on some platforms: MSVC 14.
- Some macros, such as S_IFMT or S_IFIFO, are missing on some platforms.
- The macros S_ISBLK, S_ISCHR, S_ISDIR, S_ISFIFO, S_ISLNK, S_ISREG, S_ISSOCK are broken on some platforms.
• Some platforms define macros, such as \texttt{S_ISDOOR}, that are not defined on other platforms.
• The functions \texttt{lstat} and \texttt{mkdir} are not declared on some platforms: mingw, MSVC 14.
• The macros \texttt{UTIME_NOW} and \texttt{UTIME_OMIT} are missing on some platforms.
• On some platforms, \texttt{struct stat} does not include \texttt{st_atim}, \texttt{st_mtim}, or \texttt{st_ctim} members. Use the gnulib module ‘\texttt{stat-time}’ for accessors to portably get at subsecond resolution.

Portability problems fixed by Gnulib module \texttt{sys_stat}, together with module \texttt{windows-stat-inodes}:
• On Windows platforms (excluding Cygwin), \texttt{st_ino} is always 0.

See Section 14.5 [Avoiding the year 2038 problem], page 754, for portability issues with the \texttt{time_t} components of \texttt{struct stat}.

Portability problems not fixed by Gnulib:
• The macro \texttt{S_IFBLK} is missing on some platforms: MSVC 14.
• On OpenVMS, \texttt{st_ino} is an array of three \texttt{ino_t} values, not a single value.
• To partially work around the previous two problems, you can test for nonzero \texttt{st_ino} and use the Gnulib \texttt{same-inode} module to compare nonzero values. For example, \texttt{SAME_INODE} (\texttt{a}, \texttt{b}) is true if the \texttt{struct stat} values \texttt{a} and \texttt{b} are known to represent the same file, \texttt{(a.st_ino} \texttt{&&} \texttt{!SAME_INODE} (\texttt{a}, \texttt{b})) is true if they are known to represent different files, and \texttt{!a.st_ino} is true if it is not known whether they represent different files.
• On some platforms, two different files may have the same \texttt{st_dev} and \texttt{st_ino} values, even when \texttt{st_ino} is nonzero:
  • GNU/Linux NFS servers that export all local file systems as a single NFS file system, if a local \texttt{st_dev} exceeds 255, or if a local \texttt{st_ino} exceeds 16777215.
  • Network Appliance NFS servers in snapshot directories; see Network Appliance bug \#195.
  • ClearCase MVFS; see bug id ATRia04618.

One partial workaround is to compare other file metadata such as \texttt{st_mode} and \texttt{st_mtime} to detect this bug, but this approach does not work on files whose metadata are being changed by other programs.
• On some file systems, \texttt{st_size} contains bogus information for symlinks; use the Gnulib module \texttt{areadlink-with-size} for a better way to get symlink contents.

\textbf{9.66 \texttt{sys/statvfs.h}}

POSIX specification:
\url{https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_statvfs.h.html}

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This header file is missing on some platforms: OpenBSD 3.8, mingw, MSVC 14.

9.67 sys/time.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_time.h.html

Gnulib module: sys_time

Portability problems fixed by Gnulib:

• This header file is missing on some platforms: MSVC 14.

• ‘struct timeval’ is not defined on some platforms.

• ‘struct timeval’ is defined with a tv_sec type that is narrower than time_t on some native Windows platforms: mingw64 in 64-bit mode, mingw64 in 32-bit mode when __MINGW_USE_VC2005_COMPAT is defined, MSVC 14 in 64-bit mode, MSVC 14 in 32-bit mode when _USE_32BIT_TIME_T is not defined.

See Section 14.5 [Avoiding the year 2038 problem], page 754, for portability issues with time_t and the time_t component of struct timeval.

Portability problems not fixed by Gnulib:

• ‘struct timeval’ is defined with a tv_sec type that is wider than time_t: OpenBSD 5.1 in 64-bit mode.

9.68 sys/timeb.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/009695399/basedefs/sys/timeb.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This header file is missing on some platforms: OpenBSD 6.7, Android 9.0.

9.69 sys/times.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_times.h.html

Gnulib module: sys_times

Portability problems fixed by Gnulib:

• This header file is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
9.70 sys/types.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_types.h.html

Gnulib module: sys_types

Portability problems fixed by Gnulib:
• The type pid_t is not defined on some platforms: MSVC 14.
• The type size_t is not defined in this file on some platforms: MSVC 14.
• The type ssize_t is not defined on some platforms: MSVC 14.
• The type mode_t is not defined on some platforms: MSVC 14.
• Some systems leak definitions of major, minor, and makedev through this header; however, when sys/sysmacros.h exists, that file should also be included to avoid deprecation warnings from the versions in this header: glibc 2.25.

See Section 14.5 [Avoiding the year 2038 problem], page 754, for portability issues with time_t.

Portability problems not fixed by Gnulib:
• On some platforms the types blksize_t and suseconds_t are signed integer types that are wider than long: glibc x32

This module, together with the module largefile, also defines the type off_t to a 64-bit integer type on some platforms: mingw, MSVC 14.

9.71 sys/uio.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_uio.h.html

Gnulib module: sys_uio

Portability problems fixed by Gnulib:
• This header file is missing on some platforms: mingw, MSVC 14.
• This header file is not self-contained (it requires <sys/types.h> to be included first) on some platforms: OpenBSD 4.4.

Portability problems not fixed by Gnulib:

9.72 sys/un.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_un.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This header file is missing on some platforms: mingw, MSVC 14.
• This header requires <code>sys/socket.h</code> to be included first on some platforms: Cygwin 1.7.18.
9.73 sys/utsname.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_utsname.h.html

Gnulib module: sys_utsname

Portability problems fixed by Gnulib:
• This header file is missing on some platforms: mingw, MSVC 14.
• This header file is not self-contained on some platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

9.74 sys/wait.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_wait.h.html

Gnulib module: sys_wait

Portability problems fixed by Gnulib:
• This header file is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
• System status macros such as WEXITSTATUS require an lvalue argument on some platforms. macOS 11.1.

9.75 syslog.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/syslog.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This header file is missing on some platforms: mingw, MSVC 14.

9.76 tar.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/tar.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This header file is missing on some platforms: Cygwin 1.5.x, mingw, MSVC 14.
9.77 termios.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/termios.h.html

Gnulib module: termios

Portability problems fixed by Gnulib:
- This header file is missing on some platforms: mingw, MSVC 14.
- This header does not declare pid_t on all platforms: glibc on some architectures, FreeBSD 6.4, OpenBSD 4.9, Cygwin 1.7.11.

Portability problems not fixed by Gnulib:
- The types struct termios, cc_t, speed_t, tcflag_t are not defined on some platforms: mingw, MSVC 14.

9.78 tgmath.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/tgmath.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This header file is missing on some platforms: Mac OS X 10.5, FreeBSD 5.2.1, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.9, mingw, MSVC 14, Android 9.0.

9.79 threads.h

Defines the multithreading facility of ISO C11.

Gnulib module: threads-h

Portability problems fixed by Gnulib:
- This header file is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.2.x, mingw, MSVC 14, Android 9.0.
- This header file defines thrd_start_t incorrectly on some platforms: AIX 7.2.
- This header file does not define TSS_DTOR_ITERATIONS on some platforms: AIX 7.2.

Portability problems not fixed by Gnulib:
- There is no way to define a working thread_local macro on some platforms:
  - Mac OS X 10.5,
  - OpenBSD 6.5,
  - AIX 7.1 with gcc (but it works with `xlc -qthreaded -qtls`),
  - HP-UX 11.31 with cc (but it works with gcc),
  - IRIX 6.5,
  - Android 4.3.
9.80 time.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/time.h.html

Gnulib module: time-h

Portability problems fixed by Gnulib:
- ‘struct timespec’ is not defined on some platforms.
- The macro TIME_UTC is not defined on many platforms: glibc 2.15, macOS 10.13, FreeBSD 11.0, NetBSD 7.1, OpenBSD 6.0, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- Some platforms provide a NULL macro that cannot be used in arbitrary expressions: NetBSD 5.0.

Portability problems fixed by the Gnulib module year2038:
- On some platforms where time_t defaults to 32-bit but can be changed to 64-bit, functions like stat can fail with errno == EOVERFLOW when a 32-bit timestamp is out of range, such as with a file timestamp in the far future or past: glibc 2.34+ atop 32-bit x86 or ARM Linux. See Section 14.5 [Avoiding the year 2038 problem], page 754.

Portability problems not fixed by Gnulib:
- On platforms where time_t is always 32-bit, functions like stat can fail with errno == EOVERFLOW when a timestamp is out of range, such as with a file timestamp in the far future or past; on other such platforms, the functions silently return the low-order 32 bits of the correct timestamp. These platforms will be obsolete when 32-bit time_t rolls around, which will occur in 2038 for the typical case when time_t is signed. See Section 14.5 [Avoiding the year 2038 problem], page 754.
- On some platforms the tv_nsec member of struct timespec is not of type long, but is of type long long instead: glibc x32

9.81 trace.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/trace.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This header file is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.

9.82 uchar.h

Defines the types char16_t, char32_t and declares the functions mbtoci6, c16rtomb, mbtoci32, c32rtomb.

Gnulib module: uchar or uchar-c23
Portability problems fixed by either Gnulib module `uchar` or `uchar-c23`:

- This header file is missing on many non-glibc platforms: glibc 2.15, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin, mingw, MSVC 9.
- This file is not self-contained on some platforms: Haiku.
- This file produces compilation errors in C++ mode on some platforms: AIX 7.2 with `xlclang++`.

Portability problems fixed by Gnulib module `uchar-c23`:
- `char32_t` values may not be Unicode code points. This is the case in ISO C 11 compliant but not ISO C 23 compliant implementations.

Portability problems not fixed by Gnulib:

### 9.83 ucontext.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/009695399/basedefs/ucontext.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This header file is missing on some platforms: OpenBSD 6.7, Cygwin 1.7.35, mingw, MSVC 14.

### 9.84 ulimit.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/ulimit.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This header file is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin, mingw, MSVC 14, Android 9.0.

### 9.85 unistd.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/unistd.h.html

Gnulib module: unistd

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: MSVC 14.
- The SEEK_* macros are not defined in this file on some platforms: mingw.
- The *_FILENO macros are not defined in this file on some platforms: OS/2 EMX, mingw.
- The _exit function is not declared in this file on some platforms: mingw.
• Some platforms provide a NULL macro that cannot be used in arbitrary expressions:
  NetBSD 5.0

Portability problems not fixed by Gnulib:

9.86 utime.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/utime.h.html

Gnulib module: utime-h

Portability problems fixed by Gnulib:
• This header file is missing on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

9.87 utmpx.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/utmpx.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This header file is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

9.88 wchar.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/wchar.h.html

Gnulib module: wchar

Portability problems fixed by Gnulib:
• This header file cannot be included on some platforms: Linux uClibc built without wide character support.
• The type wint_t is incorrect on some platforms: mingw, MSVC 14.
• Some platforms provide a NULL macro that cannot be used in arbitrary expressions: NetBSD 5.0

Portability problems not fixed by Gnulib:
• This header file leads to link errors and endless recursions or endless loops on some platforms: glibc version 2.5 or older, together with gcc version 4.3 or newer and the option ‘-std=c99’ or ‘-std=gnu99’.
9.89 wctype.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/wctype.h.html

Gnulib module: wctype-h

Portability problems fixed by Gnulib:
- This header file is missing on some platforms: HP-UX 11.00.
- The type wint_t is incorrect on some platforms: mingw, MSVC 14.
- The functions isw* are missing on some platforms: FreeBSD 4.11.
- The function iswblank is declared but not defined on some platforms: IRIX 6.5.30.

Portability problems not fixed by Gnulib:

9.90 wordexp.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/wordexp.h.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This header file is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.
10 ISO C and POSIX Function Substitutes

This chapter describes which functions and function-like macros specified by ISO C (including ISO TS 18661-1) or POSIX are substituted by Gnulib, which portability pitfalls are fixed by Gnulib, and which (known) portability problems are not worked around by Gnulib.

The notation “Gnulib module: —” means that Gnulib does not provide a module providing a substitute for the function. When the list “Portability problems not fixed by Gnulib” is empty, such a module is not needed: No portability problems are known. Otherwise, it indicates that such a module would be useful but is not available: No one so far found this function important enough to contribute a substitute for it. If you need this particular function, you may write to <bug-gnulib at gnu dot org>.

10.1 FD_CLR

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/FD_CLR.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.2 FD_ISSET

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/FD_ISSET.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.3 FD_SET

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/FD_SET.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.4 FD_ZERO

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/FD_ZERO.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
10.5 _Exit

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/_Exit.html

Gnulib module: _Exit

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, Android 4.4.

Portability problems not fixed by Gnulib:

10.6 _exit

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/_exit.html

Gnulib module: unistd

Portability problems fixed by Gnulib:
- This function is declared in a different header file (namely, <stdlib.h>) on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

10.7 _longjmp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/_longjmp.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.

Note: A future revision of POSIX later than the 2008/2009 one may drop the functions _setjmp and _longjmp. Still, in 2008, on all systems which have _setjmp, it is the fastest way to save the registers but not the signal mask (up to 30 times faster than setjmp on some systems).

10.8 _setjmp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/_setjmp.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

Note: A future revision of POSIX later than the 2008/2009 one may drop the functions _setjmp and _longjmp. Still, in 2008, on all systems which have _setjmp, it is the fastest
way to save the registers but not the signal mask (up to 30 times faster than `setjmp` on some systems).

### 10.9 `_tolower`

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/functions/_tolower.html

**Gnulib module:** —
- Portability problems fixed by Gnulib:
- Portability problems not fixed by Gnulib:
  - This function is missing on some platforms: macOS 11.1, Minix 3.1.8, Android 4.4.

### 10.10 `_toupper`

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/functions/_toupper.html

**Gnulib module:** —
- Portability problems fixed by Gnulib:
- Portability problems not fixed by Gnulib:
  - This function is missing on some platforms: macOS 11.1, Minix 3.1.8, Android 4.4.

### 10.11 `a64l`

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/functions/a64l.html

**Gnulib module:** —
- Portability problems fixed by Gnulib:
- Portability problems not fixed by Gnulib:
  - This function is missing on some platforms: FreeBSD 6.0, Minix 3.1.8, mingw, MSVC 14, Android 9.0.
  - This function was not correctly implemented in glibc versions before 2.2.5.

### 10.12 `abort`

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/functions/abort.html

**Gnulib module:** —
- Portability problems fixed by Gnulib:
- Portability problems not fixed by Gnulib:
  - Some platforms mistakenly close all stdio streams prior to raising SIGABRT: Cygwin 1.5.x.
  - Some platforms always print a message to stderr, even if a SIGABRT handler uses longjmp to resume execution at a safe point: mingw, MSVC 14.
10.13 abs

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/abs.html

Gnulib module: —
Portability problems fixed by Gnulib:

• This function is missing on some platforms: Android 4.3.

10.14 accept

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/accept.html

Gnulib module: accept

Portability problems fixed by Gnulib:

• On Windows platforms (excluding Cygwin), the descriptors returned by the accept function cannot be used in calls to read, write, and close; you have to use recv, send, closesocket in these cases instead.
• On Windows platforms (excluding Cygwin), error codes from this function are not placed in errno, and WSAGetLastError must be used instead.
• On HP-UX 11, in 64-bit mode, when the macro _HPUX_ALT_XOPEN_SOCKET_API is not defined, this function behaves incorrectly because it is declared to take a pointer to a 64-bit wide socklen_t entity but in fact considers it as a pointer to a 32-bit wide unsigned int entity.

Portability problems not fixed by Gnulib:

• Some platforms don’t have a socklen_t type; in this case this function’s third argument type is ‘int *’.
• On some platforms, this function’s third argument type is ‘void *’, not ‘socklen_t *’: Solaris 10.

10.15 access

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/access.html

Gnulib module: access

Portability problems fixed by Gnulib:

• This function does not support the X_OK mode on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

• This function uses the effective id instead of the real id on some platforms: Cygwin 1.5.x.

Other problems of this function:

• There is an inherent race between calling this function and performing some action based on the results; you should think twice before trusting this function, especially in a set-uid or set-gid program.
• This function does not have an option for not following symbolic links (like `stat` versus `lstat`). If you need this option, use the Gnulib module `faccessat` with the `AT_EACCESS` flag.

• On native Windows, files whose basename does not contain a `'.'` cannot be executed through `execlp` or `execvp`. Nevertheless, this function may return true for such files.

• On Windows, different facilities for executing a program have different ways of finding an executable file, by trying various suffixes. For example, `execlp` and `execvp` search for files with the suffixes `.com`, `.exe`, `.bat`, `.cmd`, when the file with the given file name does not exist. Whereas `cmd.exe` searches according to the `PATHEXT` environment variable. This function does not perform any search; it merely looks at the file with the given file name.

10.16 acos

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/acos.html

Gnulib module: acos

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.17 acosf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/acosf.html

Gnulib module: acosf

Portability problems fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.

• This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

10.18 acosh

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/acosh.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 9.
10.19 acoshf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/acoshf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, mingw, MSVC 9.

10.20 acoshl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/acoshl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 4.4.

10.21 acosl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/acosl.html

Gnulib module: acosl

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

10.22 aio_cancel

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_cancel.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- On platforms where off_t is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.23 aio_error

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_error.html

Gnulib module: —
Portability problems fixed by Gnulib:
• On platforms where off_t is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.24 aio_fsync

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_fsync.html

Gnulib module: —
Portability problems fixed by Gnulib:
• On platforms where off_t is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.25 aio_read

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_read.html

Gnulib module: —
Portability problems fixed by Gnulib:
• On platforms where off_t is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.26 aio_return

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_return.html

Gnulib module: —
Portability problems fixed by Gnulib:
• On platforms where off_t is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.27 aio_suspend

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_suspend.html

Gnulib module: —

Portability problems fixed by Gnulib:
- On platforms where off_t is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.28 aio_write

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_write.html

Gnulib module: —

Portability problems fixed by Gnulib:
- On platforms where off_t is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.29 alarm

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/alarm.html

Gnulib module: —

Portability problems fixed by Gnulib:
- This function has no impact if <code>SIGALRM</code> is inherited as ignored; programs should use <code>signal (SIGALRM, SIG_DFL)</code> if it is important to ensure the alarm will fire.
- Use of this function in multi-threaded applications is not advised.
- This function is missing on some platforms: mingw (2011), MSVC 14.
- This function is conditionally declared in the non-standard <code>io.h</code> header on some platforms: mingw (2012 or newer).
10.30 aligned_alloc

Documentation:
man aligned_alloc

Gnulib module: aligned_alloc

Portability problems fixed by Gnulib:
- This function fails if the alignment argument is smaller than \texttt{sizeof (void *)} on some platforms: macOS 11.1, AIX 7.2.

Portability problems not fixed by Gnulib:
- On some platforms, \texttt{aligned_alloc} crashes if the requested size is not a multiple of the alignment: AddressSanitizer (gcc 11.2 or clang 13).
- This function is missing on many older platforms: glibc 2.15, macOS 10.13, FreeBSD 6.4, NetBSD 7.1, OpenBSD 6.0, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Gnulib has partial substitutes for \texttt{aligned_alloc} that do not crash even if the AddressSanitizer bug is present:
- The Gnulib module \texttt{alignalloc} provides a portable function \texttt{alignalloc} that is a near-substitute for glibc \texttt{aligned_alloc}, except that the result must be freed with \texttt{alignfree} rather than plain \texttt{free}.
- The Gnulib module \texttt{aligned-malloc} provides functions for allocating and freeing blocks of suitably aligned memory.
- The Gnulib module \texttt{pagealign_alloc} provides a similar API for allocating and freeing blocks of memory aligned on a system page boundary.

10.31 alphasort

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/alphasort.html

Gnulib module: alphasort

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Solaris 9, mingw, MSVC 14.

Portability problems not fixed by Gnulib:
- The parameters of this function are declared as \texttt{const void *} on some platforms: glibc 2.3.6, macOS 10.7, FreeBSD 6.0, NetBSD 7.1, OpenBSD 6.7.
- The parameters of this function are declared as \texttt{void *} on some platforms: AIX 5.1.

10.32 asctime

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/asctime.html

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is deprecated in C23. Portable applications can use `strftime` (or even `sprintf`) instead.
- This function may overflow its internal buffer if an invalid year is passed.

10.33 `asctime_r`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/asctime_r.html

Future POSIX removal:
https://www.austingroupbugs.net/view.php?id=1410

Gnulib module: extensions

Portability problems fixed by Gnulib:

- This function has an incompatible declaration on some platforms: Solaris 11.4 (when `_POSIX_PTHREAD_SEMANTICS` is not defined).

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- This function may put more than 26 bytes into the argument buffer if an invalid year is passed.

10.34 `asin`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/asin.html

Gnulib module: asin

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.35 `asinf`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/asinf.html

Gnulib module: asinf

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:
10.36 `asinh`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/asinh.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 9.

10.37 `asinhf`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/asinhf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, mingw, MSVC 9.

10.38 `asinhl`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/asinhl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 4.4.

10.39 `asinl`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/asinl.html

Gnulib module: asinl

Portability problems fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:
10.40 assert

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/assert.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

Extension: Gnulib offers a module ‘assert’ that allows the installer to disable assertions through a ‘configure’ option: ‘--disable-assert’.

10.41 atan

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/atan.html

Gnulib module: atan

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.42 atan2

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/atan2.html

Gnulib module: atan2

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.43 atan2f

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/atan2f.html

Gnulib module: atan2f

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:
10.44 atan2l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/atan2l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
• This function is only defined as a macro with arguments on some platforms: MSVC 14.

10.45 atanf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/atanf.html

Gnulib module: atanf

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
• This function is only defined as a macro with arguments on some platforms: MSVC 14.

10.46 atanh

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/atanh.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 9.

10.47 atanhf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/atanhf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, mingw, MSVC 9.
10.48 **atanhl**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/atanhl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 4.4.

10.49 **atanl**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/atanl.html

Gnulib module: atanl

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

10.50 **atexit**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/atexit.html

Gnulib module: atexit

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some old platforms.

10.51 **atof**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/atof.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Android 4.4.
- This function mis-parses strings with leading ‘+’ on some old platforms: Old versions of Linux.
- This function returns a positive value for negative underflow on some platforms: glibc 2.4, Mingw, Cygwin.
• This function fails to do a valid parse of ‘-0x’ on some platforms: glibc 2.4, Cygwin < 1.5.25-11.
• This function fails to parse Infinities and plain NaNs on some platforms: Mingw, OpenBSD 4.0.
• This function fails to parse NaN() on some platforms: Mingw, OpenBSD 4.0, Cygwin < 1.5.25-11.
• This function fails to parse NaN(n-char-sequence) on some platforms: Mingw, OpenBSD 4.0.
• This function fails to parse C99 hexadecimal floating point on some platforms: Mingw, OpenBSD 4.0.
• This function fails to correctly parse very long strings on some platforms: Mingw, Cygwin.

10.52 atoi

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/atoi.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.53 atol

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/atol.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.54 atoll

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/atoll.html

Gnulib module: atoll

Portability problems fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11.23, MSVC 9.

Portability problems not fixed by Gnulib:
10.55 basename

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/basename.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-basename-3.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: IRIX 6.5, mingw, MSVC 14.
- glibc and Android have two different functions basename: the POSIX version and the GNU version.
- basename assumes file names in POSIX syntax; it does not work with file names in Windows syntax.

The Gnulib module basename-lgpl provides similar API, with a function last_component, that also works with Windows file names.

10.56 bind

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/bind.html

Gnulib module: bind

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- On Windows platforms (excluding Cygwin), error codes from this function are not placed in errno, and WSAGetLastError must be used instead.

10.57 bsearch

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/bsearch.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.58 btowc

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/btowc.html

Gnulib module: btowc

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, mingw.
• This function returns WEOF for a NUL argument on some platforms: Cygwin 1.7.2.
• This function does not return WEOF for an EOF argument on some platforms: IRIX 6.5.
• In the C or POSIX locales, this function is not consistent with GnuLib’s \texttt{mbtowc} and can return \texttt{WEOF}: glibc 2.35, MirOS BSD #10.
• In the C or POSIX locales, this function is not consistent with \texttt{mbtowc} on some platforms: mingw.

Portability problems not fixed by GnuLib:
• On Windows and 32-bit AIX platforms, \texttt{wchar_t} is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the GnuLib function \texttt{btoc32}, provided by GnuLib module \texttt{btoc32}, operates on 32-bit wide characters and therefore does not have this limitation.

10.59 \texttt{c8rtomb}

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:
• This function is missing on most platforms: glibc 2.29, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.60 \texttt{c16rtomb}

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:
• This function is missing on most non-glibc platforms: glibc 2.15, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 9, Android 4.4.

10.61 \texttt{c32rtomb}

GnuLib module: \texttt{c32rtomb}

Portability problems fixed by GnuLib:

• This function is missing on most non-glibc platforms: glibc 2.15, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 9, Android 4.4.
• This function returns 0 when the first argument is NULL in some locales on some platforms: AIX 7.2.

Portability problems not fixed by GnuLib:
• This function is only defined as an inline function on some platforms: Haiku 2020.
10.62 cabs

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cabs.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Solaris 9.

10.63 cabsf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cabsf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 9, mingw, MSVC 9.

10.64 cabsl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cabsl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 5.1.

10.65 cacos

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cacos.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.
10.66 cacosf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cacosf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

10.67 cacosh

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cacosh.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

10.68 cacoshf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cacoshf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

10.69 cacoshl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cacoshl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 11.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.
10.70 cacosl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cacosl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 11.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

10.71 calloc

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/calloc.html

Gnulib module: calloc-posix

Portability problems fixed by Gnulib:

• Upon failure, the function does not set errno to ENOMEM on some platforms: mingw, MSVC 14.

• On some platforms, calloc (n, s) can succeed even if multiplying n by s would exceed PTRDIFF_MAX or SIZE_MAX. Although failing to check for exceeding PTRDIFF_MAX is arguably allowed by POSIX it can lead to undefined behavior later, so calloc-posix does not allow going over the limit.

Extension: Gnulib provides a module ‘calloc-gnu’ that substitutes a calloc implementation that behaves more like the glibc implementation. It fixes this portability problem:

• calloc (0, s) and calloc (n, 0) return NULL on success on some platforms: AIX 7.2.

10.72 call_once

Documentation:

Gnulib module: call_once

Portability problems fixed by Gnulib:

• This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

• This function does not work on some platforms: Haiku.
10.73 canonicalize

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.74 canonicalizef

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.75 canonicalizel

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.76 carg

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/carg.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.
10.77 cargf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cargf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

10.78 cargl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cargl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 5.1.

10.79 casin

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/casin.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

10.80 casinf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/casinf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.
10.81 casinh

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/casinh.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

10.82 casinhf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/casinhf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

10.83 casinhl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/casinhl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 11.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

10.84 casinl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/casinl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 11.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.
10.85 catan

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/catan.html

Gnulib module: —

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

10.86 catanf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/catanf.html

Gnulib module: —

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

10.87 catanh

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/catanh.html

Gnulib module: —

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

10.88 catanhf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/catanhf.html

Gnulib module: —

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.
10.89 catanh1

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/catanhl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 11.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

10.90 catanl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/catanl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 11.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

10.91 catclose

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/catclose.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 7.1.

10.92 catgets

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/catgets.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 7.1.
10.93 catopen

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/catopen.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 7.1.

10.94 cbrt

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cbrt.html

Gnulib module: cbrt

Portability problems fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, MSVC 9.

Portability problems not fixed by Gnulib:

10.95 cbrtf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cbrtf.html

Gnulib module: cbrtf

Portability problems fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9, MSVC 9.
• This function is not declared on some platforms: IRIX 6.5.
• This function returns a wrong value for a minus zero on some platforms: IRIX 6.5.

Portability problems not fixed by Gnulib:

10.96 cbrtl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cbrtl.html

Gnulib module: cbrtl or cbrtl-ieee

Portability problems fixed by either Gnulib module cbrtl or cbrtl-ieee

• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.
• This function is not declared on some platforms: IRIX 6.5.
• This function produces grossly wrong results on some platforms: OpenBSD 5.1/SPARC.

Portability problems fixed by Gnulib module cbrtl-ieee:

• This function returns a positive zero for a minus zero argument on some platforms: IRIX 6.5.
Portability problems not fixed by Gnulib:

**10.97 ccos**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ccos.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

**10.98 ccosf**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ccosf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

**10.99 ccosh**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ccosh.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

**10.100 ccoshf**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ccoshf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.
10.101 ccoshl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ccoshl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

10.102 ccosl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ccosl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

10.103 ceil

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ceil.html

Gnulib module: ceil or ceil-ieee

Portability problems fixed by either Gnulib module ceil or ceil-ieee:

Portability problems fixed by Gnulib module ceil-ieee:

- This function returns a positive zero for an argument between −1 and 0 on some platforms: AIX 7.1.

Portability problems not fixed by Gnulib:

10.104 ceilf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ceilf.html

Gnulib module: ceilf or ceilf-ieee

Portability problems fixed by either Gnulib module ceilf or ceilf-ieee:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.
Portability problems fixed by Gnulib module `ceill-ieee`:
- This function returns a positive zero for an argument between \(-1\) and 0 on some platforms: macOS 10.13, AIX 7.1.

Portability problems not fixed by Gnulib:

10.105 `ceill`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ceill.html

Gnulib module: `ceill` or `ceill-ieee`

Portability problems fixed by either Gnulib module `ceill` or `ceill-ieee`:
- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.
- This function returns a wrong result for small arguments on some platforms: OpenBSD 5.6.

Portability problems fixed by Gnulib module `ceill-ieee`:

Portability problems not fixed by Gnulib:

10.106 `cexp`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cexp.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

10.107 `cexpf`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cexpf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.
10.108  cexpl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cexpl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

10.109  cfgetispeed

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cfgetispeed.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.

10.110  cfgetospeed

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cfgetospeed.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.

10.111  cfsetispeed

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cfsetispeed.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
10.112 cfsetospeed

 POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cfsetospeed.html

 GnuLib module: —

 Portability problems fixed by GnuLib:

 Portability problems not fixed by GnuLib:

 • This function is missing on some platforms: mingw, MSVC 14, Android 4.4.

10.113 chdir

 POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/chdir.html

 GnuLib module: chdir

 Portability problems fixed by GnuLib:

 Portability problems not fixed by GnuLib:

 • This function is declared in different header files (namely, <io.h> or <direct.h>) on some platforms: mingw, MSVC 14.

10.114 chmod

 POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/chmod.html

 GnuLib module: chmod

 Portability problems fixed by GnuLib:

 • This function does not fail when the file name argument ends in a slash and (without the slash) names a non-directory, on some platforms: AIX 7.2, IRIX 6.5.

 • This function fails with a wrong error code (EINVAL instead of ENOTDIR) when the file name argument ends in a slash and (without the slash) names a non-directory, on some platforms: mingw, MSVC.

 Portability problems not fixed by GnuLib:

10.115 chown

 POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/chown.html

 GnuLib module: chown

 Portability problems fixed by GnuLib:

 • Some platforms fail to detect trailing slash on non-directories, as in chown("link-to-file/",uid,gid): FreeBSD 7.2, AIX 7.1, Solaris 9.

 • Some platforms fail to update the change time when at least one argument was not −1, but no ownership changes resulted: OpenBSD 6.7.

 • When passed an argument of −1, some implementations really set the owner user/group id of the file to this value, rather than leaving that id of the file alone.
• When applied to a symbolic link, some implementations don’t dereference the symlink, i.e. they behave like `lchown`.
• This function is missing on some platforms; however, the replacement always fails with `ENOSYS`: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

10.116 cimag

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cimag.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

10.117 cimagf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cimagf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

10.118 cimagl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cimagl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 5.1.
10.119  clearerr

   POSIX specification:
   https://pubs.opengroup.org/onlinepubs/9699919799/functions/clearerr.html
   GnuLib module: —
   Portability problems fixed by GnuLib:
   Portability problems not fixed by GnuLib:

10.120  clock

   POSIX specification:
   https://pubs.opengroup.org/onlinepubs/9699919799/functions/clock.html
   GnuLib module: —
   Portability problems fixed by GnuLib:
   Portability problems not fixed by GnuLib:

10.121  clock_getcpuclockid

   POSIX specification:
   https://pubs.opengroup.org/onlinepubs/9699919799/functions/clock_getcpuclockid.html
   GnuLib module: —
   Portability problems fixed by GnuLib:
   Portability problems not fixed by GnuLib:
   • This function is missing on some platforms: Mac OS X 10.11, FreeBSD 6.0, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14, Android 5.1.

10.122  clock_getres

   POSIX specification:
   https://pubs.opengroup.org/onlinepubs/9699919799/functions/clock_getres.html
   GnuLib module: —
   Portability problems fixed by GnuLib:
   Portability problems not fixed by GnuLib:
   • This function is missing on some platforms: Mac OS X 10.11, Minix 3.1.8, mingw, MSVC 14.
   • On many platforms, this function returns a value other than the clock resolution of clock_gettime, i.e., the minimum distance between differing timestamps. For example, on AIX 7.2 it returns 10 milliseconds even though the clock resolution is 1 microsecond. Conversely, on GNU/Linux it typically returns 1 nanosecond even though the clock resolution may be greater.
The Gnulib module `gettime-res` is a partial substitute; it implements the `CLOCK_REALTIME` functionality of `clock_getres`, and fixes the too-high resolution bug of platforms like AIX 7.2.

10.123 clock_gettime

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/clock_gettime.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Mac OS X 10.11, Minix 3.1.8, mingw, MSVC 14.

The Gnulib modules `gettime` and `timespec_get` are partial substitutes; they implement the `CLOCK_REALTIME` functionality of `clock_gettime`.

10.124 clock_nanosleep

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/clock_nanosleep.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Mac OS X 10.11, FreeBSD 11.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14.

10.125 clock_settime

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/clock_settime.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Mac OS X 10.11, Minix 3.1.8, Cygwin 1.7.9, mingw, MSVC 14.
10.126 clog

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/clog.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 11.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 7.1.

10.127 clogf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/clogf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 11.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 7.1.

10.128 clogl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/clogl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 11.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

10.129 close

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/close.html

Gnulib module: close

Portability problems fixed by Gnulib:

• This function is declared in a different header file (namely, <io.h>) on some platforms: MSVC 14.
• This function crashes when invoked with invalid arguments on some platforms: MSVC 14.
- On Windows platforms (excluding Cygwin), `socket` and `accept` do not return file descriptors that can be closed by `close`. Instead, `closesocket` must be used.

Portability problems not fixed by Gnulib:

### 10.130 `closedir`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/closedir.html

Gnulib module: `closedir`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

### 10.131 `closelog`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/closelog.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.132 `cnd_broadcast`

Documentation:

Gnulib module: `cnd`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.133 `cnd_destroy`

Documentation:

Gnulib module: `cnd`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:
10.134 cnd_init

Documentation:

Gnulib module: cnd
Portability problems fixed by Gnulib:
- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

10.135 cnd_signal

Documentation:

Gnulib module: cnd
Portability problems fixed by Gnulib:
- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

10.136 cnd_timedwait

Documentation:

Gnulib module: cnd
Portability problems fixed by Gnulib:
- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

10.137 cnd_wait

Documentation:

Gnulib module: cnd
Portability problems fixed by Gnulib:
- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
Portability problems not fixed by Gnulib:

10.138 **confstr**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/confstr.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

10.139 **conj**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/conj.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

10.140 **conjf**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/conjf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

10.141 **conjl**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/conjl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 5.1.
10.142 connect
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/connect.html
Gnulib module: connect
Portability problems fixed by Gnulib:
- On Windows platforms (excluding Cygwin), error codes from this function are not placed in errno, and WSAGetLastError must be used instead.

Portability problems not fixed by Gnulib:

10.143 copysign
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/copysign.html
Gnulib module: copysign
Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, MSVC 9.

Portability problems not fixed by Gnulib:

10.144 copysignf
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/copysignf.html
Gnulib module: copysignf
Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, older IRIX 6.5, Solaris 9, MSVC 9.
- This function is not declared on some platforms: IRIX 6.5.

Portability problems not fixed by Gnulib:

10.145 copysignl
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/copysignl.html
Gnulib module: copysignl
Portability problems fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.

Portability problems not fixed by Gnulib:
10.146 cos

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cos.html

Gnulib module: cos

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.147 cosf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cosf.html

Gnulib module: cosf

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

10.148 cosh

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cosh.html

Gnulib module: cosh

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.149 coshf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/coshf.html

Gnulib module: coshf

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:
10.150 coshl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/coshl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
• This function is only defined as a macro with arguments on some platforms: MSVC 14.

10.151 cosl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cosl.html

Gnulib module: cosl

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
• This function is only defined as a macro with arguments on some platforms: MSVC 14.

10.152 cpow

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cpow.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 11.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 7.1.

10.153 cpowf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cpowf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 11.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 7.1.
10.154 cpowl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cpowl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 11.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

10.155 cproj

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cproj.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

• The glibc implementation is or was broken.

10.156 cprojf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cprojf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

• The glibc implementation is or was broken.

10.157 cprojl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cprojl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 5.1.

• The glibc implementation is or was broken.
10.158 creal

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/creal.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

10.159 crealf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/crealf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

10.160 creall

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/creall.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 5.1.

10.161 creat

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/creat.html

Gnulib module: creat

Portability problems fixed by Gnulib:

- This function does not support modes with execution bits (such as 0700) on some platforms: MSVC 14.
- On platforms where off_t is a 32-bit type, creat may not work correctly with files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.
• This function does not fail when the file name argument ends in a slash and (without
the slash) names a nonexistent file, on some platforms: FreeBSD 7.2, AIX 7.1, HP-UX

Portability problems not fixed by Gnulib:
• On Windows, this function returns a file handle in O_TEXT mode. If you need a file
handle in O_BINARY mode, you need to use the function open instead.

10.162 crypt

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/crypt.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: glibc 2.34, FreeBSD 6.0, NetBSD 5.0,
Cygwin 2.9, mingw, MSVC 14, Android 9.0.
• This function is not declared in <unistd.h> (without -D_GNU_SOURCE) on some plat-
forms: glibc (at least 2.11–2.13).

10.163 csin

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/csin.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8,
Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

10.164 csinf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/csinf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8,
Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.
10.165 csinh

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/csinh.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

10.166 csinhf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/csinhf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

10.167 csinhl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/csinhl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

10.168 csinl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/csinl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.
10.169 csqrt

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/csqrt.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

10.170 csqrtf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/csqrtf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

10.171 csqrtl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/csqrtl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 5.1.

10.172 ctan

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctan.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.
10.173 \texttt{ctanf}

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctanf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

10.174 \texttt{ctanh}

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctanh.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

10.175 \texttt{ctanhf}

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctanhf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

10.176 \texttt{ctanhl}

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctanhl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.
10.177 ctanl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctanl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

10.178 ctermid

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctermid.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

10.179 ctime

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctime.html

Gnulib module: ctime

Portability problems fixed by Gnulib:

• On native Windows platforms (mingw, MSVC), this function works incorrectly when the environment variable TZ has been set by Cygwin.

Portability problems not fixed by Gnulib:

• This function is deprecated in C23. Portable applications can use localtime_r and strftime (or even sprintf) instead.
• This function may overflow its internal buffer if an invalid year is passed.
• The ctime function need not be reentrant, and consequently is not required to be thread safe. Implementations of ctime typically write the timestamp into static buffer. If two threads call ctime at roughly the same time, you might end up with the wrong date in one of the threads, or some undefined string. There is a reentrant interface ctime_r.
• Native Windows platforms (mingw, MSVC) support only a subset of time zones supported by GNU or specified by POSIX. See Section 10.1192 [tzset], page 443.

A more flexible function is strftime. However, note that it is locale dependent.
10.180 ctime_r

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctime_r.html

Future POSIX removal:
https://www.austingroupbugs.net/view.php?id=1410

Gnulib module: extensions
Portability problems fixed by Gnulib:
• This function has an incompatible declaration on some platforms: Solaris 11.4 (when
_POSIX_PTHREAD_SEMANTICS is not defined).

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.
• This function may put more than 26 bytes into the argument buffer if an invalid year
   is passed.

ctime_r takes a pre-allocated buffer and length of the buffer, and returns NULL on errors. The
input buffer should be at least 26 bytes in size. The output string is locale-independent. However,
years can have more than 4 digits if time_t is sufficiently wide, so the length of
the required output buffer is not easy to determine. Increasing the buffer size when ctime_r
returns NULL is not necessarily sufficient. The NULL return value could mean some other
error condition, which will not go away by increasing the buffer size.

A more flexible function is strftime. However, note that it is locale dependent.

10.181 daddl

Documentation:

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD
  13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris
  11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.182 daylight

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/daylight.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This variable is missing on some platforms: FreeBSD 13.0, OpenBSD 3.8, IRIX 6.5.
• The address of this variable is not a compile-time constant on some platforms: Cygwin,
  mingw.
Native Windows platforms (mingw, MSVC) support only a subset of time zones supported by GNU or specified by POSIX. See Section 10.1192 [tzset], page 443.

A more portable way of getting the UTC offset is to use `strftime` with the `%z` format. See Section 10.1082 [strftime], page 409.

10.183 dbm_clearerr

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm_clearerr.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: glibc 2.3.6, HP-UX 11.11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.184 dbm_close

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm_close.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: glibc 2.3.6, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.185 dbm_delete

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm_delete.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: glibc 2.3.6, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.186 dbm_error

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm_error.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: glibc 2.3.6, HP-UX 11.11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.187 dbm_fetch

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm_fetch.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.188 dbm_firstkey

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm_firstkey.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.189 dbm_nextkey

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm_nextkey.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.190 dbm_open

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm_open.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.191 dbm_store

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm_store.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: glibc 2.3.6, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.192 ddivl

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.193 difftime

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/difftime.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.194 dirfd

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/dirfd.html

Gnulib module: dirfd

Portability problems fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, AIX 7.1, HP-UX 11, Solaris 10, mingw, MSVC 14.

Portability problems not fixed by Gnulib:
• This function always fails on some platforms: mingw.
• There is a dirfd macro but no function, and the macro does not work with an argument of type void *, as a function would: NetBSD 9.2.
10.195 dirname

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/dirname.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: IRIX 6.5, mingw, MSVC 14.
- dirname assumes file names in POSIX syntax; it does not work with file names in Windows syntax.

The Gnulib module dirname provides similar API, with functions dir_name and mdir_name, that also works with Windows file names.

10.196 div

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/div.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.197 dlclose

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/dlclose.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.198 dlerror

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/dlerror.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
10.199 dlopen

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/dlopen.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dlopen-1.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- If the file name argument is not absolute, the file is searched for. The search algorithm is system specific.

10.200 dlsym

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/dlsym.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dlsym-1.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- The visibility of symbols loaded in dependent shared libraries or present in the main executable is system dependent.

10.201 dmull

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.202 dprintf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/dprintf.html

Gnulib module: dprintf or dprintf-posix or dprintf-gnu

Portability problems fixed by either Gnulib module dprintf or dprintf-posix or dprintf-gnu:

- This function is missing on many non-glibc platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.5.x, mingw, MSVC 14.

Portability problems fixed by either Gnulib module dprintf-posix or dprintf-gnu:

- This function does not support size specifiers as in C23 (w8, w16, w32, w64, wf8, wf16, wf32, wf64) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, Solaris 11.4, Cygwin 2.9.0.
- printf "%f", "%e", "%g" of Infinity and NaN yields an incorrect result on some platforms: Solaris 11.4.
- This function does not support the ‘a’ and ‘A’ directives on some platforms: glibc-2.3.6, Solaris 11.4.
- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, Solaris 11.4, Cygwin 2.9.0.
- This function does not support the ‘n’ directive on some platforms: glibc when used with _FORTIFY_SOURCE >= 2 (set by default on Ubuntu), macOS 11.1.
- This function does not support precisions in the ‘ls’ directive correctly on some platforms: Solaris 11.4.
- printf "%10f" of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Solaris 11.4.
- This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: AIX 7.1.
- This function produces wrong output for the ‘lc’ directive with a NUL wide character argument on some platforms: glibc 2.35, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems not fixed by Gnulib:

- The %n directive is not portable, use %s mapped to an argument of strerror(errno) (or a version of strerror_r) instead.
- Formatting noncanonical ‘long double’ numbers produces nonmeaningful results on some platforms: glibc and others, on x86, x86_64, IA-64 CPUs.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.
• On some platforms, this function does not set \texttt{errno} or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

10.203 \textbf{drand48}

\textbf{POSIX specification:}  
\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/drand48.html}

\begin{itemize}
  \item Gnulib module: —
  \item Portability problems fixed by Gnulib:
  \item Portability problems not fixed by Gnulib:
\end{itemize}

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.204 \textbf{dsubl}

\textbf{Documentation:}  
\url{https://www.gnu.org/software/libc/manual/html_node/Misc-FP-Arithmetic.html}

\begin{itemize}
  \item Gnulib module: —
  \item Portability problems fixed by Gnulib:
  \item Portability problems not fixed by Gnulib:
\end{itemize}

• This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.205 \textbf{dup}

\textbf{POSIX specification:}  
\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/dup.html}

\begin{itemize}
  \item Gnulib module: dup
  \item Portability problems fixed by Gnulib:
  \item This function is declared in a different header file (namely, \texttt{<io.h>}) on some platforms: MSVC 14.
  \item This function crashes when invoked with invalid arguments on some platforms: MSVC 14.
\end{itemize}

Portability problems not fixed by Gnulib:

10.206 \textbf{dup2}

\textbf{POSIX specification:}  
\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/dup2.html}

\begin{itemize}
  \item Gnulib module: dup2
  \item Portability problems fixed by Gnulib:
  \item This function is declared in a different header file (namely, \texttt{<io.h>}) on some platforms: MSVC 14.
  \item This function always returns 0 for success on some platforms: mingw, MSVC 14.
\end{itemize}
• This function can hang when duplicating an fd to itself on some platforms: mingw, MSVC 14.
• This function crashes when invoked with invalid arguments on some platforms: Cygwin 1.7.17, MSVC 14.
• This function crashes when invoked with valid arguments on some platforms: Cygwin 1.7.25.
• This function fails with EINVAL when duplicating an fd to itself: Android.
• This function resets the FD_CLOEXEC flag when duplicating an fd to itself on some platforms: Haiku.
• This function returns 0 for dup2 (1, 1) on some platforms: Cygwin 1.5.x.
• This function may return -EBADF instead of -1 on some platforms: Linux releases between July 2008 and May 2009 (versions 2.6.27 to 2.6.29).
• This function returns EMFILE instead of EBADF for large targets, which interferes with using dup2(fd,fd)==fd) as the minimal EBADF filter: AIX 7.1, FreeBSD 6.1, Cygwin 1.5.

Portability problems not fixed by Gnulib:

**10.207 duplocale**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/duplocale.html

Gnulib module: duplocale

Portability problems fixed by Gnulib:
• The argument LC_GLOBAL_LOCALE is not supported on some platforms: glibc 2.11, AIX 7.1.
• With the argument LC_GLOBAL_LOCALE, this function returns a wrong result on some platforms: NetBSD 7.1.

Portability problems not fixed by Gnulib:
• This function is missing on many platforms: FreeBSD 9.0, NetBSD 5.0, OpenBSD 6.1, Minix 3.1.8, AIX 6.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.5.x, mingw, MSVC 14, Android 4.4.
• This function is useless because the locale_t type is not defined on some platforms: z/OS.
• With the argument LC_GLOBAL_LOCALE, this function returns a wrong result on some platforms: Haiku.

**10.208 encrypt**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/encrypt.html

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function is not declared in `<unistd.h>` (without `-D_GNU_SOURCE`) on some platforms: glibc (at least 2.11–2.13).

### 10.209 endgrent

POSIX specification:

**https://pubs.opengroup.org/onlinepubs/9699919799/functions/endgrent.html**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

### 10.210 endhostent

POSIX specification:

**https://pubs.opengroup.org/onlinepubs/9699919799/functions/endhostent.html**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 8.1.

### 10.211 endnetent

POSIX specification:

**https://pubs.opengroup.org/onlinepubs/9699919799/functions/endnetent.html**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Cygwin 2.9, mingw, MSVC 14, Android 8.1.

### 10.212 endprotoent

POSIX specification:

**https://pubs.opengroup.org/onlinepubs/9699919799/functions/endprotoent.html**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 8.1.
10.213 endpwent

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/endpwent.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.

10.214 endservent

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/endservent.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.

10.215 endutxent

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/endutxent.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

10.216 environ

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/environ.html

Gnulib module: environ
Portability problems fixed by Gnulib:
• POSIX does not require this variable to be declared, and it is indeed not declared on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 5.0, OpenBSD 3.8, IRIX 6.5, Solaris 11.4.
• On macOS, this variable is not declared. Up to Mac OS X 10.4, one can use
  extern char **environ;
to get the variable declared. This does not work any more, however, in shared libraries on macOS 11.1. Here is a workaround: Instead, one can use
  #include <crt_externs.h>
  #define environ (*_NSGetEnviron())

  This works at all versions of macOS.
• On Cygwin in 64-bit mode, references to this variable cause a link error when the option
\texttt{-Wl,--disable-auto-import} is in use.

Portability problems not fixed by Gnulib:
• The address of this variable is not a compile-time constant on some platforms: mingw.
• Assigning NULL to \texttt{environ} to clear all variables is not portable; better is to assign
\texttt{environ} to one-element array containing a NULL pointer. That said, an empty envi-
rronment is not portable either, as some systems may require particular environment
variables (such as \texttt{PATH}) to be present in order to operate consistently.

10.217 \texttt{erand48}

POSIX specification:
\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/erand48.html}
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.218 \texttt{erf}

POSIX specification:
\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/erf.html}
Gnulib module: erf
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, MSVC 9.

10.219 \texttt{erfc}

POSIX specification:
\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/erfc.html}
Gnulib module: erfc
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, MSVC 9.

10.220 \texttt{erfcf}

POSIX specification:
\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/erfcf.html}
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX
  6.5, Solaris 9, MSVC 9.
10.221 erfcl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/erfcl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 4.4.

10.222 erff

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/erff.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

10.223 erfl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/erfl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 4.4.

10.224 errno

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/errno.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- On Windows, the socket functions don’t set errno; their error code is available through WSAGetLastError() instead.
10.225 execl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/execl.html

Gnulib module: execl

Portability problems fixed by Gnulib:
- On Windows platforms (excluding Cygwin), this function does not pass command-line arguments correctly if they contain space, tab, backslash, or double-quote characters.
- On Windows platforms (excluding Cygwin), this function spawns an asynchronous child process and then exits the current process immediately. As a consequence, the parent of the current process 1. may incorrectly proceed as if its child had exited, and 2. will never see the child’s exit status.
- On Windows platforms (excluding Cygwin), the return type of this function is intptr_t, not int.

Note: The Gnulib replacement for this function is not async-safe, that is, it must not be invoked from a signal handler.

Portability problems not fixed by Gnulib:
- On some platforms, a script without executable permission is still run: Cygwin 1.5.x.

10.226 execle

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/execle.html

Gnulib module: execle

Portability problems fixed by Gnulib:
- On Windows platforms (excluding Cygwin), this function does not pass command-line arguments correctly if they contain space, tab, backslash, or double-quote characters.
- On Windows platforms (excluding Cygwin), this function spawns an asynchronous child process and then exits the current process immediately. As a consequence, the parent of the current process 1. may incorrectly proceed as if its child had exited, and 2. will never see the child’s exit status.
- On Windows platforms (excluding Cygwin), the return type of this function is intptr_t, not int.

Note: The Gnulib replacement for this function is not async-safe, that is, it must not be invoked from a signal handler.

Portability problems not fixed by Gnulib:
- On some platforms, a script without executable permission is still run: Cygwin 1.5.x.

10.227 execlp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/execlp.html

Gnulib module: execlp
Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not pass command-line arguments correctly if they contain space, tab, backslash, or double-quote characters.
- On Windows platforms (excluding Cygwin), this function spawns an asynchronous child process and then exits the current process immediately. As a consequence, the parent of the current process 1. may incorrectly proceed as if its child had exited, and 2. will never see the child’s exit status.
- On Windows platforms (excluding Cygwin), the return type of this function is `intptr_t`, not `int`.

Portability problems not fixed by Gnulib:

- On some platforms, a script without executable permission is still run: Cygwin 1.5.x.

10.228 `execv`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/execv.html

Gnulib module: execv

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not pass command-line arguments correctly if they contain space, tab, backslash, or double-quote characters.
- On Windows platforms (excluding Cygwin), this function spawns an asynchronous child process and then exits the current process immediately. As a consequence, the parent of the current process 1. may incorrectly proceed as if its child had exited, and 2. will never see the child’s exit status.
- On Windows platforms (excluding Cygwin), the return type of this function is `intptr_t`, not `int`.

Note: The Gnulib replacement for this function is not async-safe, that is, it must not be invoked from a signal handler.

Portability problems not fixed by Gnulib:

- On some platforms, a script without executable permission is still run: Cygwin 1.5.x.

10.229 `execve`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/execve.html

Gnulib module: execve

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not pass command-line arguments correctly if they contain space, tab, backslash, or double-quote characters.
- On Windows platforms (excluding Cygwin), this function spawns an asynchronous child process and then exits the current process immediately. As a consequence, the parent of the current process 1. may incorrectly proceed as if its child had exited, and 2. will never see the child’s exit status.
• On Windows platforms (excluding Cygwin), the return type of this function is `intptr_t`, not `int`.

Note: The GnuLib replacement for this function is not async-safe, that is, it must not be invoked from a signal handler.

Portability problems not fixed by GnuLib:
• On some platforms, a script without executable permission is still run: Cygwin 1.5.x.

10.230 execvp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/execvp.html

GnuLib module: execvp

Portability problems fixed by GnuLib:
• On Windows platforms (excluding Cygwin), this function does not pass command-line arguments correctly if they contain space, tab, backslash, or double-quote characters.
• On Windows platforms (excluding Cygwin), this function spawns an asynchronous child process and then exits the current process immediately. As a consequence, the parent of the current process 1. may incorrectly proceed as if its child had exited, and 2. will never see the child’s exit status.
• On Windows platforms (excluding Cygwin), the return type of this function is `intptr_t`, not `int`.

Portability problems not fixed by GnuLib:
• On some platforms, a script without executable permission is still run: Cygwin 1.5.x.

10.231 exit

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/exit.html

GnuLib module: stdlib

Portability problems fixed by GnuLib:
• Some problems with the macros `EXIT_SUCCESS` and `EXIT_FAILURE`, see Section 9.52 [stdlib.h], page 71.

Portability problems not fixed by GnuLib:

10.232 exp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/exp.html

GnuLib module: exp

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:
Chapter 10: ISO C and POSIX Function Substitutes

10.233 exp2

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/exp2.html

Gnulib module: exp2

Portability problems fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, older IRIX 6.5, Solaris 9, MSVC 9.
• This function is not declared on some platforms: IRIX 6.5.
• This function returns grossly wrong results on some platforms: OpenBSD 4.9.

Portability problems not fixed by Gnulib:

10.234 exp2f

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/exp2f.html

Gnulib module: exp2f

Portability problems fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, MSVC 9.
• This function is not declared on some platforms: IRIX 6.5.

Portability problems not fixed by Gnulib:

10.235 exp2l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/exp2l.html

Gnulib module: exp2l or exp2l-ieee

Portability problems fixed by either Gnulib module exp2l or exp2l-ieee:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.
• This function is not declared on some platforms: IRIX 6.5.
• This function produces results which are accurate to only 16 digits on some platforms: NetBSD 9.0.

Portability problems fixed by Gnulib module exp2l-ieee:
• This function returns a wrong value for a NaN argument on some platforms: OpenBSD 4.9.
• This function returns a wrong value for a negative infinity argument on some platforms: IRIX 6.5.

Portability problems not fixed by Gnulib:
10.236  expf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/expf.html

Gnulib module: expf

Portability problems fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
• This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

10.237  expl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/expl.html

Gnulib module: expl

Portability problems fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
• This function returns 0.0 for all arguments on some platforms: Haiku 2017.
• This function returns NaN for small operands on some platforms: OpenBSD 5.4.
• This function is only defined as a macro with arguments on some platforms: MSVC 14.
• This function produces results which are accurate to only 16 digits on some platforms: musl libc 1.2.2/arm64, musl libc 1.2.2/s390x, NetBSD 9.0.

Portability problems not fixed by Gnulib:

10.238  expm1

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/expm1.html

Gnulib module: expm1 or expm1-ieee

Portability problems fixed by either Gnulib module expm1 or expm1-ieee:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 9.

Portability problems fixed by Gnulib module expm1-ieee:
• This function has problems when the argument is minus zero on some platforms: AIX 7.1.

Portability problems not fixed by Gnulib:
10.239 expm1f

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/expm1f.html

Gnulib module: expm1f or expm1f-ieee

Portability problems fixed by either Gnulib module expm1f or expm1f-ieee:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 9, mingw, MSVC 9.
- This function produces wrong results for arguments \( \leq -17.32868 \) on some platforms: IRIX 6.5.

Portability problems fixed by Gnulib module expm1f-ieee:

- This function returns a positive zero for a minus zero argument on some platforms: AIX 7.2.

Portability problems not fixed by Gnulib:

10.240 expm1l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/expm1l.html

Gnulib module: expm1l

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 4.4.
- This function is not declared on some platforms: IRIX 6.5.
- This function produces results which are accurate to only 16 digits on some platforms: musl libc 1.2.2/arm64, musl libc 1.2.2/s390x, Mac OS X 10.5, NetBSD 8.0.

Portability problems not fixed by Gnulib:

10.241 fabs

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fabs.html

Gnulib module: fabs

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.242 fabsf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fabsf.html

Gnulib module: fabsf

Portability problems fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, Solaris 9.
• This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

10.243 fabsl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fabsl.html

Gnulib module: fabsl

Portability problems fixed by Gnulib:
• This function is missing on some platforms: NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x.
• This function is only defined as a macro with arguments on some platforms: MSVC 14.
• This function returns a minus zero for a minus zero argument on some platforms: IRIX 6.5 with gcc 4.2.4.

Portability problems not fixed by Gnulib:

10.244 faccessat

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/faccessat.html

Gnulib module: faccessat

Portability problems fixed by Gnulib:
• This function is missing on some platforms: glibc 2.3.6, macOS 10.12, FreeBSD 7.4, NetBSD 6.1.5, OpenBSD 4.9, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.
• On some platforms, faccessat (dfd, "file/", amode, flag) succeeds instead of failing when file is not a directory: macOS 11.1.

Portability problems not fixed by Gnulib:
• The replacement does not always take ACLs into account.
• The replacement is not safe to be used in libraries.
• The replacement is not multithread-safe.
• The replacement does not support the AT_SYMLINK_NOFOLLOW flag, which is supported by GNU faccessat.
• On some platforms, faccessat can mishandle AT_EACCESS after a process starts as root and then becomes non-root: GNU/Linux with glibc 2.32.

Other problems of this function:
• There is an inherent race between calling this function and performing some action based on the results; you should think twice before trusting this function, especially in a set-uid or set-gid program.
10.245 fadd

Documentation: 

Gnulib module: — 

Portability problems fixed by Gnulib: 

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.246 faddl

Documentation: 

Gnulib module: — 

Portability problems fixed by Gnulib: 

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.247 fattach

POSIX specification: 
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fattach.html

Gnulib module: — 

Portability problems fixed by Gnulib: 

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.248 fchdir

POSIX specification: 
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fchdir.html

Gnulib module: fchdir 

Portability problems fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14. But the replacement function is not safe to be used in libraries and is not multithread-safe.

Portability problems not fixed by Gnulib:
10.249 fchmod

POSIX specification: https://pubs.opengroup.org/onlinepubs/9699919799/functions/fchmod.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.

10.250 fchmodat

POSIX specification: https://pubs.opengroup.org/onlinepubs/9699919799/functions/fchmodat.html

Gnulib module: fchmodat

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14. But the replacement function is not safe to be used in libraries and is not multithread-safe.
- This function does not fail when the file name argument ends in a slash and (without the slash) names a non-directory, on some platforms: AIX 7.2.
- When given the AT_SYMLINK_NOFOLLOW flag, this function fails with errno set to ENOTSUP, even when the file is not a symbolic link: GNU/Linux with glibc 2.31, Cygwin 2.9.

Portability problems not fixed by Gnulib:
- Some platforms do not allow changing the access bits on symbolic links.
- If the AT_SYMLINK_NOFOLLOW flag is specified, this function can fail with errno set to EMFILE or ENFILE, and it fails with errno set to EOPNOTSUPP if the /proc file system is not mounted: GNU/Linux with glibc 2.34.

10.251 fchown

POSIX specification: https://pubs.opengroup.org/onlinepubs/9699919799/functions/fchown.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.


10.252  fchownat

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fchownat.html

Gnulib module: fchownat

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14. But the replacement function is not safe to be used in libraries and is not multithread-safe. Also, the replacement may fail to change symlinks if lchown is unsupported, or fail altogether if chown is unsupported.
- This function is declared in <sys/stat.h>, not in <unistd.h>, on some platforms: Android 4.3.
- Some platforms fail to detect trailing slash on non-directories, as in fchown(dir,"link-to-file/",uid,gid,flag): Solaris 9.
- Some platforms mistakenly dereference symlinks when using AT_SYMLINK_NOFOLLOW: Linux kernel 2.6.17.
- This function does not fail for an empty filename on some platforms: Linux with glibc < 2.11.

Portability problems not fixed by Gnulib:

10.253  fclose

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fclose.html

Gnulib module: fclose

Portability problems fixed by Gnulib:

- On some platforms, this function fails to set the file position of a seekable input stream to the byte after the last one actually read: glibc 2.34, FreeBSD, AIX 7.2.
- This function crashes if the stream’s file descriptor has already been closed on some platforms: MSVC 14.
- On Windows platforms (excluding Cygwin), socket and accept followed by fdopen do not return streams that can be closed by fclose.

Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not set errno upon failure.

10.254  fcntl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fcntl.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fcntl-3.html
Chapter 10: ISO C and POSIX Function Substitutes

Gnulib module: fcntl

Portability problems fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14.

• This function does not support F_DUPFD_CLOEXEC on some platforms: glibc with Linux kernels before 2.6.24, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, AIX 7.1, HP-UX 11, IRIX 6.5, Solaris 11 2010-11, Cygwin 1.7.1. Note that the gnulib replacement code is functional but not atomic.

• The F_DUPFD_CLOEXEC action of this function does not set the FD_CLOEXEC flag on some platforms: NetBSD 9.0.

• The F_DUPFD_CLOEXEC action of this function sets the FD_CLOEXEC flag on the wrong file descriptor on some platforms: Haiku.

• The F_DUPFD action of this function does not reject out-of-range targets properly on some platforms: AIX 7.1, Cygwin 1.5.x, Haiku.

• The F_DUPFD action of this function mistakenly clears FD_CLOEXEC on the source descriptor on some platforms: Haiku.

Portability problems not fixed by Gnulib:

• The replacement function does not support F_SETFD, F_GETFL, F_SETFL, F_GETOWN, F_SETOWN, F_GETLK, F_SETLK, and F_SETLKW on some platforms: mingw, MSVC 14.

• When a file does not support locking (such as on an NFS file system that does not support file locking), calls with F_SETLK and F_SETLKW fail with errno set to different values on different systems: EINVAL on OpenIndiana (as suggested by the POSIX 1003.1-2017 fcnt1 specification), ENOLCK on GNU/Linux, and EOPNOTSUPP on FreeBSD.

10.255 fdatasync

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fdatasync.html

Gnulib module: fdatasync

Portability problems fixed by Gnulib:

• This function is present but not declared on some platforms: Mac OS X 10.7.

• This function is missing on some platforms: Mac OS X 10.5, FreeBSD 11.0, OpenBSD 3.8, Minix 3.1.8, mingw, MSVC 14, Android 2.2.

Portability problems not fixed by Gnulib:

10.256 fdetach

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fdetach.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.257 fdim

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fdim.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.

10.258 fdimf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fdimf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

10.259 fdiml

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fdiml.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.

10.260 fdiv

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.261 fdivl

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.262 fdopen

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fdopen.html

Gnulib module: fdopen

Portability problems fixed by Gnulib:

- This function crashes when invoked with invalid arguments on some platforms: MSVC 14.

- On Windows platforms (excluding Cygwin), this function does not set \texttt{errno} upon failure.

Portability problems not fixed by Gnulib:

10.263 fdopendir

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fdopendir.html

Gnulib module: fdopendir

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14. But the replacement function is not safe to be used in libraries and is not multithread-safe. Also, the replacement does not guarantee that 'dirfd(fdopendir(n))']==n' (dirfd might fail, or return a different file descriptor than n).

- This function exists but is not declared on some platforms: FreeBSD 7.3.

- This function does not reject non-directory file descriptors on some platforms: GNU/Hurd.

- This function mistakenly closes non-directory file descriptors on some platforms: FreeBSD 8.1.

Portability problems not fixed by Gnulib:
10.264 feclearexcept

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/feclearexcept.html

Gnulib module: —
Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9, Android 4.4.

10.265 fegetenv

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fegetenv.html

Gnulib module: —
Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9, Android 4.4.

10.266 fegetexceptflag

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fegetexceptflag.html

Gnulib module: —
Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9, Android 4.4.

10.267 fegetmode

Documentation:

Gnulib module: —
Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.268 fegetround

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fegetround.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9, Android 4.4.

10.269 feholdexcept

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/feholdexcept.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9, Android 4.4.

10.270 feof

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/feof.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.271 feraiseexcept

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/feraiseexcept.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 14, Android 4.4.
10.272 ferror

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ferror.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.273 fesetenv

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fesetenv.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9, Android 4.4.

10.274 fesetexcept

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.275 fesetexceptflag

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fesetexceptflag.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9, Android 4.4.
10.276 fesetmode

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.277 fesetround

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fesetround.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9, Android 4.4.

10.278 fetestexcept

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fetestexcept.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9, Android 4.4.

10.279 fetestexceptflag

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.280 feupdateenv

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/feupdateenv.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 14, Android 4.4.

10.281 fexecve

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fexecve.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11 2010-11, Cygwin 1.5.x, mingw, MSVC 14, Android 8.1.

10.282 fflush

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fflush.html

Gnulib module: fflush

Portability problems fixed by Gnulib:

• fflush followed by fseek or fseeko, applied to an input stream, should have the effect of positioning the underlying file descriptor. It doesn’t do this on some platforms: glibc 2.34, FreeBSD 13.0, and others.

• fflush on an input stream changes the position of the stream to the end of the previous buffer, on some platforms: mingw, MSVC 14.

• fflush on an input stream right after ungetc does not discard the ungetc buffer, on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Cygwin 1.5.25-10.

Portability problems not fixed by Gnulib:

• fflush, ftell, ftello, fgetpos behave incorrectly on input streams that are opened in O_TEXT mode and whose contents contains Unix line terminators (LF), on some platforms: mingw, MSVC 14.

• On Windows platforms (excluding Cygwin), this function does not set errno upon failure.

• This function crashes if the stream’s file descriptor has already been closed, if MSVC_INVALID_PARAMETER_HANDLING is HAIRY_LIBRARY_HANDLING or SANE_LIBRARY_HANDLING, on some platforms: MSVC 14.
• `fflush` on an input stream right after `ungetc` does not discard the `ungetc` buffer, on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11 2010-11, mingw, MSVC 14.

10.283 **ffs**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ffs.html

Gnulib module: ffs

Portability problems fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
• This function is only defined as an inline function on some platforms: Android 13.

10.284 **fgetc**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fgetc.html

Gnulib module: stdio, nonblocking

Portability problems fixed by Gnulib module stdio, together with module nonblocking:
• When reading from a non-blocking pipe whose buffer is empty, this function fails with `errno` being set to `EINVAL` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
• C99 and POSIX.1-2001 and later require end-of-file to be sticky, that is, they require this function to act as if it reads end-of-file if `feof` would return nonzero. However, on some systems this function attempts to read from the underlying file descriptor even if the stream's end-of-file indicator is set. These systems include glibc and default Solaris.
• On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
• This function crashes if the stream's file descriptor has already been closed, if `MSVC_INVALID_PARAMETER_HANDLING` is `HAIRY_LIBRARY_HANDLING` or `SANE_LIBRARY_HANDLING`, on some platforms: MSVC 14.

10.285 **fgetpos**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fgetpos.html

Gnulib module: —

Portability problems not fixed by Gnulib:
• On platforms where `off_t` is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:
• `fflush`, `ftell`, `ftello`, `fgetpos` behave incorrectly on input streams that are opened in `O_TEXT` mode and whose contents contains Unix line terminators (LF), on some platforms: mingw, MSVC 14.
• This function mistakenly succeeds on pipes on some platforms: mingw 10.
10.286 fgets

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fgets.html

Gnulib module: stdio, nonblocking

Portability problems fixed by Gnulib module stdio, together with module nonblocking:
- When reading from a non-blocking pipe whose buffer is empty, this function fails with 
  `errno` being set to `EINVAL` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
- C99 and POSIX.1-2001 and later require end-of-file to be sticky, that is, they require this function to act as if it reads end-of-file if `feof` would return nonzero. However, on some systems this function attempts to read from the underlying file descriptor even if the stream’s end-of-file indicator is set. These systems include glibc and default Solaris.
- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.

10.287 fgetwc

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fgetwc.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.288 fgetws

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fgetws.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.289 fileno

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fileno.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
10.290 flockfile

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/flockfile.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.291 floor

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/floor.html
Gnulib module: floor or floor-ieee
Portability problems fixed by either Gnulib module floor or floor-ieee:
Portability problems fixed by Gnulib module floor-ieee:
Portability problems not fixed by Gnulib:

10.292 floorf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/floorf.html
Gnulib module: floorf or floorf-ieee
Portability problems fixed by either Gnulib module floorf or floorf-ieee:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 9.
• This function is only defined as a macro with arguments on some platforms: MSVC 14.
Portability problems fixed by Gnulib module floorf-ieee:
Portability problems not fixed by Gnulib:

10.293 floorl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/floorl.html
Gnulib module: floorl or floorl-ieee
Portability problems fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x.
• This function is only defined as a macro with arguments on some platforms: MSVC 14.
Portability problems not fixed by Gnulib:
10.294 fma

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fma.html

Gnulib module: fma

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.
- This function produces wrong results on some platforms: glibc 2.11, Mac OS X 10.5, FreeBSD 6.4/x86, NetBSD 8.0, Cygwin 1.5, mingw.

Portability problems not fixed by Gnulib:

10.295 fmaf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmaf.html

Gnulib module: fmaf

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.
- This function produces wrong results on some platforms: glibc 2.11, Mac OS X 10.5, FreeBSD 6.4/x86, FreeBSD 12.2/arm, Cygwin 1.5, mingw.

Portability problems not fixed by Gnulib:

- This function produces wrong results on some platforms: musl libc/powerpc64le when emulated by QEMU 5.0.0.

10.296 fmal

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmal.html

Gnulib module: fmal

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.
- This function produces wrong results on some platforms: glibc 2.17, macOS 10.13, FreeBSD 6.4/x86, mingw.

Portability problems not fixed by Gnulib:
10.297 `fmax`

 POSIX specification:
 https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmax.html

 Gnulib module: —

 Portability problems fixed by Gnulib:

 Portability problems not fixed by Gnulib:

 • This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.

10.298 `fmaxf`

 POSIX specification:
 https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmaxf.html

 Gnulib module: —

 Portability problems fixed by Gnulib:

 Portability problems not fixed by Gnulib:

 • This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

10.299 `fmaxl`

 POSIX specification:
 https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmaxl.html

 Gnulib module: —

 Portability problems fixed by Gnulib:

 Portability problems not fixed by Gnulib:

 • This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.

10.300 `fmaxmag`

 Documentation:

 Gnulib module: —

 Portability problems fixed by Gnulib:

 Portability problems not fixed by Gnulib:

 • This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.301 fmaxmagf

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.302 fmaxmagl

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.303 fmemopen

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmemopen.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.5.x, mingw, MSVC 14, Android 5.1.

10.304 fmin

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmin.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.
10.305 fminf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fminf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

10.306 fminl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fminl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.

10.307 fminmag

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.308 fminmagf

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.309  fminmagl

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.310  fmod

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmod.html

Gnulib module: fmod or fmod-ieee

Portability problems fixed by either Gnulib module fmod or fmod-ieee:

Portability problems fixed by Gnulib module fmod-ieee:

- This function has problems when the first argument is minus zero on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

10.311  fmodf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmodf.html

Gnulib module: fmodf or fmodf-ieee

Portability problems fixed by either Gnulib module fmodf or fmodf-ieee:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems fixed by Gnulib module fmodf-ieee:

- This function has problems when the first argument is minus zero on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

10.312  fmodl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmodl.html

Gnulib module: fmodl or fmodl-ieee

Portability problems fixed by either Gnulib module fmodl or fmodl-ieee:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
• This function is only defined as a macro with arguments on some platforms: MSVC 14.
• This function is not declared and does not work on some platforms: AIX 5.1.

Portability problems fixed by Gnulib module fmodl-ieee:
• This function has problems when the first argument is minus zero on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

10.313 fmtmsg

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmtmsg.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.314 fmul

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.315 fmull

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.316 fnmatch

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fnmatch.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fnmatch-3.html

Gnulib module: fnmatch or fnmatch-gnu

Portability problems fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14.
• This function is broken on some platforms: some versions of glibc, NetBSD 7.1, some versions of Solaris.

Portability problems not fixed by Gnulib:

10.317 fopen

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fopen.html

Gnulib module: fopen or fopen-gnu

Portability problems fixed by either Gnulib module fopen or fopen-gnu:

• This function does not fail when the file name argument ends in a slash and (without the slash) names a nonexistent file or a file that is not a directory, on some platforms: HP-UX 11.00, AIX 7.1, Solaris 9.
• On platforms where off_t is a 32-bit type, fopen may not work correctly with files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.
• On Windows platforms (excluding Cygwin), this function does usually not recognize the /dev/null filename.

Portability problems fixed by Gnulib module fopen-gnu:

• This function does not support the mode character ‘x’ (corresponding to O_EXCL), introduced in ISO C11, on some platforms: FreeBSD 8.2, NetBSD 6.1, OpenBSD 5.6, Minix 3.2, AIX 6.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 1.7.16 (2012), mingw, MSVC 14.
• This function does not support the mode character ‘e’ (corresponding to O_CLOEXEC), introduced into a future POSIX revision through https://www.austingroupbugs.net/view.php?id=411, on some platforms: glibc 2.6, macOS 11.1, FreeBSD 9.0, NetBSD 5.1, OpenBSD 5.6, Minix 3.2, AIX 7.2, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 1.7.16 (2012), mingw, MSVC 14.

Portability problems not fixed by Gnulib:

• On Windows platforms (excluding Cygwin), this function does not set errno upon failure.
• On Windows, this function returns a file stream in “text” mode by default; this means that it translates ‘\n’ to CR/LF by default. Use the "b" flag if you need reliable binary I/O.
• On Windows platforms (excluding Cygwin), this function fails to open directories for reading. Such streams have implementation-defined semantics on other platforms. To avoid directory streams with a consistent error message, use `fstat` after `open` and `fdopen`, rather than `fopen` and `fileno`.

10.318 fork

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fork.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14.
• On some platforms, `fork` followed by a call of the `exec` family (`execl`, `execle`, `execv`, `execvp`, or `execve`) is less efficient than `vfork` followed by the same call. `vfork` is a variant of `fork` that has been introduced to optimize the `fork/exec` pattern.
• On Windows platforms (excluding Cygwin), this function is not implemented; use `_spawnvp` instead.

10.319 fpathconf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fpathconf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14.

10.320 fpclassify

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fpclassify.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.4, Android 9.0.

10.321 fprintf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fprintf.html

Gnulib module: fprintf-posix or fprintf-gnu or stdio, nonblocking, sigpipe
Portability problems fixed by either GnuLib module `fprintf-posix` or `fprintf-gnu`:

- This function does not support size specifiers as in C99 (hh, 11, j, t, z) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not support size specifiers as in C23 (w8, w16, w32, w64, wf8, wf16, wf32, wf64) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- `printf` of `long double` numbers is unsupported on some platforms: mingw, MSVC 14.
- `printf` "%f", "%e", "%g" of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.4, mingw, MSVC 14.
- This function does not support the ‘a’ and ‘A’ directives on some platforms: glibc-2.3.6, Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the ‘F’ directive on some platforms: NetBSD 3.0, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘n’ directive on some platforms: glibc when used with `_FORTIFY_SOURCE >= 2` (set by default on Ubuntu), macOS 11.1, MSVC 14.
- This function does not support the ‘1s’ directive on some platforms: OpenBSD 4.0, IRIX 6.5, Cygwin 1.5.x, Haiku.
- This function does not support precisions in the ‘1s’ directive correctly on some platforms: Solaris 11.4.
- This function does not support format directives that access arguments in an arbitrary order, such as "%%2$s", on some platforms: NetBSD 3.0, mingw, MSVC 14.
- This function doesn’t support the ‘’ flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not round the argument of the ‘a’ directive correctly on some platforms: Mac OS X 10.12, FreeBSD 13.0.
- `printf` "%010f" of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC/clang.
- This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: AIX 7.1, Solaris 10/x86, mingw, MSVC/clang.
- This function mishandles large floating point precisions (for example, formatting 1.0 with "%.511f") on some platforms: Solaris 10.
- This function produces wrong output for the ‘1c’ directive with a NUL wide character argument on some platforms: glibc 2.35, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.
- This function can crash in out-of-memory conditions on some platforms: FreeBSD 13.0, NetBSD 5.0.
Portability problems fixed by Gnulib module `fprintf-gnu`:

- This function does not support the ‘B’ directive on some platforms: glibc 2.34, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems fixed by Gnulib module `stdio` or `fprintf-posix` or `fprintf-gnu`, together with module `nonblocking`:

- When writing to a non-blocking pipe whose buffer is full, this function fails with `errno` being set to `ENOSPC` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module `stdio` or `fprintf-posix` or `fprintf-gnu`, together with module `sigpipe`:

- When writing to a pipe with no readers, this function fails, instead of obeying the current `SIGPIPE` handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- The `%an` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- Formatting noncanonical `long double` numbers produces nonmeaningful results on some platforms: glibc and others, on x86, x86_64, IA-64 CPUs.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.
- Attempting to write to a read-only stream fails with `EOF` but does not set the error flag for `ferror` on some platforms: glibc 2.13, cygwin 1.7.9.

### 10.322 `fputc`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fputc.html

Gnulib module: `stdio`, `nonblocking`, `sigpipe`

Portability problems fixed by Gnulib module `stdio`, together with module `nonblocking`:

- When writing to a non-blocking pipe whose buffer is full, this function fails with `errno` being set to `ENOSPC` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module `stdio`, together with module `sigpipe`:

- When writing to a pipe with no readers, this function fails, instead of obeying the current `SIGPIPE` handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.
- This function crashes if the stream’s file descriptor has already been closed, if `MSVC_INVALID_PARAMETER_HANDLING` is `HAIRY_LIBRARY_HANDLING` or `SANE_LIBRARY_HANDLING`, on some platforms: MSVC 14.
10.323 `fputs`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fputs.html

Gnulib module: stdio, nonblocking, sigpipe

Portability problems fixed by Gnulib module stdio, together with module nonblocking:
- When writing to a non-blocking pipe whose buffer is full, this function fails with \texttt{errno} being set to \texttt{ENOSPC} instead of \texttt{EAGAIN} on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module stdio, together with module sigpipe:
- When writing to a pipe with no readers, this function fails, instead of obeying the current SIGPIPE handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
- On Windows platforms (excluding Cygwin), this function does not set \texttt{errno} upon failure.
- On some platforms, this function does not set \texttt{errno} or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

10.324 `fputwc`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fputwc.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, \texttt{wchar_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.325 `fputws`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fputws.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, \texttt{wchar_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.
- On some platforms, this function does not set \texttt{errno} or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.
10.326 fread

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fread.html

Gnulib module: stdio, nonblocking

Portability problems fixed by Gnulib module stdio, together with module nonblocking:

- When reading from a non-blocking pipe whose buffer is empty, this function fails with
  errno being set to EINVAL instead of EAGAIN on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- C99 and POSIX.1-2001 and later require end-of-file to be sticky, that is, they require
  this function to act as if it reads end-of-file if feof would return nonzero. However, on
  some systems this function attempts to read from the underlying file descriptor even if
  the stream’s end-of-file indicator is set. These systems include glibc and default Solaris.

- On Windows platforms (excluding Cygwin), this function does not set errno upon
  failure.

- This function crashes if the stream’s file descriptor has already been closed, if
  MSVC_INVALID_PARAMETER_HANDLING is HAIRY_LIBRARY_HANDLING or SANE_LIBRARY_
  HANDLING, on some platforms: MSVC 14.

10.327 free

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/free.html

Gnulib module: free-posix

Portability problems fixed by Gnulib:

- This function may clobber errno on many platforms: glibc 2.32, Mac OS X, FreeBSD,
  NetBSD, OpenBSD 4.4, Minix, AIX, HP-UX, IRIX, Cygwin, mingw, MSVC.

Portability problems not fixed by Gnulib:

10.328 freeaddrinfo

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/freeaddrinfo.html

Gnulib module: getaddrinfo

Portability problems fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11.11, IRIX 6.5, Cygwin 1.5.x,
  mingw, MSVC 14.

- On Windows, this function is declared in <ws2tcpip.h> rather than in <netdb.h>.

- On Windows, in 32-bit mode, this function is defined with a calling convention that is
  different from cdecl.

Portability problems not fixed by Gnulib:
10.329 freelocale

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/freelocale.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many platforms: FreeBSD 9.0, NetBSD 5.0, OpenBSD 6.1, Minix 3.1.8, AIX 6.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.5.x, mingw, MSVC 14, Android 4.4.

• This function is useless because the locale_t type is not defined on some platforms: z/OS.

• This function may cause crashes in subsequent newlocale invocations on some platforms: Haiku.

10.330 freopen

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/freopen.html

Gnulib module: freopen

Portability problems fixed by Gnulib:

• On some platforms, if stream does not already have an open file descriptor, freopen returns the stream without opening the file: glibc 2.24.

• On platforms where off_t is a 32-bit type, freopen may not work correctly with files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

• On Windows platforms (excluding Cygwin), this function does usually not recognize the /dev/null filename.

Portability problems not fixed by Gnulib:

• On Windows platforms (excluding Cygwin), this function does not set errno upon failure.

• This function does not support a NULL file name argument on some platforms: OpenBSD 4.9, AIX 7.1, HP-UX 11.23, IRIX 6.5, Solaris 10, mingw, MSVC 14.

• This function does not fail when the file name argument ends in a slash and (without the slash) names a nonexistent file or a file that is not a directory, on some platforms: HP-UX 11.00, Solaris 9.

• Applications should not assume that fileno(f) will be the same before and after a call to freopen(name,mode,f). However, the module freopen-safer can at least protect stdin, stdout, and stderr.

10.331 frexp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/frexp.html

Gnulib module: frexp
Portability problems fixed by Gnulib:

- This function does not work on denormalized numbers on some platforms: NetBSD 3.0.
- This function does not work on negative zero on some platforms: NetBSD 4.99, MSVC 14.
- This function does not work on infinite numbers on some platforms: IRIX 6.5, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

10.332 frexp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/frexp.html

Gnulib module: frexp

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.
- This function does not work on negative zero on some platforms: mingw.
- This function does not work on infinite numbers on some platforms: IRIX 6.5, mingw.

Portability problems not fixed by Gnulib:

10.333 frexpl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/frexpl.html

Gnulib module: frexpl

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.
- This function does not work on finite numbers on some platforms: AIX 5.1, MSVC 14.
- This function does not work on denormalized numbers on some platforms: macOS 10.13/i386.
- This function does not work on infinite numbers on some platforms: IRIX 6.5, mingw, MSVC 14.

Portability problems not fixed by Gnulib:
10.334 fromfp

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.335 fromfpf

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.336 fromfpl

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.337 fromfpf

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.338 fromfpxf

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.339 fromfpzl

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.340 fscanf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fscanf.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fscanf.html

Gnulib module: stdio, nonblocking

Portability problems fixed by Gnulib module stdio, together with module nonblocking:

- When reading from a non-blocking pipe whose buffer is empty, this function fails with errno being set to EINVAL instead of EAGAIN on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- C99 and POSIX.1-2001 and later require end-of-file to be sticky, that is, they require this function to act as if it reads end-of-file if feof would return nonzero. However, on some systems this function attempts to read from the underlying file descriptor even if the stream’s end-of-file indicator is set. These systems include glibc and default Solaris.
- On Windows platforms (excluding Cygwin), this function does not set errno upon failure.
- On Windows, this function doesn’t support the hh, 11, j, t, z size specifiers.
10.341 fseek

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fseek.html

Gnulib module: fseek

Portability problems fixed by Gnulib:
- This function mistakenly succeeds on pipes on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
- On Windows platforms (excluding Cygwin), this function does not set errno upon failure.
- On platforms where long is a 32-bit type, fseek does not work correctly with files 2 GiB and larger, even when the AC_SYS_LARGEFILE macro is used. The fix is to use fseeko instead.

10.342 fseeko

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fseeko.html

Gnulib module: fseeko

Portability problems fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.
- The declaration of fseeko in <stdio.h> is not enabled by default on some platforms: glibc 2.3.6.
- This function fails on seekable stdin, stdout, and stderr: cygwin <= 1.5.24.
- On platforms where off_t is a 32-bit type, fseeko does not work correctly with files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:

10.343 fsetpos

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fsetpos.html

Gnulib module: —

Portability problems fixed by Gnulib:
- On platforms where off_t is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:

10.344 fstat

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fstat.html

Gnulib module: fstat
Portability problems fixed by Gnulib:
• This function crashes when invoked with invalid arguments on some platforms: MSVC 14.
• On platforms where off_t is a 32-bit type, fstat may not correctly report the size of files or block devices 2 GiB and larger. See Section 14.2 [Large File Support], page 753.
• On Linux/x86 and Linux/x86_64, applications compiled in 32-bit mode cannot access files that happen to have a 64-bit inode number. This can occur with file systems such as XFS (typically on large disks) and NFS. See Section 14.2 [Large File Support], page 753.
• On Solaris 11.4, when this function yields a timestamp with a nonpositive tv_sec value, tv_nsec might be in the range $-1000000000...-1$, representing a negative nanoseconds offset from tv_sec.
• The st_atime, st_ctime, st_mtime fields are affected by the current time zone and by the DST flag of the current time zone on some platforms: mingw, MSVC 14 (when the environment variable TZ is set).

Portability problems not fixed by Gnulib:
• See Section 9.65 [sys/stat.h], page 75, for general portability problems with struct stat.
• On Cygwin, fstat applied to the file descriptors 0 and 1, returns different st_ino values, even if standard input and standard output are not redirected and refer to the same terminal.

10.345 fstatat

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fstatat.html

Gnulib module: fstatat

Portability problems fixed by Gnulib:
• This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14. But the replacement function is not safe to be used in libraries and is not multithread-safe.
• On platforms where off_t is a 32-bit type, fstatat may not correctly report the size of files or block devices larger than 2 GB. See Section 14.2 [Large File Support], page 753.
• On some platforms, fstatat(fd,"file/",buf,flag) succeeds instead of failing with ENOTDIR. Solaris 9.
• For symlinks, when the argument ends in a slash, some platforms don’t dereference the argument: Solaris 9.
• On Solaris 11.4, when this function yields a timestamp with a nonpositive tv_sec value, tv_nsec might be in the range $-1000000000...-1$, representing a negative nanoseconds offset from tv_sec.

Portability problems not fixed by Gnulib:
• This function does not fail when the second argument is an empty string on some platforms, even when AT_EMPTY_PATH is not used: glibc 2.7, Linux 2.6.38.
• See Section 9.65 [sys/stat.h], page 75, for general portability problems with `struct stat`.

10.346 `fstatvfs`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fstatvfs.html

Gnulib module: —

Portability problems fixed by Gnulib:
• On platforms where `f_blocks` in `struct statvfs` is a 32-bit value, this function may not work correctly on file systems larger than 4 TiB. See Section 14.2 [Large File Support], page 753. This affects glibc/Hurd, HP-UX 11, Solaris.

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: OpenBSD 3.8, mingw, MSVC 14, Android 4.3.

10.347 `fsub`

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.348 `fsubl`

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.349 `fsync`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fsync.html

Gnulib module: fsync

Portability problems fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.
Portability problems not fixed by Gnulib:
- If the argument is a read-only file descriptor, this function fails with E_BADF on some platforms: AIX 7.2, Cygwin 2.9.

**10.350 ftell**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ftell.html

Gnulib module: ftell

Portability problems fixed by Gnulib:
- This function mistakenly succeeds on pipes on some platforms: mingw, MSVC 14.
- This function produces incorrect results after `putc` that followed a `getc` call that reached EOF on some platforms: Solaris 11 2010-11.
- This function, when invoked after `ungetc`, throws away the `ungetc` buffer, changes the stream’s file position, and returns the wrong position on some platforms: macOS 10.15 and newer.
- This function mistakenly succeeds on pipes on some platforms: mingw 10.

Portability problems not fixed by Gnulib:
- This function produces incorrect results immediately after `fseek` on some platforms: HP-UX 11.
- `fflush`, `ftell`, `ftello`, `fgetpos` behave incorrectly on input streams that are opened in `O_TEXT` mode and whose contents contains Unix line terminators (LF), on some platforms: mingw, MSVC 14.
- On platforms where `long` is a 32-bit type, `ftell` does not work correctly with files 2 GiB and larger, even when the `AC_SYS_LARGEFILE` macro is used. The fix is to use `ftello` instead.

**10.351 ftello**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ftello.html

Gnulib module: ftello.html

Portability problems fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.
- The declaration of `ftello` in `<stdio.h>` is not enabled by default on some platforms: glibc 2.3.6.
- This function produces incorrect results after `putc` that followed a `getc` call that reached EOF on some platforms: Solaris 11 2010-11.
- This function, when invoked after `ungetc`, throws away the `ungetc` buffer, changes the stream’s file position, and returns the wrong position on some platforms: macOS 10.15 and newer.
- This function fails on seekable stdin, stdout, and stderr: cygwin <= 1.5.24.
- This function mistakenly succeeds on pipes on some platforms: mingw 10.
• On platforms where `off_t` is a 32-bit type, `ftello` does not work correctly with files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by GnuLib:
• This function produces incorrect results immediately after `fseek` on some platforms: HP-UX 11.
• `fflush`, `ftell`, `ftello`, `fgetpos` behave incorrectly on input streams that are opened in `O_TEXT` mode and whose contents contains Unix line terminators (LF), on some platforms: mingw, MSVC 14.

10.352 ftok
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ftok.html
GnuLib module: —
Portability problems fixed by GnuLib:
Portability problems not fixed by GnuLib:
• This function is missing on some platforms: mingw, MSVC 14.

10.353 ftruncate
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ftruncate.html
GnuLib module: ftruncate
Portability problems fixed by GnuLib:
• This function is missing on some platforms: MSVC 14.
• On platforms where `off_t` is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by GnuLib:

10.354 ftrylockfile
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ftrylockfile.html
GnuLib module: —
Portability problems fixed by GnuLib:
Portability problems not fixed by GnuLib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
Chapter 10: ISO C and POSIX Function Substitutes

10.355 ftw

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ftw.html

Gnulib module: —

Portability problems fixed by Gnulib:
- On platforms where off_t is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, Minix 3.1.8, mingw, MSVC 14, Android 4.1.

10.356 funlockfile

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/funlockfile.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.357 futimens

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/futimens.html

Gnulib module: futimens

Portability problems fixed by Gnulib:
- This function is missing on some platforms: glibc 2.5, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.3. However, the replacement function may end up truncating timestamps to worse resolution than supported by the file system.
- This function returns a bogus value instead of failing with ENOSYS on some platforms: Linux kernel 2.6.21.
- When using UTIME_OMIT or UTIME_NOW, some systems require the tv_sec argument to be 0, and don’t necessarily handle all file permissions in the manner required by POSIX: Linux kernel 2.6.25.
- When using UTIME_OMIT for the modification time, but specifying an access time, some systems fail to update the change time: Linux kernel 2.6.32, macOS 11.1, NetBSD 9.0, Solaris 11.1.
- Passing AT_FDCWD as the fd argument does not properly fail with EBADF on some systems: glibc 2.11, musl libc, Solaris 11.

Portability problems not fixed by Gnulib:
- Some platforms lack the ability to change the timestamps of a file descriptor, so the replacement can fail with ENOSYS; the gnulib module ‘utimens’ provides a more reliable interface fdutimens.
• The mere act of using `stat` modifies the access time of directories on some platforms, so `utimensat` can only effectively change directory modification time: Cygwin 1.5.x.

10.358 `fwide`  
POSIX specification:  
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fwide.html  
Gnulib module: —  
Portability problems fixed by Gnulib:  
Portability problems not fixed by Gnulib:  
• This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x, MSVC 14.  
• On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.  
• `fwide` is not guaranteed to be able to change a file stream’s mode to a different mode than the current one.

10.359 `fwprintf`  
POSIX specification:  
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fwprintf.html  
Gnulib module: —  
Portability problems fixed by Gnulib:  
Portability problems not fixed by Gnulib:  
• This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x.  
• On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.  
• This function does not support size specifiers as in C23 (`w8`, `w16`, `w32`, `w64`, `wf8`, `wf16`, `wf32`, `wf64`) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.  
• This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.  
• The `%a` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.  
• In the C or POSIX locales, the `%c` and `%s` conversions may fail on some platforms: glibc 2.35.  
• When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.  
• On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.
Chapter 10: ISO C and POSIX Function Substitutes

10.360 fwrite

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fwrite.html

Gnulib module: stdio, nonblocking, sigpipe

Portability problems fixed by Gnulib module stdio, together with module nonblocking:

- When writing to a non-blocking pipe whose buffer is full, this function fails with errno being set to ENOSPC instead of EAGAIN on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module stdio, together with module sigpipe:

- When writing to a pipe with no readers, this function fails, instead of obeying the current SIGPIPE handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not set errno upon failure.
- On some platforms, this function does not set errno or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.
- This function crashes if the stream’s file descriptor has already been closed, if MSVC_INVALID_PARAMETER_HANDLING is HAIRY_LIBRARY_HANDLING or SANE_LIBRARY_HANDLING, on some platforms: MSVC 14.

10.361 fwscanf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fwscanf.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fwscanf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.362 gai_strerror

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/gai_strerror.html

Gnulib module: getaddrinfo

Portability problems fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11.11, IRIX 6.5, Cygwin 1.5.x.
• This function is only available in `<ws2tcpip.h>` on some platforms: mingw, MSVC 14.
• This function’s return type is `char *` instead of `const char *` on some platforms: AIX 7.1, HP-UX 11, Solaris 9, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

10.363 `getaddrinfo`

POSIX specification:

https://pubs.opengroup.org/onlinepubs/9699919799/functions/getaddrinfo.html

Gnulib module: `getaddrinfo`

Portability problems fixed by Gnulib:
• This function is missing on some platforms: HP-UX 11.11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14.
• On Windows, this function is declared in `<ws2tcpip.h>` rather than in `<netdb.h>`.
• On Windows, in 32-bit mode, this function is defined with a calling convention that is different from cdecl.

Portability problems not fixed by Gnulib:
• Unlike glibc’s implementation, gnulib’s replacement does not support internationalized domain names (IDN) encoding.

10.364 `getc`

POSIX specification:

https://pubs.opengroup.org/onlinepubs/9699919799/functions/getc.html

Gnulib module: stdio, nonblocking

Portability problems fixed by Gnulib module stdio, together with module nonblocking:
• When reading from a non-blocking pipe whose buffer is empty, this function fails with `errno` being set to `EINVAL` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
• C99 and POSIX.1-2001 and later require end-of-file to be sticky, that is, they require this function to act as if it reads end-of-file if `feof` would return nonzero. However, on some systems this function attempts to read from the underlying file descriptor even if the stream’s end-of-file indicator is set. These systems include glibc and default Solaris.
• On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.

10.365 `getc_unlocked`

POSIX specification:

https://pubs.opengroup.org/onlinepubs/9699919799/functions/getc_unlocked.html

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.366 getchar

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getchar.html

Gnulib module: stdio, nonblocking

Portability problems fixed by Gnulib module stdio, together with module nonblocking:

• When reading from a non-blocking pipe whose buffer is empty, this function fails with
errno being set to EINVAL instead of EAGAIN on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

• C99 and POSIX.1-2001 and later require end-of-file to be sticky, that is, they require
this function to act as if it reads end-of-file if feof would return nonzero. However, on
some systems this function attempts to read from the underlying file descriptor even if
the stream’s end-of-file indicator is set. These systems include glibc and default Solaris.

• On Windows platforms (excluding Cygwin), this function does not set errno upon
failure.

10.367 getchar_unlocked

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getchar_unlocked.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.368 getcwd

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getcwd.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getcwd.html

Gnulib module: getcwd or getcwd-lGPL

Portability problems fixed by either Gnulib module getcwd or getcwd-lGPL:

• This function is declared in different header files (namely, <io.h> or <direct.h>) on
some platforms: mingw, MSVC 14.

• On glibc and Solaris 11.4 platforms, getcwd (NULL, n) allocates memory for the result.
On some other platforms, this call is not allowed.
On some platforms, the prototype for `getcwd` uses `int` instead of `size_t` for the size argument when using non-standard headers, and the declaration is missing from `<unistd.h>`: mingw, MSVC 14.

On some platforms, `getcwd(buf, 0)` crashes: MSVC 14.

On some platforms, `getcwd(buf, 0)` fails with `ERANGE` instead of the required `EINVAL`: mingw.

Portability problems fixed by GnuLib module `getcwd`:

- This function does not handle long file names (greater than `PATH_MAX`) correctly on some platforms: glibc on Linux 2.4.20, musl libc 1.2.2/powerpc64le, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 6.7, AIX 7.1.

Portability problems not fixed by GnuLib:

- When using `getcwd(NULL, nonzero)`, some platforms, such as glibc or cygwin, allocate exactly `nonzero` bytes and fail with `ERANGE` if it was not big enough, while other platforms, such as FreeBSD, mingw, or MSVC 14, ignore the size argument and allocate whatever size is necessary. If this call succeeds, an application cannot portably access beyond the string length of the result.

### 10.369 getdate

POSIX specification:  
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getdate.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

GnuLib provides a module `parse-datetime` that contains a function `parse_datetime` that has similar functionality as the `getdate` function.

### 10.370 getdate_err

POSIX specification:  
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getdate_err.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This variable is missing on some platforms: macOS 10.13, FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.371 getdelim

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getdelim.html

Gnulib module: getdelim

Portability problems fixed by Gnulib:
• This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14, Android 4.2.
• This function makes out-of-bounds reads on some platforms: macOS 10.13.
• This function crashes when passed a pointer to a NULL buffer together with a pointer to a non-zero buffer size on some platforms: FreeBSD 8.0.

Portability problems not fixed by Gnulib:
• This function has quadratic running time for long lines on some platforms: uClibc 0.9.31.

10.372 getegid

POSIX specification:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.

10.373 getenv

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getenv.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.374 geteuid

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/geteuid.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.
10.375 getgid

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getgid.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14.

10.376 getgrent

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getgrent.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

10.377 getgrgid

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getgrgid.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14.

10.378 getgrgid_r

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getgrgid_r.html

Gnulib module: extensions

Portability problems fixed by Gnulib:

• This function has an incompatible declaration on some platforms: Solaris 11.3 (when
  _POSIX_PTHREAD_SEMANTICS is not defined).

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android
  6.0.
10.379 **getgrnam**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getgrnam.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

10.380 **getgrnam_r**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getgrnam_r.html

Gnulib module: extensions

Portability problems fixed by Gnulib:

- This function has an incompatible declaration on some platforms: Solaris 11.3 (when
  
  _POSIX_PTHREAD_SEMANTICS is not defined).

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android
  
  6.0.

10.381 **getgroups**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getgroups.html

Gnulib module: getgroups

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- On some platforms, this function fails to reject a negative count, even though that is
  less than the size that would be returned: macOS 11.1, FreeBSD 13.0.
- On NeXTstep 3.2, *getgroups(0, NULL) always fails.* See macro
  
  'AC_FUNC_GETGROUPS'.
- On very old systems, this function operated on an array of ‘int’, even though that was
  a different size than an array of ‘gid_t’.

Portability problems not fixed by Gnulib:

- This function is unsafe to call between *fork* and *exec* if the parent process is multi-
  threaded.
- It is unspecified whether the effective group id will be included in the returned list, nor
  whether the list will be sorted in any particular order. For that matter, some platforms
  include the effective group id twice, if it is also a member of the current supplemental
  group ids.

The Gnulib module *mgetgroups* provides a similar API.
**10.382 gethostent**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/gethostent.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14.

**10.383 gethostid**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/gethostid.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 9.0.

**10.384 gethostname**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/gethostname.html

Gnulib module: gethostname
Portability problems fixed by Gnulib:
• This function is declared in a different header file (namely, `<winsock2.h>`) on some platforms: MSVC 14.
• On mingw and MSVC 14, this function has a prototype that differs from that specified by POSIX, and it is defined only in the ws2_32 library.

Portability problems not fixed by Gnulib:
• This function’s second argument type is `int` instead of `size_t` on some platforms: Solaris 10.
• If the given buffer is too small for the host name, some implementations fail with `EINVAL`, instead of returning a truncated host name.

**10.385 getitimer**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getitimer.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.
10.386 getline

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getline.html

Gnulib module: getline

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14, Android 4.2.
- This function is missing a declaration on some platforms: AIX 7.1.
- Some platforms provide a function by this name but with the wrong signature, for example in -linet.
- This function crashes when passed a pointer to a NULL buffer together with a pointer to a non-zero buffer size on some platforms: FreeBSD 8.0.

Portability problems not fixed by Gnulib:
- This function has quadratic running time for long lines on some platforms: uClibc 0.9.31.

10.387 getlogin

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getlogin.html

Gnulib module: getlogin

Portability problems fixed by Gnulib:
- This function is missing on some platforms: older mingw, MSVC 14.
- This function is not declared unless _POSIX is defined on some platforms: mingw.

Portability problems not fixed by Gnulib:
- This function returns an empty string even when standard input is a tty on some platforms: HP-UX 11.11.

10.388 getlogin_r

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getlogin_r.html

Gnulib module: getlogin_r

Portability problems fixed by Gnulib:
- This function is missing on some platforms: NetBSD 3.0, Minix 3.1.8, mingw, MSVC 14, Android 8.1.
- This function is not declared unless _REENTRANT is defined, on some platforms: HP-UX 11.
- This function returns a truncated result, instead of failing with error code ERANGE, when the buffer is not large enough, on some platforms: macOS 11.1.
Portability problems not fixed by Gnulib:

- This function has an incompatible declaration on some platforms: FreeBSD 12.0, MidnightBSD 2.0, Solaris 11.4 (when \_POSIX\_PTHREAD\_SEMANTICS is not defined).
- This function fails even when standard input is a tty on some platforms: HP-UX 11.11.
- This function fails with error code EINVAL instead of ERANGE when the second argument is zero on some platforms: HP-UX 11.31.
- This function fails with error code ENOMEM instead of ERANGE on some platforms: Haiku.

10.389 getmsg

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getmsg.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.390 getnameinfo

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getnameinfo.html

Gnulib module: getaddrinfo

Portability problems fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11.11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

10.391 getnetbyaddr

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getnetbyaddr.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Cygwin 2.9, mingw, MSVC 14.
10.392 getnetbyname

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getnetbyname.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Cygwin 2.9, mingw, MSVC 14.

10.393 getnetent

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getnetent.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Cygwin 2.9, mingw, MSVC 14, Android 8.1.

10.394 getopt

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getopt.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/libutil-getopt-3.html

Gnulib module: getopt-posix or getopt-gnu
The module getopt-gnu has support for “long options” and for “options that take optional arguments”. Compared to the API defined by POSIX, it adds a header file <getopt.h> and a function getopt_long.
Portability problems fixed by either Gnulib module getopt-posix or getopt-gnu:
• This function is missing on some platforms: MSVC 14.
• The value of optind after a missing required argument is wrong on some platforms: macOS 11.1, AIX 7.1, mingw.

Portability problems fixed by Gnulib module getopt-gnu:
• The function getopt does not support the ‘+’ flag in the options string on some platforms: macOS 11.1, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11 2010-11.
• The function getopt does not obey the combination of ‘+’ and ‘:’ flags in the options string on some platforms: glibc 2.11.
• The function getopt does not obey the ‘-’ flag in the options string when POSIXLY_CORRECT is set on some platforms: Cygwin 1.7.0.
• The function `getopt` does not support options with optional arguments on some platforms: macOS 11.1, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11 2010-11, Cygwin 1.5.x.

• The function `getopt_long` is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 14.

• The function `getopt_long` does not support abbreviated long options where all disambiguations are equivalent on some platforms: OpenBSD 5.0.

• The function `getopt_long_only` is missing on some platforms: FreeBSD 5.2.1, NetBSD 9.0, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, mingw, MSVC 14.

• This function crashes if the option string includes `W`; on some platforms: glibc 2.14.

Portability problems not fixed by Gnulib:

• The default behavior of the glibc implementation of `getopt` allows mixing option and non-option arguments on the command line in any order. Other implementations, such as the one in Cygwin, enforce strict POSIX compliance: they require that the option arguments precede the non-option arguments. This is something to watch out in your program’s testsuite.

• The glibc implementation allows a complete reset of the environment, including re-checking for `POSIXLY_CORRECT`, by setting `optind` to 0. Several BSD implementations provide `optreset`, causing a reset by setting it non-zero, although it does not necessarily re-read `POSIXLY_CORRECT`. Solaris `getopt` does not support either reset method, but does not maintain state that needs the extra level of reset.

• On some platforms, this function does not set the stream error indicator on attempts to write to a read-only stream: glibc 2.13, Cygwin 1.7.9.

10.395 `getpayload`

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.396 `getpayloadf`

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.397 getpayloadl

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.398 getpeername

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpeername.html

Gnulib module: getpeername

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- On Windows platforms (excluding Cygwin), error codes from this function are not placed in errno, and WSAGetLastError must be used instead.
- On HP-UX 11, in 64-bit mode, when the macro _HPUX_ALT_XOPEN_SOCKET_API is not defined, this function behaves incorrectly because it is declared to take a pointer to a 64-bit wide socklen_t entity but in fact considers it as a pointer to a 32-bit wide unsigned int entity.

Portability problems not fixed by Gnulib:
- Some platforms don’t have a socklen_t type; in this case this function’s third argument type is ‘int *’.

10.399 getpgid

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpgid.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.400 getpgrp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpgrp.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.
10.401 getpid

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpid.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.402 getpmsg

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpmsg.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.403 getppid

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getppid.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

10.404 getpriority

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpriority.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

10.405 getprotobynumber

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getprotobynumber.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
10.406 getprotobynumber

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getprotobynumber.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.

10.407 getprotoent

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getprotoent.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14, Android 8.1.

10.408 getpwent

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpwent.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

10.409 getpwnam

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpwnam.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.
10.410 getpwnam_r

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpwnam_r.html

Gnulib module: extensions

Portability problems fixed by Gnulib:
- This function has an incompatible declaration on some platforms: Solaris 11.3 (when
  _POSIX_PTHREAD_SEMANTICS is not defined).

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, mingw, MSVC
  14, Android 3.0.

10.411 getpwuid

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpwuid.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is unsafe to call between fork and exec if the parent process is multi-
  threaded. Instead, use getpwuid_r prior to forking.
- This function is missing on some platforms: mingw, MSVC 14.

10.412 getpwuid_r

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpwuid_r.html

Gnulib module: extensions

Portability problems fixed by Gnulib:
- This function has an incompatible declaration on some platforms: Solaris 11.3 (when
  _POSIX_PTHREAD_SEMANTICS is not defined).

Portability problems not fixed by Gnulib:
- This function is unsafe to call between fork and exec if the parent process is multi-
  threaded. Use it prior to forking.
- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, mingw, MSVC
  14, Android 3.0.

10.413 getrlimit

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getrlimit.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-getrlimit-1.html
Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where `rlim_t` is a 32-bit type, this function does not allow to retrieve limits larger than 4 GiB and larger, such as for `RLIMITFSIZE`. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.414 `getrusage`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getrusage.html

Gnulib module: `getrusage`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- Many platforms don't fill in all the fields of `struct rusage` with meaningful values.

### 10.415 `gets`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/gets.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function should never be used, because it can overflow any given buffer.
- This function is missing on some platforms: OpenBSD 6.7, Solaris 11.4.
- When reading from a non-blocking pipe whose buffer is empty, this function fails with `errno` being set to `EINVAL` instead of `EAGAIN` on some platforms: mingw, MSVC 14.
- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.

### 10.416 `getservbyname`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getservbyname.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
10.417 getservbyport

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getservbyport.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.

10.418 getservent

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getservent.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.

10.419 getsid

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getsid.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.1.

10.420 getsockname

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getsockname.html

Gnulib module: getsockname
Portability problems fixed by Gnulib:
• On Windows platforms (excluding Cygwin), error codes from this function are not placed in errno, and WSAGetLastError must be used instead.
• On HP-UX 11, in 64-bit mode, when the macro _HPUX_ALT_XOPEN_SOCKET_API is not defined, this function behaves incorrectly because it is declared to take a pointer to a 64-bit wide socklen_t entity but in fact considers it as a pointer to a 32-bit wide unsigned int entity.

Portability problems not fixed by Gnulib:
• Some platforms don’t have a socklen_t type; in this case this function’s third argument type is ‘int *’. 
10.421 getsockopt

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getsockopt.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getsockopt-1.html

Gnulib module: getsockopt

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), error codes from this function are not placed in errno, and WSAGetLastError must be used instead.
- On HP-UX 11, in 64-bit mode, when the macro _HPUX_ALT_XOPEN_SOCKET_API is not defined, this function behaves incorrectly because it is declared to take a pointer to a 64-bit wide socklen_t entity but in fact considers it as a pointer to a 32-bit wide unsigned int entity.

Portability problems not fixed by Gnulib:

- Some platforms don’t have a socklen_t type; in this case this function’s fifth argument type is ‘int *’.
- Many socket options are not available on all platforms.

10.422 getsubopt

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/getsubopt.html

Gnulib module: getsubopt

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.
- This function is declared in unistd.h instead of stdlib.h on some platforms: Cygwin 1.7.1.

Portability problems not fixed by Gnulib:

10.423 gettimeofday

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/gettimeofday.html

Gnulib module: gettimeofday

Portability problems fixed by Gnulib:

- This function is missing on some platforms: MSVC 14.
- This function is declared with a nonstandard function prototype (only one argument, or “...” after the first argument) on some platforms.
- On some platforms, the second argument has type struct timezone* rather than void *, making it an error to redeclare the function with the POSIX signature: glibc. However, rather than penalize these systems with a replacement function, gnulib defines
GETTIMEOFDAY_TIMEZONE to the appropriate type for use in avoiding a compiler warning if assigning gettimeofday to a function pointer.
• This function has only a precision of 15.6 milliseconds on some platforms: mingw.
  Portability problems not fixed by Gnulib:
• Behavior is non-portable if the second argument to gettimeofday is not NULL.

10.424 getuid
  POSIX specification:
  https://pubs.opengroup.org/onlinepubs/9699919799/functions/getuid.html
  Gnulib module: —
  Portability problems fixed by Gnulib:
  Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.

10.425 getutxent
  POSIX specification:
  https://pubs.opengroup.org/onlinepubs/9699919799/functions/getutxent.html
  Gnulib module: —
  Portability problems fixed by Gnulib:
  Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

10.426 getutxid
  POSIX specification:
  https://pubs.opengroup.org/onlinepubs/9699919799/functions/getutxid.html
  Gnulib module: —
  Portability problems fixed by Gnulib:
  Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

10.427 getutxline
  POSIX specification:
  https://pubs.opengroup.org/onlinepubs/9699919799/functions/getutxline.html
  Gnulib module: —
  Portability problems fixed by Gnulib:
  Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.
10.428 getwc

POSIX specification:

https://pubs.opengroup.org/onlinepubs/9699919799/functions/getwc.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.429 getwchar

POSIX specification:

https://pubs.opengroup.org/onlinepubs/9699919799/functions/getwchar.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.430 glob

POSIX specification:

https://pubs.opengroup.org/onlinepubs/9699919799/functions/glob.html

Gnulib module: glob

Portability problems fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14, Android 8.1.
• This function does not list symbolic links to nonexistent files among the results, on some platforms: glibc 2.26, AIX 7.2, HP-UX 11, Solaris 11.4.
• On platforms where off_t is a 32-bit type, this function may not work correctly on huge directories 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:

• Some platforms may store additional flags in the gl_flags field.

10.431 globfree

POSIX specification:

https://pubs.opengroup.org/onlinepubs/9699919799/functions/globfree.html

Gnulib module: glob

Portability problems fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:
10.432 gmtime

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/gmtime.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• On some platforms, this function yields incorrect values for timestamps before the year 1: MacOS X 10.5, Solaris 11.3.

10.433 gmtime_r

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/gmtime_r.html

Gnulib module: time_r

Portability problems fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.
• This function is not declared unless _REENTRANT is defined, on some platforms: HP-UX 11.

Portability problems not fixed by Gnulib:
• On some platforms, this function yields incorrect values for timestamps before the year 1: MacOS X 10.5, Solaris 11.3.

10.434 grantpt

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/grantpt.html

Gnulib module: grantpt

Portability problems fixed by Gnulib:
• This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, mingw, MSVC 14, Android 4.4.

Portability problems not fixed by Gnulib:
• This function reports success for invalid file descriptors on some platforms: OpenBSD, Cygwin 1.7.9, musl libc.

10.435 hcreate

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/hcreate.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 8.1.
10.436 hdestroy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/hdestroy.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 8.1.

10.437 hsearch

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/hsearch.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 8.1.

10.438 htonl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/htonl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, mingw, MSVC 14, Android 4.4.

10.439 htons

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/htons.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, mingw, MSVC 14, Android 4.4.
10.440 hypot

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/hypot.html

Gnulib module: hypot or hypot-ieee

Portability problems fixed by either Gnulib module hypot or hypot-ieee:

Portability problems fixed by Gnulib module hypot-ieee:
• When the arguments are mixed NaN and Infinity, this function returns a wrong value on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

10.441 hypotf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/hypotf.html

Gnulib module: hypotf or hypotf-ieee

Portability problems fixed by either Gnulib module hypotf or hypotf-ieee:

• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 9, MSVC 14.

• This function produces wrong values on some platforms: NetBSD 5.1, OpenBSD 4.9.

Portability problems fixed by Gnulib module hypot-ieee:
• When the arguments are mixed NaN and Infinity, this function returns a wrong value on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

10.442 hypotl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/hypotl.html

Gnulib module: hypotl or hypotl-ieee

Portability problems fixed by either Gnulib module hypotl or hypotl-ieee:

• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 14, Android 4.4.

• This function produces very imprecise results on some platforms: NetBSD 9.0, OpenBSD 5.1/SPARC.

Portability problems fixed by Gnulib module hypotl-ieee:
• When the arguments are mixed NaN and Infinity, this function returns a wrong value on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
10.443 `iconv`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iconv.html

Gnulib module: `iconv`

Portability problems fixed by Gnulib:
- GNU libiconv is not found if installed in `$PREFIX/lib`.

Portability problems handled by Gnulib (in the sense that `HAVE_ICONV` does not get defined if the system’s `iconv` function has this problem):
- Failures are not distinguishable from successful returns on some platforms: AIX 5.1..7.2, Solaris 10.
- A buffer overrun can occur on some platforms: AIX 6.1..7.1.

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 8.1, when GNU libiconv is not installed.
- This function was not correctly implemented in glibc versions before 2.2.
- When `iconv` encounters an input character that is valid but that cannot be converted to the output character set, glibc’s and GNU libiconv’s `iconv` stop the conversion. Some other implementations put an implementation-defined character into the output buffer. Gnulib provides higher-level facilities `striconv` and `striconveh` (wrappers around `iconv`) that deal with conversion errors in a platform independent way.
- This function returns a positive return value, instead of zero, when converting from ISO-8859-1 to UTF-8 on HP-UX 11.

10.444 `iconv_close`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iconv_close.html

Gnulib module: `iconv`

Portability problems fixed by Gnulib:
- GNU libiconv is not found if installed in `$PREFIX/lib`.

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 8.1, when GNU libiconv is not installed.

10.445 `iconv_open`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iconv_open.html

Gnulib module: `iconv`, `iconv_open`, `iconv_open-utf`

Portability problems fixed by either Gnulib module `iconv` or `iconv_open`:
- GNU libiconv is not found if installed in `$PREFIX/lib`. 
Portability problems handled by either Gnulib module `iconv` or `iconv_open` (in the sense that `HAVE_ICONV` does not get defined if the system’s `iconv_open` function has this problem):

- No converter from EUC-JP to UTF-8 is provided on some platforms: HP-UX 11.

Portability problems fixed by Gnulib module `iconv_open`:

- This function recognizes only non-standard aliases for many encodings (not the IANA registered encoding names) on many platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11 2010-11, z/OS.

Portability problems fixed by Gnulib module `iconv_open-utf`:

- This function does not support the encodings UTF-16BE, UTF-16LE, UTF-32BE, UTF-32LE on many platforms: AIX 5.1, HP-UX 11, IRIX 6.5.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 8.1, when GNU libiconv is not installed.
- For some encodings A and B, this function cannot convert directly from A to B, although an indirect conversion from A through UTF-8 to B is possible. This occurs on some platforms: Solaris 11 2010-11. Gnulib provides a higher-level facility `striconv` (a wrapper around `iconv`) that deals with this problem.
- The set of supported encodings and conversions is system dependent.

### 10.446 if_freenameindex

POSIX specification:  
[https://pubs.opengroup.org/onlinepubs/96999197799/functions/if_freenameindex.html](https://pubs.opengroup.org/onlinepubs/96999197799/functions/if_freenameindex.html)

Gnulib module: —  
Portability problems fixed by Gnulib:  
Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, HP-UX 11.23, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 6.0.
- This is available only as a macro, rather than a function, on some platforms: OpenBSD 4.6, MirBSD 10.

### 10.447 if_indextoname

POSIX specification:  
[https://pubs.opengroup.org/onlinepubs/96999197799/functions/if_indextoname.html](https://pubs.opengroup.org/onlinepubs/96999197799/functions/if_indextoname.html)

Gnulib module: —  
Portability problems fixed by Gnulib:  
Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.23, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14.
10.448 if_nameindex

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/if_nameindex.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, HP-UX 11.23, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 6.0.

10.449 if_nametoindex

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/if_nametoindex.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, HP-UX 11.23, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14.

10.450 ilogb

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ilogb.html

Gnulib module: ilogb

Portability problems fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, MSVC 9.

• This function returns a wrong result for a zero argument on some platforms: OpenBSD 6.7, AIX 5.1.

• This function returns a wrong result for denormalized arguments on some platforms: AIX 7.1 64-bit.

• This function returns a wrong result for an infinite argument on some platforms: NetBSD 7.1, OpenBSD 6.7.

• This function returns a wrong result for a NaN argument on some platforms: NetBSD 7.1, OpenBSD 6.7.

Portability problems not fixed by Gnulib:
10.451 ilogbf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ilogbf.html

Gnulib module: ilogbf

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.
- This function returns a wrong result for a zero argument on some platforms: OpenBSD 6.7.
- This function returns a wrong result for an infinite argument on some platforms: NetBSD 7.1, OpenBSD 6.7.

Portability problems not fixed by Gnulib:

10.452 ilogbl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ilogbl.html

Gnulib module: ilogbl

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.
- This function returns a wrong result for a zero argument on some platforms: Cygwin 2.9.
- This function returns a wrong result for a NaN argument on some platforms: Cygwin 3.4.6.
- This function returns a wrong result for denormalized arguments on some platforms: AIX 7.1 64-bit, Haiku 2017.

Portability problems not fixed by Gnulib:

10.453 imaxabs

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/imaxabs.html

Gnulib module: imaxabs

Portability problems fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, MSVC 9, Android 4.3.

Portability problems not fixed by Gnulib:
10.454 imaxdiv

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/imaxdiv.html

Gnulib module: imaxdiv

Portability problems fixed by Gnulib:
-
- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, MSVC 9, Android 4.3.

Portability problems not fixed by Gnulib:

10.455 inet_addr

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/inet_addr.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
-
- This function is missing on some platforms: mingw, MSVC 14.
- On some old platforms, this function returns a ‘struct in_addr’ rather than a scalar type such as ‘unsigned int’ or ‘unsigned long’.

10.456 inet_ntoa

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/inet_ntoa.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
-
- This function is missing on some platforms: mingw, MSVC 14.
- The inet_ntoa function need not be reentrant, and consequently is not required to be thread safe. Implementations of inet_ntoa typically write the timestamp into static buffer. If two threads call inet_ntoa at roughly the same time, you might end up with the wrong date in one of the threads, or some undefined string.

Note: inet_ntoa is specific for IPv4 addresses. A protocol independent function is inet_ntop.

10.457 inet_ntop

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/inet_ntop.html

Gnulib module: inet_ntop

Portability problems fixed by Gnulib:
-
- This function is missing on some platforms: HP-UX 11.00, mingw, MSVC 14.
• This function is declared in `<netdb.h>` instead of `<arpa/inet.h>` on some platforms: NonStop Kernel.
• This function is declared in `<ws2tcpip.h>`, with a POSIX incompatible declaration, on some platforms: MSVC 14 on Windows >= Vista.

Portability problems not fixed by Gnulib:
• This function’s fourth argument type is `size_t` instead of `socklen_t` on some platforms: Solaris 10.

### 10.458 inet_pton

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/inet_pton.html
Gnulib module: inet_pton

Portability problems fixed by Gnulib:
• This function is missing on some platforms: HP-UX 11.00, mingw, MSVC 14.
• This function is declared in `<netdb.h>` instead of `<arpa/inet.h>` on some platforms: NonStop Kernel.
• This function is declared in `<ws2tcpip.h>`, with a POSIX incompatible declaration, on some platforms: MSVC 14 on Windows >= Vista.

Portability problems not fixed by Gnulib:

### 10.459 initstate

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/initstate.html
Gnulib module: random

Portability problems fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
• This function is not declared on some platforms: Cygwin 1.5.25.

Portability problems not fixed by Gnulib:
• This function crashes if the state buffer is unaligned on some platforms: glibc 2.36/sparc.
• The first parameter is `unsigned long` instead of `unsigned int` on some platforms: MidnightBSD 2.0.
• The third parameter is `long` instead of `size_t` on some platforms: MidnightBSD 2.0.
• This function makes out-of-bounds writes on some platforms: Haiku.

### 10.460 insque

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/insque.html
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4.

10.461 ioctl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ioctl.html

LSB specification:
- https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ioctl-2.html
- https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ttyio-2.html
- https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sockio-2.html

Gnulib module: ioctl

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), ioctl is called ioctlsocket, and error codes from this function are not placed in errno, and WSAGetLastError must be used instead.

Portability problems not fixed by Gnulib:

- Most ioctl requests are platform and hardware specific.

10.462 isalnum

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isalnum.html

Gnulib module: ctype

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function’s behaviour depends on the locale, but does not support the multi-byte characters that occur in strings in locales with MB_CUR_MAX > 1 (this includes all the common UTF-8 locales). There are five alternative APIs:

c_isalnum

This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module ‘c-ctype’.
iswalnum  This function operates in a locale dependent way, on wide characters. In order
to use it, you first have to convert from multibyte to wide characters, using the
mbtowc function. It is provided by the Gnulib module ‘wctype’.

c32isalnum  This function operates in a locale dependent way, on 32-bit wide characters.
In order to use it, you first have to convert from multibyte to 32-bit wide
characters, using the mbrtoc32 function. It is provided by the Gnulib module
‘c32isalnum’.

mb_isalnum  This function operates in a locale dependent way, on multibyte characters. It
is provided by the Gnulib module ‘mbchar’.

uc_is_alnum  This function operates in a locale independent way, on Unicode characters. It
is provided by the Gnulib module ‘unictype/ctype-alnum’.

10.463 isalnum_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isalnum_l.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0,
  Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC
  14, Android 4.4.

10.464 isalpha

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isalpha.html
Gnulib module: ctype
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function cannot be called from plain inline or extern inline functions on some
  platforms: OS X 10.8.
Note: This function’s behaviour depends on the locale, but does not support the multi-
byte characters that occur in strings in locales with MB_CUR_MAX > 1 (this includes all the
common UTF-8 locales). There are five alternative APIs:

  c_isalpha
  This function operates in a locale independent way and returns true only for
  ASCII characters. It is provided by the Gnulib module ‘c-ctype’.

  iswalpha
  This function operates in a locale dependent way, on wide characters. In order
to use it, you first have to convert from multibyte to wide characters, using the
  mbtowc function. It is provided by the Gnulib module ‘wctype’.
c32isalpha  
This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the mbrtoc32 function. It is provided by the Gnulib module ‘c32isalpha’.

mb_isalpha  
This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module ‘mbchar’.

uc_is_alpha  
This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module ‘unictype/ctype-alpha’.

10.465 isalpha_l  
POSIX specification:  
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isalpha_l.html  
Gnulib module: —  
Portability problems fixed by Gnulib:  

Portability problems not fixed by Gnulib:  
• This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

10.466 isascii  
POSIX specification:  
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isascii.html  
Gnulib module: ctype  
Portability problems fixed by Gnulib:  
• This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:  
Note: This function’s behaviour depends on the locale, but requires special handling for the multibyte characters that occur in strings in locales with MB_CUR_MAX > 1 (this includes all the common UTF-8 locales). There are two alternative APIs:

c_isascii  
This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module ‘c-ctype’.

mb_isascii  
This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module ‘mbchar’.
10.467 isastream

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isastream.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.468 isatty

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isatty.html

Gnulib module: isatty

Portability problems fixed by Gnulib:
- This function is declared in a different header file (namely, <io.h>) on some platforms: MSVC 14.
- On native Windows, this function also returns true for character devices such as NULL.
- On native Windows, this function returns false for Cygwin consoles.
- This function crashes when invoked with invalid arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

10.469 isblank

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isblank.html

Gnulib module: isblank

Portability problems fixed by Gnulib:
- This function is missing on some platforms: IRIX 6.5, Solaris 9, mingw, MSVC 9.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function’s behaviour depends on the locale, but does not support the multi-byte characters that occur in strings in locales with MB_CUR_MAX > 1 (this includes all the common UTF-8 locales). There are five alternative APIs:

- c_isblank
  This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module 'c-ctype'.

- iswblank
  This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the mbtowc function. It is provided by the Gnulib module 'wctype'.
c32isblank
This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the `mbrtoc32` function. It is provided by the Gnulib module ‘c32isblank’.

mb_isblank
This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module ‘mbchar’.

uc_is_blank
This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module ‘unictype/ctype-blank’.

10.470 isblank_l
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isblank_l.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

10.471 iscntrl
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iscntrl.html
Gnulib module: ctype
Portability problems fixed by Gnulib:
• This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.
Portability problems not fixed by Gnulib:
Note: This function’s behaviour depends on the locale, but does not support the multibyte characters that occur in strings in locales with `MB_CUR_MAX > 1` (this includes all the common UTF-8 locales). There are five alternative APIs:
c_iscntrl
This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module ‘c-ctype’.
iswcntrl
This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the `mbtowc` function. It is provided by the Gnulib module ‘wctype’.
c32iscntrl
This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the \texttt{mbrtoc32} function. It is provided by the Gnulib module ‘c32iscntrl’.

mb_iscntrl
This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module ‘mbchar’.

uc_is_cntrl
This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module ‘unictype/ctype-cntrl’.

\textbf{10.472 iscntrl\_l}

POSIX specification:
\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/iscntrl\_l.html}

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

\begin{itemize}
\item This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
\end{itemize}

\textbf{10.473 isdigit}

POSIX specification:
\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/isdigit.html}

Gnulib module: ctype

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

Note: This function’s behaviour depends on the locale, but does not support the multibyte characters that occur in strings in locales with MB\_CUR\_MAX > 1 (this includes all the common UTF-8 locales). There are five alternative APIs:

c_isdigit
This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module ‘c-ctype’.

iswdigit
This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the \texttt{mbrtowc} function. It is provided by the Gnulib module ‘wctype’.
c32isdigit
This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the mbtocr32 function. It is provided by the Gnulib module `c32isdigit`.

mb_isdigit
This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module `mbchar`.

uc_is_digit
This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module `unictype/ctype-digit`.

10.474 isdigit_l
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isdigit_l.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

10.475 isfinite
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isfinite.html
Gnulib module: isfinite
Portability problems fixed by Gnulib:
• This macro is missing on some platforms: macOS 11.1, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.4.
• This macro incorrectly yields true for some ‘double’ arguments, on some platforms: Linux/ia64 (signalling NaNs).
Portability problems not fixed by Gnulib:
• It is implementation-dependent whether isfinite raises an exception given a signaling NaN operand.
• This macro returns an unspecified result when given noncanonical values such as un-normalized numbers, pseudo-denormals, pseudo-NaNs, pseudo-Infinities, and pseudo-zeroes.
10.476 isgraph

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isgraph.html

Gnulib module: ctype

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function’s behaviour depends on the locale, but does not support the multibyte characters that occur in strings in locales with MB_CUR_MAX > 1 (this includes all the common UTF-8 locales). There are five alternative APIs:

- **c_isgraph**
  This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module ‘c-ctype’.

- **iswgraph**
  This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the mbtowc function. It is provided by the Gnulib module ‘wctype’.

- **c32isgraph**
  This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the mbrtoc32 function. It is provided by the Gnulib module ‘c32isgraph’.

- **mb_isgraph**
  This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module ‘mbchar’.

- **uc_is_graph**
  This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module ‘unictype/ctype-graph’.

10.477 isgraph_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isgraph_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
10.478 isgreater

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isgreater.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.4, Android 9.0.

10.479 isgreaterequal

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isgreaterequal.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.4, Android 9.0.

10.480 isinf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isinf.html

Gnulib module: isinf

Portability problems fixed by Gnulib:

• This macro is missing on some platforms: AIX 5.1, IRIX 6.5, Solaris 11.4.

Portability problems not fixed by Gnulib:

• This macro returns an unspecified result when given noncanonical values such as un-normalized numbers, pseudo-denormals, pseudo-NaNs, pseudo-Infinities, and pseudo-zeroes.

10.481 isless

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isless.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.4, Android 9.0.
10.482 islessequal

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/islessequal.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.4, Android 9.0.

10.483 islessgreater

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/islessgreater.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.4, Android 9.0.

10.484 islower

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/islower.html

Gnulib module: ctype

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Note: This function’s behaviour depends on the locale, but does not support the multibyte characters that occur in strings in locales with MB_CUR_MAX > 1 (this includes all the common UTF-8 locales). There are five alternative APIs:

  c_islower
  This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module ‘c-ctype’.

  iswlower
  This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the mbtowc function. It is provided by the Gnulib module ‘wctype’.

  c32islower
  This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the mbtowc32 function. It is provided by the Gnulib module ‘c32islower’.
mb_islower

This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module `mbchar`.

uc_is_lower

This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module `unictype/ctype-lower`.

10.485 islower_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/islower_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

10.486 isnan

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isnan.html

Gnulib module: isnan

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This macro is missing on some platforms: MSVC 9.
- `isnan` was introduced with C99 and is thus commonly not present on pre-C99 systems.
- `isnan` is not a macro on some platforms: IRIX 6.5, Solaris 11.4.
- This macro does not work on some platforms: MSVC 14.
- On IRIX 6.5 with `cc`, `isnan` does not recognize some NaNs.

Portability problems not fixed by Gnulib:

- This macro returns an unspecified result when given noncanonical values such as un-normalized numbers, pseudo-denormals, pseudo-NaNs, pseudo-Infinites, and pseudo-zeroes.

10.487 isnormal

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isnormal.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.4, Android 4.4.
10.488 isprint

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isprint.html

Gnulib module: ctype

Portability problems fixed by Gnulib:
• This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function’s behaviour depends on the locale, but does not support the multi-byte characters that occur in strings in locales with MB_CUR_MAX > 1 (this includes all the common UTF-8 locales). There are five alternative APIs:

c_isprint
This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module ‘c-ctype’.

iswprint
This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the mbtowc function. It is provided by the Gnulib module ‘wctype’.

c32isprint
This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the mbtowc32 function. It is provided by the Gnulib module ‘c32isprint’.

mb_isprint
This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module ‘mbchar’.

uc_is_print
This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module ‘unictype/ctype-print’.

10.489 isprint_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isprint_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
10.490 ispunct

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ispunct.html

Gnulib module: ctype

Portability problems fixed by Gnulib:
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function’s behaviour depends on the locale, but does not support the multibyte characters that occur in strings in locales with MB_CUR_MAX > 1 (this includes all the common UTF-8 locales). There are five alternative APIs:

- **c_ispunct**
  This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module ‘c-ctype’.

- **iswpunct**
  This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the mbrtowc function. It is provided by the Gnulib module ‘wctype’.

- **c32ispunct**
  This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the mbtowc32 function. It is provided by the Gnulib module ‘c32ispunct’.

- **mb_ispunct**
  This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module ‘mbchar’.

- **uc_is_punct**
  This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module ‘unictype/ctype-punct’.

10.491 ispunct_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ispunct_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
10.492 isspace

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isspace.html

Gnulib module: ctype

Portability problems fixed by Gnulib:

• This function cannot be called from plain inline or extern inline functions on some
  platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function’s behaviour depends on the locale, but does not support the multi-
byte characters that occur in strings in locales with MB_CUR_MAX > 1 (this includes all the
common UTF-8 locales). There are five alternative APIs:

c_isspace
This function operates in a locale independent way and returns true only for
ASCII characters. It is provided by the Gnulib module ‘c-ctype’.

iswspace
This function operates in a locale dependent way, on wide characters. In order
to use it, you first have to convert from multibyte to wide characters, using the
mbrtowc function. It is provided by the Gnulib module ‘wctype’.

c32isspace
This function operates in a locale dependent way, on 32-bit wide characters.
In order to use it, you first have to convert from multibyte to 32-bit wide
characters, using the mbrtoc32 function. It is provided by the Gnulib module
‘c32isspace’.

mb_isspace
This function operates in a locale dependent way, on multibyte characters. It
is provided by the Gnulib module ‘mbchar’.

uc_is_space
This function operates in a locale independent way, on Unicode characters. It
is provided by the Gnulib module ‘unictype/ctype-space’.

10.493 isspace_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isspace_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0,
  Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC
  14, Android 4.4.
10.494 isunordered

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isunordered.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.4, Android 9.0.

10.495 isupper

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isupper.html

Gnulib module: ctype

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function’s behaviour depends on the locale, but does not support the multibyte characters that occur in strings in locales with MB_CUR_MAX > 1 (this includes all the common UTF-8 locales). There are five alternative APIs:

- c_isupper: This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module ‘c-ctype’.

- iswupper: This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the mbrtowc function. It is provided by the Gnulib module ‘wctype’.

- c32isupper: This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the mbtocr32 function. It is provided by the Gnulib module ‘c32isupper’.

- mb_isupper: This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module ‘mbchar’.

- uc_is_upper: This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module ‘unictype/ctype-upper’.
10.496 **isupper_l**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isupper_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

10.497 **iswalnum**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswalnum.html

Gnulib module: wctype-h

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

10.498 **iswalnum_l**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswalnum_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.
10.499 iswalpha

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswalpha.html

Gnulib module: wctype-h

Portability problems fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8.
• This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function c32isalpha, provided by Gnulib module c32isalpha, operates on 32-bit wide characters and therefore does not have this limitation.

10.500 iswalpha_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswalpha_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIS 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.501 iswblank

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswblank.html

Gnulib module: iswblank

Portability problems fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, IRIS 6.5, Solaris 9, mingw, MSVC 9, Android 4.4.
• This function is declared but not defined on some platforms: IRIS 6.5.30.
• This function is not declared (without -D_GNU_SOURCE) on some platforms: glibc 2.8.

Portability problems not fixed by Gnulib:
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function c32isblank, provided by Gnulib module c32isblank, operates on 32-bit wide characters and therefore does not have this limitation.
10.502 iswblank_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswblank_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.503 iswcntrl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswcntrl.html

Gnulib module: wctype-h

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function c32iscntrl, provided by Gnulib module c32iscntrl, operates on 32-bit wide characters and therefore does not have this limitation.
- This function returns 0 for U+2028 (LINE SEPARATOR) and U+2029 (PARAGRAPH SEPARATOR) on some platforms: macOS 11.1.

10.504 iswcntrl_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswcntrl_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.
10.505 iswctype

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswctype.html

Gnulib module: iswctype

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8.
- This function is declared in `<wchar.h>`, not in `<wctype.h>`, on some platforms: HP-UX 11.00.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.506 iswctype_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswctype_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.507 iswdigit

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswdigit.html

Gnulib module: wctype-h

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.
- This function is not ISO C 99 compliant on some platforms: FreeBSD 13.0, NetBSD 9.0, Solaris 11.4, mingw, MSVC 14.

Portability problems not fixed by Gnulib:
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32isdigit`, provided by Gnulib module `c32isdigit`, operates on 32-bit wide characters and therefore does not have this limitation.
10.508 iswdigit_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswdigit_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.509 iswgraph

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswgraph.html

Gnulib module: wctype-h

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8.

• This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

10.510 iswgraph_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswgraph_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.
10.511 iswlower

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswlower.html

Gnulib module: wctype-h

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function c32islower, provided by Gnulib module c32islower, operates on 32-bit wide characters and therefore does not have this limitation.

10.512 iswlower_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswlower_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.513 iswprint

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswprint.html

Gnulib module: wctype-h

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function c32isprint, provided by Gnulib module c32isprint, operates on 32-bit wide characters and therefore does not have this limitation.
10.514 iswprint_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswprint_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.515 iswpunct

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswpunct.html

Gnulib module: wchar-type-h

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function c32ispunct, provided by Gnulib module c32ispunct, operates on 32-bit wide characters and therefore does not have this limitation.

10.516 iswpunct_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswpunct_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.
10.517 `iswspace`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswspace.html

Gnulib module: `wctype-h`

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32isspace`, provided by Gnulib module `c32isspace`, operates on 32-bit wide characters and therefore does not have this limitation.

10.518 `iswspace_l`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswspace_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.519 `iswupper`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswupper.html

Gnulib module: `wctype-h`

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32isupper`, provided by Gnulib module `c32isupper`, operates on 32-bit wide characters and therefore does not have this limitation.
10.520 iswupper_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswupper_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.521 iswxdigit

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswxdigit.html

Gnulib module: wctype-h

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.
- This function is not ISO C 99 compliant on some platforms: FreeBSD 13.0, NetBSD 9.0, Solaris 11.4, MSVC 14.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function c32isxdigit, provided by Gnulib module c32isxdigit, operates on 32-bit wide characters and therefore does not have this limitation.

10.522 iswxdigit_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswxdigit_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.
10.523 isxdigit

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isxdigit.html

Gnulib module: ctype

Portability problems fixed by Gnulib:
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function’s behaviour depends on the locale, but does not support the multi-byte characters that occur in strings in locales with MB_CUR_MAX > 1 (this includes all the common UTF-8 locales). There are five alternative APIs:

c_isxdigit
This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module ‘c-ctype’.

iswxdigit
This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the mbtowc function. It is provided by the Gnulib module ‘wctype’.

c32isxdigit
This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the mbtoc32 function. It is provided by the Gnulib module ‘c32isxdigit’.

mb_isxdigit
This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module ‘mbchar’.

uc_is_xdigit
This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module ‘unictype/ctype-xdigit’.

10.524 isxdigit_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isxdigit_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
10.525 j0

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/j0.html

Gnulib module: j0
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8.

10.526 j1

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/j1.html

Gnulib module: j1
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8.

10.527 jn

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/jn.html

Gnulib module: jn
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8.

10.528 jrand48

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/jrand48.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.529 kill

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/kill.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-kill-3.html

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14.

10.530 killpg

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/killpg.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14.

10.531 l64a

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/l64a.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 6.0, Minix 3.1.8, mingw, MSVC 14, Android 9.0.
• This function was not correctly implemented in glibc versions before 2.2.5.

10.532 labs

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/labs.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Android 4.3.

10.533 lchown

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lchown.html

Gnulib module: lchown

Portability problems fixed by Gnulib:

• Some platforms fail to detect trailing slash on non-directories, as in $lchown("link-to-file/",uid,gid)$: FreeBSD 7.2, Solaris 9.
• Some platforms fail to update the change time when at least one argument was not -1, but no ownership changes resulted. However, without $lchmod$, the replacement only fixes this for non-symlinks: OpenBSD 4.0.
• This function is missing on some platforms; however, the replacement fails on symlinks if chown is supported, and fails altogether with ENOSYS otherwise: Minix 3.1.8, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

10.534 lcong48

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lcong48.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 5.1.

10.535 ldexp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ldexp.html
Gnulib module: ldexp
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:

10.536 ldexpf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ldexpf.html
Gnulib module: ldexpf
Portability problems fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9.
• This function is only defined as a macro with arguments on some platforms: MSVC 14.
Portability problems not fixed by Gnulib:

10.537 ldexpl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ldexpl.html
Gnulib module: ldexpl
Portability problems fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x.
This function is only defined as a macro with arguments on some platforms: MSVC 14.

This function has no prototype in `<math.h>` on some platforms: Mac OS X.

This function does not work on finite numbers on some platforms: AIX 5.1.

Portability problems not fixed by Gnulib:

10.538 ldiv

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ldiv.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.539 lfind

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lfind.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

This function is missing on some platforms: Android 4.4.

10.540 lgamma

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lgamma.html

Gnulib module: lgamma

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

This function is missing on some platforms: Minix 3.1.8, MSVC 9.

10.541 lgammaf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lgammaf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.
10.542 lgammal

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lgammal.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.

10.543 link

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/link.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-link-1.html

Gnulib module: link

Portability problems fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.
• This function fails to reject trailing slashes on non-directories on some platforms: FreeBSD 7.2, Solaris 11.3, Cygwin 1.5.x.
• When the second argument is a dangling symlink, some platforms follow that link and create the destination rather than failing: IRIX 6.5.

Portability problems not fixed by Gnulib:
• When the first argument is a symlink, some platforms create a hard-link to what the symlink referenced, rather than to the symlink itself. Use ‘linkat’ to force a particular behavior.

10.544 linkat

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/linkat.html

Gnulib module: linkat

Portability problems fixed by Gnulib:
• This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.9, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4. But the replacement function is not safe to be used in libraries and is not multithread-safe.
• This function fails to directly hardlink symlinks on some platforms: Mac OS X 10.10.
• This function fails to reject trailing slashes on non-directories on some platforms: macOS 11.1, AIX 7.1, Solaris 11.3.
• This functions does not support AT_SYMLINK_FOLLOW on some platforms: Linux kernel 2.6.17.

Portability problems not fixed by Gnulib:
10.545 lio_listio

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lio_listio.html

Gnulib module: —

Portability problems fixed by Gnulib:
• On platforms where off_t is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.546 listen

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/listen.html

Gnulib module: listen

Portability problems fixed by Gnulib:
• On Windows platforms (excluding Cygwin), error codes from this function are not placed in errno, and WSAGetLastError must be used instead.

Portability problems not fixed by Gnulib:

10.547 llabs

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/llabs.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, HP-UX 11.23, MSVC 9, Android 4.3.

10.548 lldiv

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lldiv.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, HP-UX 11.23, MSVC 9.
10.549 llogb

Documentation:

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.550 llogbf

Documentation:

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.551 llogbl

Documentation:

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.552 llrint

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/llrint.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.5.x, MSVC 9.
10.553 `llrintf`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/llrintf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, MSVC 9.

10.554 `llrintl`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/llrintl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, MSVC 9, Android 4.4.

10.555 `llround`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/llround.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9.

10.556 `llroundf`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/llroundf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9.
10.557 l1roundl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/l1roundl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.

10.558 localeconv

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/localeconv.html

Gnulib module: localeconv

Portability problems fixed by Gnulib:

• The struct lconv type does not contain any members on some platforms: Android up to 2014.
• The struct lconv type does not contain the members int_p_cs_precedes, int_p_sign_posn, int_p_sep_by_space, int_n_cs_precedes, int_n_sign_posn, int_n_sep_by_space on some platforms: glibc, OpenBSD 4.9, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.

• The values of fields of struct lconv of type char are -1 instead of CHAR_MAX on some platforms: mingw.

Portability problems not fixed by Gnulib:

10.559 localtime

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/localtime.html

Gnulib module: localtime

Portability problems fixed by Gnulib:

• On native Windows platforms (mingw, MSVC), this function works incorrectly when the environment variable TZ has been set by Cygwin.

Portability problems not fixed by Gnulib:

• On some platforms, this function loops forever for values near extrema (such as the year −2 \times 31): Mac OS X 10.6. You can use the time_rz module to work around the problem.
• On some platforms, this function returns nonsense values for unsupported arguments (like 2^{56}), rather than failing: FreeBSD 10.
• On some platforms, this function yields incorrect values for timestamps before the year 1: MacOS X 10.5, Solaris 11.3.
• Native Windows platforms (mingw, MSVC) support only a subset of time zones supported by GNU or specified by POSIX. See Section 10.1192 [tzset], page 443.
10.560  localtime_r

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/localtime_r.html

Gnulib module: time_r

Portability problems fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.
• This function is not declared unless _REENTRANT is defined, on some platforms: HP-UX 11.

Portability problems not fixed by Gnulib:
• On some platforms, this function loops forever for values near extrema (such as the year \(-2 \cdot 2^{31}\)): Mac OS X 10.6. You can use the time_rz module to work around the problem.
• On some platforms, this function returns nonsense values for unsupported arguments (like 2^6), rather than failing: FreeBSD 10.
• On some platforms, this function yields incorrect values for timestamps before the year 1: MacOS X 10.5, Solaris 11.3.

10.561  lockf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lockf.html

Gnulib module: —

Portability problems fixed by Gnulib:
• On platforms where off_t is a 32-bit type, this function may not work correctly across the entire data range of files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 6.0.

10.562  log

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/log.html

Gnulib module: log or log-ieee

Portability problems fixed by either Gnulib module log or log-ieee:

Portability problems fixed by Gnulib module log-ieee:
• This function returns a wrong value for a negative argument on some platforms: NetBSD 5.1, Solaris 11.4.

Portability problems not fixed by Gnulib:
10.563 log10

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/log10.html

Gnulib module: log10 or log10-ieee
Portability problems fixed by either Gnulib module log10 or log10-ieee:

- This function returns a wrong value for a negative argument on some platforms:
  NetBSD 5.1, Solaris 11.4.

Portability problems not fixed by Gnulib:

10.564 log10f

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/log10f.html

Gnulib module: log10f or log10f-ieee
Portability problems fixed by either Gnulib module log10f or log10f-ieee:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems fixed by Gnulib module log10f-ieee:

- This function returns a wrong value for a negative argument on some platforms:
  NetBSD 5.1.

Portability problems not fixed by Gnulib:

10.565 log10l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/log10l.html

Gnulib module: log10l
Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8,
  Minix 3.1.8, HP-UX 11, older IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.
- This function is not declared and does not work on some platforms: AIX 5.1.
- This function returns an unnormalized negative infinity for a minus zero argument on
  some platforms: IRIX 6.5.
- This function returns an unnormalized positive infinity for a positive infinite argument
  on some platforms: IRIX 6.5.
- This function produces results which are accurate to only 16 digits on some platforms:
  musl libc 1.2.2/arm64, musl libc 1.2.2/s390x, NetBSD 9.0.

Portability problems not fixed by Gnulib:
10.566 log1p

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/log1p.html

Gnulib module: log1p or log1p-ieee

Portability problems fixed by either Gnulib module log1p or log1p-ieee:
- This function is missing on some platforms: Minix 3.1.8, MSVC 9.

Portability problems fixed by Gnulib module log1p-ieee:
- This function has problems when the argument is minus zero on some platforms: AIX 7.1, HP-UX 11.

Portability problems not fixed by Gnulib:

10.567 log1pf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/log1pf.html

Gnulib module: log1pf or log1pf-ieee

Portability problems fixed by either Gnulib module log1pf or log1pf-ieee:
- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 9, MSVC 9.
- This function returns a wrong value for the argument -1.0f on some platforms: IRIX 6.5.

Portability problems fixed by Gnulib module log1pf-ieee:
- This function has problems when the argument is minus zero on some platforms: OpenBSD 4.9, AIX 7.1.

Portability problems not fixed by Gnulib:

10.568 log1pl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/log1pl.html

Gnulib module: log1pl or log1pl-ieee

Portability problems fixed by either Gnulib module log1pl or log1pl-ieee:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.
- This function produces results which are accurate to only 16 digits on some platforms: musl libc 1.2.2/arm64, musl libc 1.2.2/s390x.

Portability problems fixed by Gnulib module log1pl-ieee:
- This function has problems when the argument is minus zero on some platforms: AIX 7.1, IRIX 6.5.

Portability problems not fixed by Gnulib:
10.569 log2

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/log2.html

Gnulib module: log2 or log2-ieee

Portability problems fixed by either Gnulib module log2 or log2-ieee:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, older IRIX 6.5, Solaris 9, MSVC 9, Android 4.2.
- This function is not declared on some platforms: IRIX 6.5.
- This function is only provided as a macro on some platforms: Cygwin 1.5.x.
- This function returns slightly wrong values for exact powers of 2 on some platforms: Cygwin 1.7.9.

Portability problems fixed by Gnulib module log2-ieee:
- This function returns a wrong value for a negative argument on some platforms: NetBSD 5.1, Solaris 10/x86_64.

Portability problems not fixed by Gnulib:

10.570 log2f

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/log2f.html

Gnulib module: log2f or log2f-ieee

Portability problems fixed by either Gnulib module log2f or log2f-ieee:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, older IRIX 6.5, Solaris 9, MSVC 9, Android 4.2.
- This function is not declared on some platforms: IRIX 6.5.
- This function is only provided as a macro on some platforms: Cygwin 1.5.x.
- This function returns slightly wrong values for exact powers of 2 on some platforms: Cygwin 1.7.9.

Portability problems fixed by Gnulib module log2f-ieee:
- This function returns a wrong value for a negative argument on some platforms: NetBSD 5.1, Solaris 10/x86_64.

Portability problems not fixed by Gnulib:

10.571 log2l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/log2l.html

Gnulib module: log2l

Portability problems fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.2.
• This function is not declared on some platforms: IRIX 6.5.
• This function produces results which are accurate to only 16 digits on some platforms:
  musl libc 1.2.2/arm64, musl libc 1.2.2/s390x.
• This function returns Infinity for some large finite arguments on some platforms: musl
  libc 1.2.2/arm64, musl libc 1.2.2/s390x.

Portability problems not fixed by Gnulib:

10.572  logb

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/logb.html

Gnulib module: logb

Portability problems fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, MSVC 9.
• This function is missing a declaration on some platforms: Cygwin 1.5.x.
• This function produces wrong results for subnormal numbers on some platforms: glibc
  2.17/powerpc, glibc 2.7/sparc, glibc 2.7/hppa, Solaris 11.4, Cygwin 1.5.x.

Portability problems not fixed by Gnulib:

10.573  logbf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/logbf.html

Gnulib module: logbf

Portability problems fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX
  6.5, Solaris 9, MSVC 9.
• This function produces wrong results for subnormal numbers on some platforms: glibc
  2.11/powerpc, glibc 2.7/sparc, glibc 2.7/hppa, Solaris 11.4.

Portability problems not fixed by Gnulib:

10.574  logbl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/logbl.html

Gnulib module: logbl

Portability problems fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8,
  Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9,
  Android 4.2.
• This function produces wrong results for subnormal numbers on some platforms: glibc
  2.11/powerpc, glibc 2.7/sparc, glibc 2.7/hppa, Solaris 11.4, glibc 2.23/powerpc64le.

Portability problems not fixed by Gnulib:
10.575 logf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/logf.html

Gnulib module: logf or logf-ieee

Portability problems fixed by either Gnulib module logf or logf-ieee:
- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems fixed by Gnulib module logf-ieee:
- This function returns a wrong value for a negative argument on some platforms: NetBSD 5.1.

Portability problems not fixed by Gnulib:

10.576 logl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/logl.html

Gnulib module: logl

Portability problems fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.
- This function produces results which are accurate to only 16 digits on some platforms: musl libc 1.2.2/arm64, musl libc 1.2.2/s390x, NetBSD 9.0.

Portability problems not fixed by Gnulib:

10.577 longjmp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/longjmp.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- The effects of this call are system and compiler optimization dependent, since it restores the contents of register-allocated variables but not the contents of stack-allocated variables.
- When longjumping out of a signal handler that was being executed on an alternate stack (installed through sigaltstack), on FreeBSD, NetBSD, OpenBSD, you need to clear the SS_ONSTACK flag in the stack_t structure managed by the kernel.
10.578  lrand48

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lrand48.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.579  lrint

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lrint.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.

10.580  lrintf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lrintf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

10.581  lrintl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lrintl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, MSVC 9, Android 4.4.
10.582 lround

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lround.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.

10.583 lroundf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lroundf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

10.584 lroundl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lroundl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.

10.585 lsearch

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lsearch.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Android 4.4.
10.586 lseek

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lseek.html

Gnulib module: lseek

Portability problems fixed by Gnulib:
- On some platforms, lseek (fd, offset, SEEK_DATA) returns a value greater than offset even when offset addresses data: macOS 12.
- This function is declared in a different header file (namely, <io.h>) on some platforms: MSVC 14.
- On platforms where off_t is a 32-bit type, lseek does not work correctly with files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.
- This function mistakenly succeeds on pipes on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
- POSIX does not specify which file descriptors support seeking and which don’t. In practice, regular files and block devices support seeking, and ttys, pipes, and most character devices don’t support it.
- When the third argument is invalid, POSIX says that lseek should set errno to EINVAL and return -1, but in this situation a SIGSYS signal is raised on some platforms: IRIX 6.5.
- Some systems do not support SEEK_DATA and SEEK_HOLE: AIX, HP-UX, Microsoft Windows, NetBSD, OpenBSD.
- Some systems have a buggy SEEK_DATA and SEEK_HOLE, and Gnulib works around the problem via #undef SEEK_DATA and #undef SEEK_HOLE: FreeBSD 13, macOS 12.

10.587 lstat

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lstat.html

Gnulib module: lstat

Portability problems fixed by Gnulib:
- On platforms where off_t is a 32-bit type, lstat may not correctly report the size of files or block devices 2 GiB and larger. See Section 14.2 [Large File Support], page 753.
- On Linux/x86 and Linux/x86_64, applications compiled in 32-bit mode cannot access files that happen to have a 64-bit inode number. This can occur with file systems such as XFS (typically on large disks) and NFS. See Section 14.2 [Large File Support], page 753.
- For symlinks, when the argument ends in a slash, some platforms don’t dereference the argument: Solaris 9.
- On some platforms, lstat("file/",buf) succeeds instead of failing with ENOTDIR. macOS 11.1, Solaris 9.
- On Solaris 11.4, when this function yields a timestamp with a nonpositive tv_sec value, tv_nsec might be in the range −1000000000..−1, representing a negative nanoseconds offset from tv_sec.
- On Windows platforms (excluding Cygwin), symlinks are not supported, so `lstat` does not exist.

Portability problems not fixed by Gnulib:
- See Section 9.65 [sys/stat.h], page 75, for general portability problems with `struct stat`.

### 10.588 malloc

**POSIX specification:**

https://pubs.opengroup.org/onlinepubs/9699919799/functions/malloc.html

Gnulib module: malloc-posix

Portability problems fixed by Gnulib:
- Upon failure, the function does not set `errno` to `ENOMEM` on some platforms: mingw, MSVC 14.
- On some platforms, `malloc(n)` can succeed even if `n` exceeds `PTRDIFF_MAX`. Although this behavior is arguably allowed by POSIX it can lead to behavior not defined by POSIX later, so malloc-posix does not allow going over the limit.

Extension: Gnulib provides a module `malloc-gnu` that substitutes a malloc implementation that behaves more like the glibc implementation, by fixing this portability problem:
- `malloc(0)` returns `NULL` on success on some platforms: AIX 7.2.

### 10.589 mblen

**POSIX specification:**

https://pubs.opengroup.org/onlinepubs/9699919799/functions/mblen.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Android 7.1.

### 10.590 mbrlen

**POSIX specification:**

https://pubs.opengroup.org/onlinepubs/9699919799/functions/mbrlen.html

Gnulib module: mbrlen

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, mingw.
- In the C or POSIX locales, this function can return `(size_t) -1` and set `errno` to `EILSEQ`: glibc 2.35.
- This function returns 0 instead of `(size_t) -2` when the input is empty: glibc 2.19.
- This function returns `(size_t) -1` instead of `(size_t) -2` when the input is empty: AIX 5.1.
• This function does not put the state into non-initial state when parsing an incomplete multibyte character on some platforms: AIX 5.1.
• This function returns the total number of bytes that make up the multibyte character, not the number of bytes that were needed to complete the multibyte character, on some platforms: HP-UX 11.11, Solaris 11 2010-11.
• This function may not return 0 when parsing the NUL character on some platforms: Solaris 9.

Portability problems not fixed by Gnulib:

10.591 mbrtoc8

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on most platforms: glibc 2.29, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.592 mbrtoc16

Gnulib module: mbrtoc16

Portability problems fixed by Gnulib:
• This function is missing on most non-glibc platforms: glibc 2.15, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 9, Android 4.4.
• This function may crash when the first argument is NULL on some platforms: glibc 2.36.
• In the C or POSIX locales, this function can return \((\text{size\_t}) -1\) and set errno to EILSEQ: glibc 2.36.
• This function returns 0 instead of \((\text{size\_t}) -2\) when the input is empty: glibc 2.19, Android 11.
• This function returns the total number of bytes that make up the multibyte character, not the number of bytes that were needed to complete the multibyte character, on some platforms: mingw.
• This function returns \((\text{size\_t}) -3\) instead of a byte count when it has stored a high surrogate, and returns a byte count instead of \((\text{size\_t}) -3\) when it has stored a low surrogate, on some platforms: Android.
• This function does not recognize multibyte sequences that mbrtowc recognizes on some platforms: FreeBSD 13.2, Solaris 11.4, MSVC 14.

Portability problems not fixed by Gnulib:
• After mbrtoc16 returns a char16_t value, mbsinit cannot be used to determine whether the function is ready to return another char16_t value. To do so, instead call mbrtoc16 again, with an appropriately incremented const char * argument and an appropriately decremented size_t argument.
10.593 mbrtoc32

Gnulib module: mbrtoc32

Portability problems fixed by Gnulib:
- This function is missing on most non-glibc platforms: glibc 2.15, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 9, Android 4.4.
- In the C or POSIX locales, this function can return (size_t) -1 and set errno to EILSEQ: glibc 2.35.
- This function returns 0 instead of (size_t) -2 when the input is empty: glibc 2.19, mingw, Android 11, Haiku.
- This function does not recognize multibyte sequences that mbrtowc recognizes on some platforms: FreeBSD 13.2, Solaris 11.4, mingw, MSVC 14.

Portability problems not fixed by Gnulib:
- This function is only defined as an inline function on some platforms: Haiku 2020.

Note: If you want the guarantee that the char32_t values returned by this function are Unicode code points, you also need to request the uchar-c23 module.

10.594 mbrtowc

POSIX specification: https://pubs.opengroup.org/onlinepubs/9699919799/functions/mbrtowc.html

Gnulib module: mbrtowc

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, mingw.
- In the C or POSIX locales, this function can return (size_t) -1 and set errno to EILSEQ: glibc 2.35.
- This function returns 0 instead of (size_t) -2 when the input is empty: glibc 2.19, MSVC 14, Android 11.
- This function returns (size_t) -1 instead of (size_t) -2 when the input is empty: AIX 7.2.
- This function does not put the state into non-initial state when parsing an incomplete multibyte character on some platforms: AIX 7.2.
- This function stores a wide character when parsing an incomplete multibyte character on some platforms: MSVC 14.
- This function returns the total number of bytes that make up the multibyte character, not the number of bytes that were needed to complete the multibyte character, on some platforms: HP-UX 11.11, Solaris 11 2010-11, mingw, MSVC 14.
- This function may not return 0 when parsing the NUL character on some platforms: Solaris 9.
Portability problems not fixed by GnuLib:

- In UTF-8 locales, this function may return wide characters up to 0x7FFFFFFF (that is, beyond 0x0010FFFF) on some platforms: glibc 2.34.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the ISO C11 function `mbrtoc32`, provided by GnuLib module `mbrtoc32`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.595 `mbsinit`

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mbsinit.html

GnuLib module: `mbsinit`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, MSVC 14.
- This function always returns 1, even in multibyte locales, on some platforms: mingw.

Portability problems not fixed by GnuLib:

- This function is not useful after calls to `mbrtoc16` or `mbrtoc8`.

### 10.596 `mbsnrtowcs`

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mbsnrtowcs.html

GnuLib module: `mbsnrtowcs`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4.
- This function produces invalid wide characters on some platforms: Solaris 11.4.
- In the C or POSIX locales, this function can return `(size_t) -1` and set `errno` to `EILSEQ`: glibc 2.35.

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the GnuLib function `mbsnrtoc32s`, provided by GnuLib module `mbsnrtoc32s`, operates on 32-bit wide characters and therefore does not have this limitation.
- The specification is not clear about whether this function should update the conversion state when the first argument (the destination pointer) is `NULL`. The glibc, Mac OS X, FreeBSD implementations do update the state in this case. For portability, when passing a `NULL` destination argument, it is best to pass a pointer to a temporary copy of the conversion state.
10.597 mbsrtowcs

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mbsrtowcs.html

Gnulib module: mbsrtowcs

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, mingw.
- This function does not work on some platforms: HP-UX 11, Solaris 11 2010-11.
- In the C or POSIX locales, this function can return (size_t) -1 and set errno to EILSEQ: glibc 2.35.
- This function does not work when the first argument is NULL on some platforms: mingw.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function mbsrtoc32s, provided by Gnulib module mbsrtoc32s, operates on 32-bit wide characters and therefore does not have this limitation.
- The specification is not clear about whether this function should update the conversion state when the first argument (the destination pointer) is NULL. The glibc implementation does not update the state in this case; the macOS and FreeBSD implementations do. For portability, when passing a NULL destination argument, it is best to pass a pointer to a temporary copy of the conversion state.

10.598 mbstowcs

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mbstowcs.html

Gnulib module: mbstowcs

Portability problems fixed by Gnulib:

- In the C or POSIX locales, this function can return (size_t) -1 and set errno to EILSEQ: glibc 2.35.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function mbstoc32s, provided by Gnulib module mbstoc32s, operates on 32-bit wide characters and therefore does not have this limitation.

10.599 mbtowc

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mbtowc.html

Gnulib module: mbtowc

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Android 4.4.
Portability problems not fixed by GnuLib:

- In UTF-8 locales, this function may return wide characters up to 0x7FFFFFFF (that is, beyond 0x0010FFFF) on some platforms: glibc 2.34.
- This function accumulates hidden state on some platforms: glibc 2.8 (see https://sourceware.org/bugzilla/show_bug.cgi?id=9674).
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.600 `memccpy`

POSIX specification: https://pubs.opengroup.org/onlinepubs/9699919799/functions/memccpy.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

### 10.601 `memchr`

POSIX specification: https://pubs.opengroup.org/onlinepubs/9699919799/functions/memchr.html

GnuLib module: memchr

Portability problems fixed by GnuLib:

- This function dereferences too much memory on some platforms: glibc 2.10 on x86_64, IA-64; glibc 2.11 on Alpha, AIX 7.2.
- This function returns NULL if the character argument is not in the range of an unsigned char on some platforms: Android 5.0.

Portability problems not fixed by GnuLib:

### 10.602 `memcmp`

POSIX specification: https://pubs.opengroup.org/onlinepubs/9699919799/functions/memcmp.html

GnuLib module: memcmp

Portability problems fixed by GnuLib:

- This function fails when comparing 16 bytes or more and with at least one buffer not starting on a 4-byte boundary on some older platforms: NeXTstep/x86.

Portability problems not fixed by GnuLib:

- This function produces wrong results when the arguments are constant strings and the compiler is clang 6.0.1.
10.603 memcpy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/memcpy.html

Gnulib module: memcpy

Portability problems fixed by Gnulib:
• This function cannot be called from plain inline or extern inline functions on some
  platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

10.604 memmove

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/memmove.html

Gnulib module: memmove

Portability problems fixed by Gnulib:
• This function cannot be called from plain inline or extern inline functions on some
  platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

10.605 memset

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/memset.html

Gnulib module: memset

Portability problems fixed by Gnulib:
• This function cannot be called from plain inline or extern inline functions on some
  platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

10.606 memset_explicit

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Erasing-Sensitive-Data.html,

Gnulib module: memset_explicit

The memset_explicit function is an approximation to what is needed, and does not
suffice in general to erase information. Although calling memset_explicit should clear the
memory in question, the information that was in memory may still be available elsewhere
on the machine. Proper implementation of information erasure requires support from levels
below C code.

Portability problems fixed by Gnulib:
• This function is missing on some platforms: glibc 2.36, FreeBSD 13.1, NetBSD 9.3,
  OpenBSD 7.2, macOS 13, Solaris 11.4, Android 13, and many other systems.
Portability problems not fixed by Gnulib:

- Although the module’s implementation should set the memory on platforms compatible with GCC and on platforms using traditional linkers, it may not set the memory on non-GCC platforms that use whole-program optimization.

10.607 mkdir

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mkdir.html

Gnulib module: sys_stat or mkdir

Portability problems fixed by either Gnulib module sys_stat or mkdir:

- This function is declared in different header files (namely, `<io.h>` or `<direct.h>`) on some platforms: mingw, MSVC 14.
- On Windows platforms (excluding Cygwin), this function is called `_mkdir` and takes only one argument. The fix (without Gnulib) is to define a macro like this:
  
  ```
  #define mkdir ((int (*)(void)) _mkdir)
  ```

  or

  ```
  #define mkdir(path,mode) _mkdir (path)
  ```

Portability problems fixed by Gnulib module mkdir:

- When the argument ends in a slash, the function call fails on some platforms.
- This function mistakenly succeeds on `mkdir("d/./",mode)` on some platforms: Cygwin 1.5.x, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

10.608 mkdirat

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mkdirat.html

Gnulib module: mkdirat

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14. But the replacement function is not safe to be used in libraries and is not multithread-safe.

Portability problems not fixed by Gnulib:

10.609 mkdtemp

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mkdtemp.html

Gnulib module: mkdtemp

Portability problems fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

Portability problems not fixed by Gnulib:
10.610 mkfifo

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mkfifo.html

Gnulib module: mkfifo

Portability problems fixed by Gnulib:
- This function mishandles trailing slash on some platforms: FreeBSD 7.2, Solaris 9.
- This function is missing on some platforms; however, the replacement always fails with ENOSYS: mingw, MSVC 14, Android 4.4.

Portability problems not fixed by Gnulib:
- If the argument exists and is a directory, this function fails with EISDIR instead of the correct EEXIST: HP-UX 11.11.

10.611 mkfifoat

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mkfifoat.html

Gnulib module: mkfifoat

Portability problems fixed by Gnulib:
- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 5.1. But the replacement function is not safe to be used in libraries and is not multithread-safe.
- This function does not fail when the file name argument ends in a slash and (without the slash) names a nonexistent file, on some platforms: AIX 7.2.

Portability problems not fixed by Gnulib:
- The gnulib replacement function always fails with ‘ENOSYS’ on some platforms: mingw, MSVC 14.
- If the argument exists and is a directory, the gnulib replacement function fails with EISDIR instead of the correct EEXIST: HP-UX 11.11.

10.612 mknod

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mknod.html

Gnulib module: mknod

Portability problems fixed by Gnulib:
- This function requires super-user privileges to create a fifo: FreeBSD 7.2, NetBSD 8.0, OpenBSD 6.7.
- This function mishandles trailing slash on some platforms: FreeBSD 7.2, Solaris 9.
- This function is missing on some platforms; however, the replacement always fails with ENOSYS: mingw, MSVC 14.
Portability problems not fixed by Gnulib:

- Use of this function for anything except fifos is not portable, generally requiring superuser privileges and knowledge of supported device numbers.
- If the argument exists and is a directory, this function fails with EISDIR instead of the correct EEXIST: HP-UX 11.11.

10.613 mknodat

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mknodat.html

Gnulib module: mkfifoat

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4. But the replacement function is not safe to be used in libraries and is not multithread-safe.
- This function does not fail when the file name argument ends in a slash and (without the slash) names a nonexistent file, on some platforms: AIX 7.2.

Portability problems not fixed by Gnulib:

- The gnulib replacement function always fails with ‘ENOSYS’ on some platforms: mingw, MSVC 14.
- If the argument exists and is a directory, the gnulib replacement function fails with EISDIR instead of the correct EEXIST: HP-UX 11.11.

10.614 mkstemp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mkstemp.html

Gnulib module: mkstemp

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- On platforms where off_t is a 32-bit type, mkstemp may not work correctly to create files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.
- On some older platforms, mkstemp can create a world or group writable or readable file, if you haven’t set the process umask to 077. This is a security risk.

Portability problems not fixed by Gnulib:

The gnulib module clean-temp can create temporary files that will not be left behind after signals such as SIGINT.
10.615 mktime

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mktime.html

Gnulib module: mktime

Portability problems fixed by Gnulib:

- On native Windows platforms (mingw, MSVC), this function works incorrectly when the environment variable TZ has been set by Cygwin.
- mktime may go into an endless loop on some platforms.
- mktime may occasionally return wrong results on some platforms.

Portability problems not fixed by Gnulib:

- On some platforms, this function yields incorrect values for timestamps before the year 1: MacOS X 10.5, Solaris 11.3.
- Native Windows platforms (mingw, MSVC) support only a subset of time zones supported by GNU or specified by POSIX. See Section 10.1192 [tzset], page 443.

10.616 mlock

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mlock.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.617 mlockall

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mlockall.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 4.1.

10.618 mmap

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mmap.html

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where off_t is a 32-bit type, this function may not work correctly across the entire data range of files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.
Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- To get anonymous memory, on some platforms, you can use the flags \texttt{MAP\_ANONYMOUS | MAP\_PRIVATE} and \texttt{-1} instead of a file descriptor; on others you have to use a read-only file descriptor of \texttt{/dev/zero}.
- On HP-UX, passing a non-NULL first argument, as a hint for the address (even without \texttt{MAP\_FIXED}), often causes \texttt{mmap} to fail. Better pass \texttt{NULL} in this case.
- On HP-UX, \texttt{MAP\_FIXED} basically never works. On other platforms, it depends on the circumstances whether memory can be returned at a given address.

10.619 \texttt{modf}

POSIX specification:

\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/modf.html}

Gnulib module: \texttt{modf} or \texttt{modf-ieee}

Portability problems fixed by either Gnulib module \texttt{modf} or \texttt{modf-ieee}:

Portability problems fixed by Gnulib module \texttt{modf-ieee}:

- This function has problems with a NaN argument on some platforms: NetBSD 5.1, Cygwin.
- This function has problems with infinite arguments on some platforms: FreeBSD 6.4, OpenBSD 6.7, IRIX 6.5.

Portability problems not fixed by Gnulib:

10.620 \texttt{modff}

POSIX specification:

\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/modff.html}

Gnulib module: \texttt{modff} or \texttt{modff-ieee}

Portability problems fixed by either Gnulib module \texttt{modff} or \texttt{modff-ieee}:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11.
- This function is only defined as a buggy macro with arguments on some platforms: MSVC 14.

Portability problems fixed by Gnulib module \texttt{modff-ieee}:

- This function has problems with a NaN argument on some platforms: NetBSD 5.1, OpenBSD 6.7, Solaris 9, Cygwin.
- This function has problems with infinite arguments on some platforms: IRIX 6.5, mingw.

Portability problems not fixed by Gnulib:
10.621 **modfl**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/modfl.html

Gnulib module: modfl or modfl-ieee

Portability problems fixed by either Gnulib module modfl or modfl-ieee:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems fixed by Gnulib module modfl-ieee:
- This function has problems with infinite arguments on some platforms: IRIX 6.5, mingw.

Portability problems not fixed by Gnulib:

10.622 **mprotect**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mprotect.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- This function does not set `errno` on some platforms: mingw.
- On AIX, it is not possible to use `mprotect` on memory regions allocated with `malloc`.

10.623 **mq_close**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_close.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

10.624 **mq_getattr**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_getattr.html

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

10.625 mq_notify

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_notify.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

10.626 mq_open

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_open.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

10.627 mq_receive

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_receive.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

10.628 mq_send

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_send.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.
10.629 mq_setattr

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_setattr.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

10.630 mq_timedreceive

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_timedreceive.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

10.631 mq_timedsend

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_timedsend.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

10.632 mq_unlink

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_unlink.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.
10.633 mrand48

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mrand48.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.634 msgctl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/msgctl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 7.1.

10.635 msgget

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/msgget.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 7.1.

10.636 msgrcv

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/msgrcv.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 7.1.
10.637  **msgsnd**

   POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/msgsnd.html
   Gnulib module: —
   Portability problems fixed by Gnulib:
   Portability problems not fixed by Gnulib:
   • This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 7.1.

10.638  **msync**

   POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/msync.html
   Gnulib module: —
   Portability problems fixed by Gnulib:
   Portability problems not fixed by Gnulib:
   • This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
   • On NetBSD, `msync` takes only two arguments.

10.639  **mtx_destroy**

   Documentation:
   Gnulib module: mtx
   Portability problems fixed by Gnulib:
   • This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3,
NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
   Portability problems not fixed by Gnulib:

10.640  **mtx_init**

   Documentation:
   Gnulib module: mtx
   Portability problems fixed by Gnulib:
   • This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3,
NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
   Portability problems not fixed by Gnulib:
10.641 mtx_lock

Documentation:

Gnulib module: mtx

Portability problems fixed by Gnulib:
- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

10.642 mtx_timedlock

Documentation:

Gnulib module: mtx

Portability problems fixed by Gnulib:
- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

10.643 mtx_trylock

Documentation:

Gnulib module: mtx

Portability problems fixed by Gnulib:
- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

10.644 mtx_unlock

Documentation:

Gnulib module: mtx

Portability problems fixed by Gnulib:
- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:
10.645 munlock

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/munlock.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.646 munlockall

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/munlockall.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 4.1.

10.647 munmap

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/munmap.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14.

10.648 nan

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/nan.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.
10.649 **nanf**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/nanf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

10.650 **nanl**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/nanl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 3.1.

10.651 **nanosleep**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/nanosleep.html

Gnulib module: nanosleep

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- This function mishandles large arguments when interrupted by a signal on some platforms: Linux 64-bit, Solaris 64-bit.
- This function cannot sleep longer than 49.7 days on some platforms: Cygwin 1.5.x.
- This function does not fail when passed a negative nanosecond value on some platforms: newer 32-bit mingw.

Portability problems not fixed by Gnulib:

10.652 **nearbyint**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/nearbyint.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.
10.653 nearbyintf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/nearbyintf.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

10.654 nearbyintl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/nearbyintl.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.

10.655 newlocale

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/newlocale.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on many platforms: FreeBSD 9.0, NetBSD 5.0, OpenBSD 6.1, Minix 3.1.8, AIX 6.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.5.x, mingw, MSVC 14, Android 4.4.
• This function is useless because the locale_t type is not defined on some platforms: z/OS.
• This function is useless because the locale_t type contains basically no information on some platforms: OpenBSD 6.3.

10.656 nextafter

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/nextafter.html
Gnulib module: nextafter
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, MSVC 9.
10.657 nextafterf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/nextafterf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.

10.658 nextafterl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/nextafterl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 4.4.

10.659 nextdown

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html,
• man nextdown.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: glibc 2.23, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.660 nextdownf

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html,
• man nextdownf.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.23, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.661 nextdownl

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html,
- man nextdownl.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.23, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.662 nexttoward

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/nexttoward.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 4.2.

10.663 nexttowardf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/nexttowardf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9.
10.664 `nexttowardl`

POSIX specification:  
https://pubs.opengroup.org/onlinepubs/9699919799/functions/nexttowardl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 8.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 4.2.

10.665 `nextup`

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html,
- man nextup.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.23, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.666 `nextupf`

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html,
- man nextupf.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.23, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.667 `nextupl`

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html,
- man nextupl.
Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on all non-glibc platforms: glibc 2.23, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.668 nftw

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/nftw.html

Gnulib module: —

Portability problems fixed by Gnulib:
- On platforms where off_t is a 32-bit type, this function may not correctly report the size of files or block devices 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, Minix 3.1.8, mingw, MSVC 14, Android 4.1.

10.669 nice

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/nice.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.
- In glibc before glibc 2.2.4, nice returned 0 upon success.

10.670 nl_langinfo

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/nl_langinfo.html

Gnulib module: nl_langinfo

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 7.1.
- The constant CODESET is not supported on some platforms: OpenBSD 3.8.
- The constants ALTMON_1 to ALTMON_12 are not defined on some platforms: glibc 2.26, musl libc, macOS 11.1, NetBSD 8.0, OpenBSD 6.7, AIX 7.2, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Haiku, Cygwin 2.9.
The constants \texttt{ERA}, \texttt{ERA\_D\_FMT}, \texttt{ERA\_D\_T\_FMT}, \texttt{ERA\_T\_FMT}, \texttt{ALT\_DIGITS} are not supported on some platforms: OpenBSD 6.7.

The constants \texttt{YESEXPR} and \texttt{NOEXPR} do not return a valid string on some platforms: IRIX 6.5.

This function is not multithread-safe on some platforms: Solaris 11.3.

Portability problems not fixed by Gnulib:

- On Cygwin 1.5.x, which doesn’t have locales, \texttt{nl\_langinfo(CODESET)} always returns "US-ASCII".
- On Cygwin 1.7.0, only the charset portion of a locale designation is honored.
- On NetBSD 5.0, in some locales, \texttt{nl\_langinfo(CRNCYSTR)} returns the empty string, although the local currency symbol, as returned by \texttt{localeconv()\rightarrowcurrency\_symbol}, is non-empty.
- On NetBSD 5.1, in the "C" locale, the results of \texttt{nl\_langinfo(ABMON\_1)} ... \texttt{nl\_langinfo(ABMON\_12)} are full month names, not abbreviated month names.

\section*{10.671 \texttt{nl\_langinfo\_l}}

POSIX specification:
\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/nl\_langinfo\_l.html}

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 7.1.

\section*{10.672 \texttt{nrand48}}

POSIX specification:
\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/nrand48.html}

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

\section*{10.673 \texttt{ntohl}}

POSIX specification:
\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/ntohl.html}

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, mingw, MSVC 14, Android 4.4.
10.674 *ntohs*

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ntohs.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, mingw, MSVC 14, Android 4.4.

10.675 *open*

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/open.html

Gnulib module: open, fchdir

Portability problems fixed by the Gnulib module *open*:

- Some platforms do not support *O_CLOEXEC*: Mac OS X 10.6, FreeBSD 8.4, NetBSD 5.1, OpenBSD 4.9, Minix 3.1.8, AIX 7.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.7.x, mingw, MSVC 14.
- On platforms where *off_t* is a 32-bit type, *open* may not work correctly with files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.
- This function does not fail when the file name argument ends in a slash and (without the slash) names a nonexistent file or a file that is not a directory, on some platforms: macOS 11.1, FreeBSD 7.2, AIX 7.1, HP-UX 11.00, Solaris 9.
- This function does not support the *O_NONBLOCK* flag when it is defined by the gnulib module *nonblocking* on some platforms: mingw, MSVC 14.
- On Windows platforms (excluding Cygwin), this function does usually not recognize the /dev/null filename.

Portability problems fixed by the Gnulib module *fchdir*:

- On Windows platforms (excluding Cygwin), this function fails to open a read-only descriptor for directories.

Portability problems not fixed by Gnulib:

- The Gnulib replacement for *O_CLOEXEC* is not atomic, and so is not safe in the presence of multiple threads or signal handlers.
- *open* ("symlink", *O_CREAT ...*) fails when the argument points to a nonexistent file in an existing directory on some platforms: Haiku.
- *open* ("symlink", *O_NOFOLLOW ...*) fails with *errno* set to EMLINK instead of the POSIX-required ELOOP on some platforms: FreeBSD 10.1.
- *open* ("symlink", *O_NOFOLLOW ...*) fails with *errno* set to EFTYPE instead of the POSIX-required ELOOP on some platforms: NetBSD 6.1.
- On Windows, this function returns a file handle in *O_TEXT* mode by default; this means that it translates ‘\n’ to CR/LF by default. Use the *O_BINARY* flag if you need reliable binary I/O.
10.676 openat

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/openat.html

Gnulib module: openat

Portability problems fixed by Gnulib:
- This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14. But the replacement function is not safe to be used in libraries and is not multithread-safe.
- Some platforms do not support O_CLOEXEC: AIX 7.1, Solaris 10.
- On platforms where off_t is a 32-bit type, open may not work correctly with files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.
- This function does not fail when the file name argument ends in a slash and (without the slash) names a nonexistent file or a file that is not a directory, on some platforms: Solaris 9.

Portability problems not fixed by Gnulib:
- The Gnulib replacement for O_CLOEXEC is not atomic, and so is not safe in the presence of multiple threads or signal handlers.
- openat (fd, "symlink", O_NOFOLLOW ...) fails with errno set to EMLINK instead of the POSIX-required ELOOP on some platforms: FreeBSD 10.1.
- openat (fd, "symlink", O_NOFOLLOW ...) fails with errno set to EFTYPE instead of the POSIX-required ELOOP on some platforms: NetBSD 6.1.

10.677 opendir

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/opendir.html

Gnulib module: opendir

Portability problems fixed by Gnulib:
- This function is missing on some platforms: MSVC 14.
- On platforms where off_t is a 32-bit type, this function may not work correctly on huge directories 2 GiB and larger. Also, on platforms where ino_t is a 32-bit type, this function may report inode numbers incorrectly. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:

10.678 openlog

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/openlog.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.
10.679 **open_memstream**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/open_memstream.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.5.x, mingw, MSVC 14, Android 5.1.

An alternative to the `open_memstream` function is the Gnulib module **string-buffer**.

10.680 **open_wmemstream**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/open_wmemstream.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.5.x, mingw, MSVC 14, Android 5.1.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.681 **optarg**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/optarg.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: Mac OS X 10.5, IRIX 6.5, MSVC 14.

10.682 **opterr**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/opterr.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: IRIX 6.5, MSVC 14.
10.683 optind

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/optind.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This variable is missing on some platforms: IRIX 6.5, MSVC 14.

10.684 optopt

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/optopt.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This variable is missing on some platforms: Mac OS X 10.5, IRIX 6.5, MSVC 14.

10.685 pathconf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pathconf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14.

10.686 pause

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pause.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14.

10.687 pclose

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pclose.html

Gnulib module: pclose

Portability problems fixed by Gnulib:

• This function is missing on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:
10.688 perror

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/perror.html

Gnulib module: perror

Portability problems fixed by Gnulib:

- This function does not support the error values that are specified by POSIX but not defined by the system, on some platforms: OpenBSD 4.0, Cygwin 1.5.x, mingw, MSVC 14.
- This function treats errno of 0 like failure, although POSIX requires that the message declare it as a success, on some platforms: FreeBSD 8.2, OpenBSD 4.7, macOS 11.1.
- This function clobbers the strerror buffer on some platforms: Cygwin 1.7.9, Android 11.
- This function fails to print a useful a string for out-of-range integers on some platforms: HP-UX 11, IRIX 6.5.

Portability problems not fixed by Gnulib:

- POSIX requires that this function set the stream error bit (detected by ferror) on write failure, but not all platforms do this: glibc 2.13, cygwin 1.7.9.
- POSIX requires that this function not alter stream orientation, but the gnulib replacement locks in byte orientation and fails on wide character streams.

10.689 pipe

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pipe.html

Gnulib module: pipe-posix

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- This function crashes rather than failing with EMFILE if no resources are left on some platforms: Cygwin 1.7.9.

10.690 poll

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/poll.html

Gnulib module: poll

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, HP NonStop.
- This function doesn’t work on special files like /dev/null and ttys like /dev/tty on some platforms: macOS 10.15, AIX 5.3.

Portability problems not fixed by Gnulib:

- Under Windows, when passing a pipe, Gnulib’s poll replacement might return 0 even before the timeout has passed. Programs using it with pipes can thus busy wait.
• On some platforms, file descriptors other than sockets do not support POLLHUP; they will return a "readable" or "writable" status instead: AIX 7.2, HP NonStop, mingw, MSVC.

10.691 popen

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/popen.html

Gnulib module: popen
Portability problems fixed by Gnulib:
• This function is missing on some platforms: MSVC 14.
• Some platforms start the child with closed stdin or stdout if the standard descriptors were closed in the parent: Cygwin 1.5.x.

Portability problems not fixed by Gnulib:
• On native Windows platforms, this function terminates the current process with exit code 127 if the environment variable COMSPEC is not set.
• Some platforms mistakenly set the close-on-exec bit, then if it is cleared by the application, the platform then leaks file descriptors from earlier popen calls into subsequent popen children: Cygwin 1.5.x.

10.692 posix_fadvise

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_fadvise.html

Gnulib module: —
Portability problems fixed by Gnulib:
• On platforms where off_t is a 32-bit type, this function may not work correctly across the entire data range of files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4.

10.693 posix_fallocate

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_fallocate.html

Gnulib module: —
Portability problems fixed by Gnulib:
• On platforms where off_t is a 32-bit type, this function may not work correctly across the entire data range of files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.
Portability problems not fixed by GnuLib:

- **This function is missing on some platforms:** macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4.

- POSIX specifies that EINVAL should be returned when the file system doesn’t support the allocation operation directly. glibc however emulates the file system allocation with writes where unsupported, and apps have depended on that long term implementation. This is both inefficient, and as of glibc 2.21 at least, buggy on certain NFS setups.

### 10.694 `posix_madvise`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_madvise.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- **This function is missing on some platforms:** NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 5.1.

### 10.695 `posix_mem_offset`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_mem_offset.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- **This function is missing on some platforms:** glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.696 `posix_memalign`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_memalign.html

GnuLib module: `posix_memalign`

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- **This function produces misaligned results on some platforms:** OpenBSD 6.1.

- **This function is missing on some platforms:** Mac OS X 10.5, FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.1.
The Gnulib module `aligned-malloc` provides functions for allocating and freeing blocks of suitably aligned memory.

The Gnulib module `pagealign_alloc` provides a similar API for allocating and freeing blocks of memory aligned on a system page boundary.

### 10.697 `posix_openpt`

POSIX specification: [https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_openpt.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_openpt.html)

Gnulib module: `posix_openpt`

Portability problems fixed by Gnulib:
- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4. However, the replacement may fail with `ENOSYS` or `ENOENT` on some platforms.

Portability problems not fixed by Gnulib:

Note that when using this function to open the master side of a pseudo-terminal, you still need platform dependent code to open the corresponding slave side. The Gnulib module `openpty` provides an easy-to-use API that does both at once.

### 10.698 `posix_spawn`

POSIX specification: [https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawn.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawn.html)

Gnulib module: `posix_spawn`

Portability problems fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.3, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
- When this function fails, it causes the stdio buffer contents to be output twice on some platforms: AIX 6.1.
- When the program to be invoked is an executable script without a ‘#!’ marker in the first line, this function executes the script as if it were a shell script, on some platforms: GNU/Hurd.

Portability problems not fixed by Gnulib:
- This function does not work on some platforms: AIX 6.1 (under particular circumstances).

The Gnulib modules `posix_spawn_file_actions_addchdir` and `posix_spawn_file_actions_addfchdir` provide additional actions, that consist in changing the current directory of the child process before starting the specified program.
10.699  **posix_spawn_file_actions_addclose**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_spawn_file_actions_addclose.html

Gnulib module: posix_spawn_file_actions_addclose

Portability problems fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
- This function does not reject a negative file descriptor on some platforms: musl libc.

Portability problems not fixed by Gnulib:

10.700  **posix_spawn_file_actions_adddup2**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_spawn_file_actions_adddup2.html

Gnulib module: posix_spawn_file_actions_adddup2

Portability problems fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
- This function does not reject a too large file descriptor on some platforms: musl libc, Solaris 11.4.

Portability problems not fixed by Gnulib:

10.701  **posix_spawn_file_actions_addopen**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_spawn_file_actions_addopen.html

Gnulib module: posix_spawn_file_actions_addopen

Portability problems fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
- This function does not reject a too large file descriptor on some platforms: musl libc, Solaris 11.4.

Portability problems not fixed by Gnulib:
10.702  `posix_spawn_file_actions_destroy`

   POSIX specification:
   https://pubs.opengroup.org/onlinepubs/9699919799/functions/
   posix_spawn_file_actions_destroy.html

   Gnulib module: posix_spawn_file_actions_destroy

   Portability problems fixed by Gnulib:
   •  This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

   Portability problems not fixed by Gnulib:

10.703  `posix_spawn_file_actions_init`

   POSIX specification:
   https://pubs.opengroup.org/onlinepubs/9699919799/functions/
   posix_spawn_file_actions_init.html

   Gnulib module: posix_spawn_file_actions_init

   Portability problems fixed by Gnulib:
   •  This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

   Portability problems not fixed by Gnulib:

10.704  `posix_spawnattr_destroy`

   POSIX specification:
   https://pubs.opengroup.org/onlinepubs/9699919799/functions/
   posix_spawnattr_destroy.html

   Gnulib module: posix_spawnattr_destroy

   Portability problems fixed by Gnulib:
   •  This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

   Portability problems not fixed by Gnulib:

10.705  `posix_spawnattr_getflags`

   POSIX specification:
   https://pubs.opengroup.org/onlinepubs/9699919799/functions/
   posix_spawnattr_getflags.html

   Gnulib module: posix_spawnattr_getflags

   Portability problems fixed by Gnulib:
   •  This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
Portability problems not fixed by Gnulib:

10.706  **posix_spawnattr_getpgroup**

   POSIX specification:
   https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_getpgroup.html
   Gnulib module: posix_spawnattr_getpgroup
   Portability problems fixed by Gnulib:
   • This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

   Portability problems not fixed by Gnulib:

10.707  **posix_spawnattr_getschedparam**

   POSIX specification:
   https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_getschedparam.html
   Gnulib module: posix_spawnattr_getschedparam
   Portability problems fixed by Gnulib:
   • This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

   Portability problems not fixed by Gnulib:

10.708  **posix_spawnattr_getschedpolicy**

   POSIX specification:
   https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_getschedpolicy.html
   Gnulib module: posix_spawnattr_getschedpolicy
   Portability problems fixed by Gnulib:
   • This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

   Portability problems not fixed by Gnulib:

10.709  **posix_spawnattr_getsigdefault**

   POSIX specification:
   https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_getsigdefault.html
   Gnulib module: posix_spawnattr_getsigdefault
Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

10.710  

posix_spawnattr_getsigmask

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_getsigmask.html

Gnulib module: posix_spawnattr_getsigmask

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

10.711  

posix_spawnattr_init

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_init.html

Gnulib module: posix_spawnattr_init

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

10.712  

posix_spawnattr_setflags

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_setflags.html

Gnulib module: posix_spawnattr_setflags

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:
10.713 posix_spawnattr_setpgroup

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_spawnattr_setpgroup.html

Gnulib module: posix_spawnattr_setpgroup

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

10.714 posix_spawnattr_setschedparam

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_spawnattr_setschedparam.html

Gnulib module: posix_spawnattr_setschedparam

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

10.715 posix_spawnattr_setschedpolicy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_spawnattr_setschedpolicy.html

Gnulib module: posix_spawnattr_setschedpolicy

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

10.716 posix_spawnattr_setsigdefault

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_spawnattr_setsigdefault.html

Gnulib module: posix_spawnattr_setsigdefault

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
Portability problems not fixed by Gnulib:

10.717 posix_spawnattr_setsigmask

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_spawnattr_setsigmask.html

Gnulib module: posix_spawnattr_setsigmask

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

10.718 posix_spawnp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnp.html

Gnulib module: posix_spawnp

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.3, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
- When this function fails, it causes the stdio buffer contents to be output twice on some platforms: AIX 6.1.
- When the program to be invoked is an executable script without a ‘#!’ marker in the first line, this function executes the script as if it were a shell script, on some platforms: glibc 2.14/Linux, glibc 2.32/Hurd, macOS 12.5, FreeBSD 13.2, OpenBSD 7.2, AIX 7.2, Solaris 11.4, Cygwin 3.4.x.

Portability problems not fixed by Gnulib:

- This function does not work on some platforms: AIX 6.1 (under particular circumstances).

The Gnulib modules posix_spawn_file_actions_addchdir and posix_spawn_file_actions_addfchdir provide additional actions, that consist in changing the current directory of the child process before starting the specified program.

10.719 posix_trace_attr_destroy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_attr_destroy.html

Gnulib module: —
Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**10.720 posix_trace_attr_getclockres**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_getclockres.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**10.721 posix_trace_attr_getcreatetime**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_getcreatetime.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**10.722 posix_trace_attr_getgenversion**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_getgenversion.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.723 posix_trace_attr_getinherited

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_attr_getinherited.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.724 posix_trace_attr_getlogfullpolicy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_attr_getlogfullpolicy.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.725 posix_trace_attr_getlogsize

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_attr_getlogsize.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.726 posix_trace_attr_getmaxdatasize

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_attr_getmaxdatasize.html

Gnulib module: —
Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.727 posix_trace_attr_getmaxsystemeventsize

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_getmaxsystemeventsize.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.728 posix_trace_attr_getmaxusereventsize

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_getmaxusereventsize.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.729 posix_trace_attr_getname

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_getname.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.730 posix_trace_attr_getstreamfullpolicy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_attr_getstreamfullpolicy.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.731 posix_trace_attr_getstreamsize

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_attr_getstreamsize.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.732 posix_trace_attr_init

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_attr_init.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.733 posix_trace_attr_setinherited

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_attr_setinherited.html

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.734 posix_trace_attr_setlogfullpolicy

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_setlogfullpolicy.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.735 posix_trace_attr_setlogsize

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_setlogsize.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.736 posix_trace_attr_setmaxdatasize

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_setmaxdatasize.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.737  posix_trace_attr_setname

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_attr_setname.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.738  posix_trace_attr_setstreamfullpolicy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_attr_setstreamfullpolicy.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.739  posix_trace_attr_setstreamsize

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_attr_setstreamsize.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.740  posix_trace_clear

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_clear.html

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.741 posix_trace_close

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_close.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.742 posix_trace_create

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_create.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.743 posix_trace_create_withlog

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_create_withlog.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.744 posix_trace_event

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_event.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.745 posix_trace_eventid_equal

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_eventid_equal.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.746 posix_trace_eventid_get_name

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_eventid_get_name.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.747 posix_trace_eventid_open

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_eventid_open.html

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**10.748 posix_trace_eventset_add**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_eventset_add.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**10.749 posix_trace_eventset_del**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_eventset_del.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**10.750 posix_trace_eventset_empty**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_eventset_empty.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.751 posix_trace_eventset_fill

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_eventset_fill.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.752 posix_trace_eventset_ismember

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_eventset_ismember.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.753 posix_trace_eventtypelist_getnext_id

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_eventtypelist_getnext_id.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.754 posix_trace_eventtypelist_rewind

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_eventtypelist_rewind.html

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.755 posix_trace_flush

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_flush.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.756 posix_trace_get_attr

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_get_attr.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.757 posix_trace_get_filter

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_get_filter.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.758 posix_trace_get_status

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_get_status.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.759 posix_trace_getnext_event

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_getnext_event.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.760 posix_trace_open

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_open.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.761 posix_trace_rewind

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_rewind.html

Gnulib module: —
Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.762 posix_trace_set_filter

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_set_filter.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.763 posix_trace_shutdown

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_shutdown.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.764 posix_trace_start

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_start.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.765 posix_trace_stop

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_stop.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.766 posix_trace_timedgetnext_event

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_timedgetnext_event.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.767 posix_trace_trid_eventid_open

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_trid_eventid_open.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.768 posix_trace_trygetnext_event

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/
posix_trace_trygetnext_event.html

Gnulib module: —
Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.769 posix_typed_mem_get_info

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_typed_mem_get_info.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.770 posix_typed_mem_open

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_typed_mem_open.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.771 pow

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pow.html

GnuLib module: pow

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

10.772 powf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/powf.html

GnuLib module: pow

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
• This function is only defined as a macro with arguments on some platforms: MSVC 9.
Portability problems not fixed by Gnulib:

10.773 powl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/powl.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
• This function is only defined as a macro with arguments on some platforms: MSVC 14.

10.774 pread

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pread.html
Gnulib module: pread
Portability problems fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.
• On platforms where off_t is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.
• This function returns zero instead of positive values when large file support is enabled on some platforms: HP-UX 11.11.
• This function does not fail on pipes on some platforms: HP-UX 11.31.
Portability problems not fixed by Gnulib:

10.775 printf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/printf.html
Gnulib module: printf-posix or printf-gnu or stdio, nonblocking, sigpipe
Portability problems fixed by either Gnulib module printf-posix or printf-gnu:
• This function does not support size specifiers as in C99 (hh, ll, j, t, z) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, mingw, MSVC 14.
• This function does not support size specifiers as in C23 (w8, w16, w32, w64, wf8, wf16, wf32, wf64) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
• printf of ‘long double’ numbers is unsupported on some platforms: mingw, MSVC 14.
• `printf"%f", "%e", "%g"` of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.4, mingw, MSVC 14.

• This function does not support the ‘a’ and ‘A’ directives on some platforms: glibc-2.3.6, Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.

• This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.

• This function does not support the ‘F’ directive on some platforms: NetBSD 3.0, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14.

• This function does not support the ‘Ls’ directive on some platforms: glibc when used with `_FORTIFY_SOURCE >= 2` (set by default on Ubuntu), macOS 11.1, MSVC 14.

• This function does not support the ‘Ls’ directive on some platforms: OpenBSD 4.0, IRIX 6.5, Cygwin 1.5.x, Haiku.

• This function does not support precisions in the ‘Ls’ directive correctly on some platforms: Solaris 11.4.

• This function does not support format directives that access arguments in an arbitrary order, such as "%2$s", on some platforms: NetBSD 3.0, mingw, MSVC 14.

• This function doesn’t support the ‘f’ flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.

• This function does not round the argument of the ‘a’ directive correctly on some platforms: Mac OS X 10.12, FreeBSD 13.0.

• `printf"%010f"` of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC/clang.

• This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: AIX 7.1, Solaris 10/x86, mingw, MSVC/clang.

• This function mishandles large floating point precisions (for example, formatting 1.0 with “%.511f”) on some platforms: Solaris 10.

• This function produces wrong output for the ‘Lc’ directive with a NUL wide character argument on some platforms: glibc 2.35, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

• This function can crash in out-of-memory conditions on some platforms: FreeBSD 13.0, NetBSD 5.0.

Portability problems fixed by Gnulib module `printf-gnu`:

• This function does not support the ‘B’ directive on some platforms: glibc 2.34, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems fixed by Gnulib module `stdio` or `printf-posix` or `printf-gnu`, together with module `nonblocking`:

• When writing to a non-blocking pipe whose buffer is full, this function fails with `errno` being set to `ENOSPC` instead of `EAGAIN` on some platforms: mingw, MSVC 14.
Portability problems fixed by GnuLib module `stdio` or `printf-posix` or `printf-gnu`, together with module `sigpipe`:

- When writing to a pipe with no readers, this function fails, instead of obeying the current `SIGPIPE` handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by GnuLib:

- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(ENOMEM)` (or a version of `strerror_r`) instead.
- Formatting noncanonical ‘long double’ numbers produces nonmeaningful results on some platforms: glibc and others, on x86, x86_64, IA-64 CPUs.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.
- Attempting to write to a read-only stream fails with `EOF` but does not set the error flag for `ferror` on some platforms: glibc 2.13, cygwin 1.7.9.

### 10.776 pselect

POSIX specification: https://pubs.opengroup.org/onlinepubs/9699919799/functions/pselect.html

GnuLib module: —

Portability problems fixed by GnuLib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, mingw, MSVC 14.
- On some platforms, this function fails to detect invalid fds with `EBADF`, but only if they lie beyond the current maximum open fd: FreeBSD 8.2.

Portability problems not fixed by GnuLib:

- This function has a slightly incompatible declaration on some platforms: AIX 7.1 (when `_ALL_SOURCE` is defined).
- When the `sigmask` argument is nonnull on platforms that do not natively support this function, race conditions are possible when its gnulib implementation temporarily modifies the signal mask, and the behavior is unspecified in a multi-threaded process.

### 10.777 psiginfo

POSIX specification: https://pubs.opengroup.org/onlinepubs/9699919799/functions/psiginfo.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.9, macOS 11.1, FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 1.7.9, mingw, MSVC 14, Android 4.1.
10.778 psignal

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/psignal.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Cygwin 1.7.9, mingw, MSVC 14, Android 4.1.

10.779 pthread_atfork

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_atfork.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, mingw, MSVC 14, Android 3.0.

10.780 pthread_attr_destroy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_destroy.html

Gnulib module: pthread-thread

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

10.781 pthread_attr_getdetachstate

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_getdetachstate.html

Gnulib module: pthread-thread

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.
10.782 pthread_attr_getguardsize

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_getguardsize.html

GnuC module: —

Portability problems fixed by GnuC:

Portability problems not fixed by GnuC:

• This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, Cygwin 1.7.9, mingw, MSVC 14.

10.783 pthread_attr_getinheritsched

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_getinheritsched.html

GnuC module: —

Portability problems fixed by GnuC:

Portability problems not fixed by GnuC:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 8.1.

10.784 pthread_attr_getschedparam

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_getschedparam.html

GnuC module: —

Portability problems fixed by GnuC:

Portability problems not fixed by GnuC:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.785 pthread_attr_getschedpolicy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_getschedpolicy.html

GnuC module: —

Portability problems fixed by GnuC:

Portability problems not fixed by GnuC:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
10.786 pthread_attr_getscope

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_getscope.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.787 pthread_attr_getstack

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_getstack.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11.11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14.

10.788 pthread_attr_getstacksize

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_getstacksize.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.789 pthread_attr_init

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_init.html

Gnulib module: pthread-thread
Portability problems fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.
• This function is only defined as an inline function on some platforms: HP-UX 11.11.
Portability problems not fixed by Gnulib:
10.790  pthread_attr_setdetachstate

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_setdetachstate.html

Gnulib module: pthread-thread

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.791  pthread_attr_setguardsize

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_setguardsize.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, Cygwin 1.7.9, mingw, MSVC 14.

10.792  pthread_attr_setinheritsched

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_setinheritsched.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 8.1.

10.793  pthread_attr_setschedparam

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_setschedparam.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
10.794 pthread_attr_setschedpolicy

    POSIX specification:
    https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_setschedpolicy.html

    GnuLib module: —

    Portability problems fixed by GnuLib:

    Portability problems not fixed by GnuLib:

    • This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.795 pthread_attr_setscope

    POSIX specification:
    https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_setscope.html

    GnuLib module: —

    Portability problems fixed by GnuLib:

    Portability problems not fixed by GnuLib:

    • This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.796 pthread_attr_setstack

    POSIX specification:
    https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_setstack.html

    GnuLib module: —

    Portability problems fixed by GnuLib:

    Portability problems not fixed by GnuLib:

    • This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11.11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14.

10.797 pthread_attr_setstacksize

    POSIX specification:
    https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_setstacksize.html

    GnuLib module: —

    Portability problems fixed by GnuLib:

    Portability problems not fixed by GnuLib:

    • This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
10.798 pthread_barrier_destroy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_barrier_destroy.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 6.0.

10.799 pthread_barrier_init

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_barrier_init.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 6.0.

10.800 pthread_barrier_wait

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_barrier_wait.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 6.0.

10.801 pthread_barrierattr_destroy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_barrierattr_destroy.html

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 6.0.

10.802 `pthread_barrierattr_getpshared`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_barrierattr_getpshared.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.2, macOS 11.1, FreeBSD 5.2.1, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 6.0.

10.803 `pthread_barrierattr_init`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_barrierattr_init.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 6.0.

10.804 `pthread_barrierattr_setpshared`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_barrierattr_setpshared.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 6.0.
10.805 `pthread_cancel`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_cancel.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 9.0.

10.806 `pthread_cleanup_pop`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_cleanup_pop.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, NetBSD 9.0, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.807 `pthread_cleanup_push`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_cleanup_push.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, NetBSD 9.0, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.808 `pthread_cond_broadcast`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_cond_broadcast.html

Gnulib module: pthread-cond

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:
10.809  *pthread_cond_destroy*

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_cond_destroy.html

Gnulib module: pthread-cond

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.810  *pthread_cond_init*

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_cond_init.html

Gnulib module: pthread-cond

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.811  *pthread_cond_signal*

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_cond_signal.html

Gnulib module: pthread-cond

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.812  *pthread_cond_timedwait*

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_cond_timedwait.html

Gnulib module: pthread-cond

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:
10.813 pthread_cond_wait

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_cond_wait.html

Gnulib module: pthread-cond

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.814 pthread_condattr_destroy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_condattr_destroy.html

Gnulib module: pthread-cond

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.815 pthread_condattr_getclock

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_condattr_getclock.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: glibc 2.3.2, macOS 11.1, FreeBSD 5.2.1, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14, Android 4.4.

10.816 pthread_condattr_getpshared

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_condattr_getpshared.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.
10.817 pthread_condattr_init

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_condattr_init.html

Gnulib module: pthread-cond

Portability problems fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.818 pthread_condattr_setclock

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_condattr_setclock.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.2, macOS 11.1, FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14, Android 4.4.

10.819 pthread_condattr_setpshared

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_condattr_setpshared.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

10.820 pthread_create

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_create.html

Gnulib module: pthread-thread

Portability problems fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.
• This function is only defined as an inline function on some platforms: HP-UX 11.11.
Portability problems not fixed by Gnulib:

- On Linux/glibc platforms before the advent of NPTL in 2003, signals could only be sent to one particular thread. In POSIX, signals are sent to the entire process and executed by any thread of the process that happens to have the particular signal currently unblocked.

### 10.821 pthread_detach

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_detach.html

Gnulib module: pthread-thread

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.822 pthread_equal

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_equal.html

Gnulib module: pthread-thread

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.823 pthread_exit

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_exit.html

Gnulib module: pthread-thread

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.824 pthread_getconcurrency

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_getconcurrency.html

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: NetBSD 9.0, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

10.825 pthread_getcpuclockid

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_getcpuclockid.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14.

10.826 pthread_getschedparam

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_getschedparam.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.827 pthread_getspecific

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_getspecific.html

Gnulib module: pthread-tss

Portability problems fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:
10.828 pthread_join

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_join.html

Gnulib module: pthread-thread

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.829 pthread_key_create

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_key_create.html

Gnulib module: pthread-tss

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.830 pthread_key_delete

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_key_delete.html

Gnulib module: pthread-tss

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.831 pthread_kill

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_kill.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
10.832 pthread_mutex_consistent

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutex_consistent.html

**Gnulib module:** —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: glibc 2.11, macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.833 pthread_mutex_destroy

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutex_destroy.html

**Gnulib module:** pthread-mutex
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

10.834 pthread_mutex_getprioceiling

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutex_getprioceiling.html

**Gnulib module:** —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: glibc 2.3.6, NetBSD 7.1, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

10.835 pthread_mutex_init

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutex_init.html

**Gnulib module:** pthread-mutex
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:
10.836 **pthread_mutex_lock**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutex_lock.html

Gnulib module: pthread-mutex

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.837 **pthread_mutex_setprioceiling**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutex_setprioceiling.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: glibc 2.3.6, NetBSD 7.1, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

10.838 **pthread_mutex_timedlock**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutex_timedlock.html

Gnulib module: pthread_mutex_timedlock

Portability problems fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.839 **pthread_mutex_trylock**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutex_trylock.html

Gnulib module: pthread-mutex

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:
10.840 **pthread_mutex_unlock**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutex_unlock.html

Gnulib module: pthread-mutex

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.841 **pthread_mutexattr_destroy**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_destroy.html

Gnulib module: pthread-mutex

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.842 **pthread_mutexattr_getprioceiling**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_getprioceiling.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: glibc 2.3.6, NetBSD 7.1, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

10.843 **pthread_mutexattr_getprotocol**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_getprotocol.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: glibc 2.3.6, NetBSD 7.1, Minix 3.1.8, mingw, MSVC 14, Android 8.1.
10.844 **pthread_mutexattr_getpshared**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_getpshared.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

10.845 **pthread_mutexattr_getrobust**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_getrobust.html

Gnulib module: pthread-mutex
Portability problems fixed by Gnulib:
- This function is missing on some platforms: glibc 2.11, macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0. But the provided replacement is just a dummy.

Portability problems not fixed by Gnulib:

10.846 **pthread_mutexattr_gettype**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_gettype.html

Gnulib module: pthread-mutex
Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.847 **pthread_mutexattr_init**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_init.html

Gnulib module: pthread-mutex
Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:
10.848 pthread_mutexattr_setprioceiling

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_setprioceiling.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: glibc 2.3.6, NetBSD 7.1, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

10.849 pthread_mutexattr_setprotocol

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_setprotocol.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: glibc 2.3.6, NetBSD 7.1, Minix 3.1.8, mingw, MSVC 14, Android 8.1.

10.850 pthread_mutexattr_setpshared

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_setpshared.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

10.851 pthread_mutexattr_setrobust

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_setrobust.html

Gnulib module: pthread-mutex
Portability problems fixed by Gnulib:
• This function is missing on some platforms: glibc 2.11, macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0. But the provided replacement is just a dummy.
Portability problems not fixed by Gnulib:
10.852 pthread_mutexattr_settype

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_settype.html

Gnulib module: pthread-mutex

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.853 pthread_once

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_once.html

Gnulib module: pthread-once

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.854 pthread_rwlock_destroy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlock_destroy.html

Gnulib module: pthread-rwlock

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.855 pthread_rwlock_init

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlock_init.html

Gnulib module: pthread-rwlock

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:
10.856  pthread_rwlock_rdlock

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlock_rdlock.html

Gnulib module: pthread-rwlock

Portability problems fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:
• This function prefers readers to writers (meaning, when this function is called on an rwlock that is already taken by one or more readers, and another writer is already waiting to take it, this function may return successfully immediately) – a behaviour that may lead to writer starvation – on some platforms: glibc 2.28. As a workaround, you can use the gl_rwlock_t type from the Gnulib module ‘lock’.

10.857  pthread_rwlock_timedrdlock

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlock_timedrdlock.html

Gnulib module: pthread-rwlock

Portability problems fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:
• This function prefers readers to writers (meaning, when this function is called on an rwlock that is already taken by one or more readers, and another writer is already waiting to take it, this function may return successfully immediately) – a behaviour that may lead to writer starvation – on some platforms: glibc 2.28.

10.858  pthread_rwlock_timedwrlock

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlock_timedwrlock.html

Gnulib module: pthread-rwlock

Portability problems fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.
Portability problems not fixed by Gnulib:

10.859 pthread_rwlock_tryrdlock

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlock_tryrdlock.html

Gnulib module: pthread-rwlock

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

- This function prefers readers to writers (meaning, when this function is called on an rwlock that is already taken by one or more readers, and another writer is already waiting to take it, this function may return successfully immediately) – a behaviour that may lead to writer starvation – on some platforms: glibe 2.28.

10.860 pthread_rwlock_trywrlock

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlock_trywrlock.html

Gnulib module: pthread-rwlock

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.861 pthread_rwlock_unlock

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlock_unlock.html

Gnulib module: pthread-rwlock

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:
10.862 pthread_rwlock_wrlock

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlock_wrlock.html
Gnulib module: pthread-rwlock
Portability problems fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.863 pthread_rwlockattr_destroy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlockattr_destroy.html
Gnulib module: pthread-rwlock
Portability problems fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.864 pthread_rwlockattr_getpshared

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlockattr_getpshared.html
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: NetBSD 9.0, Minix 3.1.8, mingw, MSVC 14.

10.865 pthread_rwlockattr_init

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlockattr_init.html
Gnulib module: pthread-rwlock
Portability problems fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:
**10.866 pthread_rwlockattr_setpshared**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlockattr_setpshared.html

Gnulib module: —
- Portability problems fixed by Gnulib:
- Portability problems not fixed by Gnulib:
  - This function is missing on some platforms: NetBSD 9.0, Minix 3.1.8, mingw, MSVC 14.

**10.867 pthread_self**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_self.html

Gnulib module: pthread-thread
- Portability problems fixed by Gnulib:
- Portability problems not fixed by Gnulib:
  - This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

**10.868 pthread_setcancelstate**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_setcancelstate.html

Gnulib module: —
- Portability problems fixed by Gnulib:
- Portability problems not fixed by Gnulib:
  - This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 9.0.

**10.869 pthread_setcanceltype**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_setcanceltype.html

Gnulib module: —
- Portability problems fixed by Gnulib:
- Portability problems not fixed by Gnulib:
  - This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 9.0.
10.870  pthread_setconcurrency

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_setconcurrency.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: NetBSD 9.0, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

10.871  pthread_setschedparam

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_setschedparam.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.872  pthread_setschedprio

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_setschedprio.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.3, macOS 11.1, FreeBSD 13.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14, Android 8.1.

10.873  pthread_setspecific

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_setspecific.html

Gnulib module: pthread-tss

Portability problems fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:
10.874 pthread_sigmask

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_sigmask.html

Gnulib module: pthread_sigmask

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- This function is declared in <pthread.h> instead of <signal.h> on some platforms: FreeBSD 6.4, OpenBSD 3.8.
- This function does nothing and always returns 0 in programs that are not linked with -lpthread on some platforms: FreeBSD 13.0, MidnightBSD 1.1, HP-UX 11.31, Solaris 9.
- When it fails, this function returns -1 instead of the error number on some platforms: Cygwin 1.7.5.
- This function does not immediately raise signals that were pending before the call and unblocked by the call on some platforms: IRIX 6.5.

Portability problems not fixed by Gnulib:
- On platforms that do not natively support this function, it has unspecified behavior in a multi-threaded process.
- In case of failure, the return value is wrong on some platforms: NetBSD 9.0 when libpthread is not in use.

10.875 pthread_spin_destroy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_spin_destroy.html

Gnulib module: pthread-spin

Portability problems fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14, Android 6.0. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.876 pthread_spin_init

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_spin_init.html

Gnulib module: pthread-spin

Portability problems fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC
Portability problems not fixed by Gnulib:

10.877 pthread_spin_lock

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_spin_lock.html

Gnulib module: pthread-spin

Portability problems fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14, Android 6.0. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.878 pthread_spin_trylock

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_spin_trylock.html

Gnulib module: pthread-spin

Portability problems fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14, Android 6.0. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.879 pthread_spin_unlock

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_spin_unlock.html

Gnulib module: pthread-spin

Portability problems fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14, Android 6.0. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:
10.880 pthread_testcancel

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_testcancel.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 9.0.

10.881 ptsname

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ptsname.html

Gnulib module: ptsname
Portability problems fixed by Gnulib:
• This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, mingw, MSVC 14.
• This function fails to set errno on failure on some platforms: FreeBSD 8.2.

Portability problems not fixed by Gnulib:
• On Solaris 11 2010-11, this function fails on all BSD-style /dev/pty* device files.
• This function is not thread-safe on some platforms: Cygwin 1.7.9. Likewise, the gnulib replacement is not thread-safe.

Note that the Gnulib module ptsname_r is a version of this function that is more likely to be thread-safe.

10.882 putc

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/putc.html

Gnulib module: stdio, nonblocking, sigpipe
Portability problems fixed by Gnulib module stdio, together with module nonblocking:
• When writing to a non-blocking pipe whose buffer is full, this function fails with errno being set to ENOSPC instead of EAGAIN on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module stdio, together with module sigpipe:
• When writing to a pipe with no readers, this function fails, instead of obeying the current SIGPIPE handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
• On Windows platforms (excluding Cygwin), this function does not set errno upon failure.
• On some platforms, this function does not set errno or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.
10.883 putc_unlocked

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/putc_unlocked.html

Gnulib module: —

Portability problems fixed by Gnulib:
• This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
• On some platforms, this function does not set errno or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

10.884 putchar

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/putchar.html

Gnulib module: stdio, nonblocking, sigpipe

Portability problems fixed by Gnulib module stdio, together with module nonblocking:
• When writing to a non-blocking pipe whose buffer is full, this function fails with errno being set to ENOSPC instead of EAGAIN on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module stdio, together with module sigpipe:
• When writing to a pipe with no readers, this function fails, instead of obeying the current SIGPIPE handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
• On Windows platforms (excluding Cygwin), this function does not set errno upon failure.
• On some platforms, this function does not set errno or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

10.885 putchar_unlocked

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/putchar_unlocked.html

Gnulib module: —

Portability problems fixed by Gnulib:
• This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
• On some platforms, this function does not set errno or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.
10.886 putenv

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/putenv.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

Extension: Gnulib provides a module ‘putenv’ that substitutes a putenv implementation that can also be used to remove environment variables.

10.887 putmsg

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/putmsg.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.888 putpmsg

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/putpmsg.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.889 puts

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/puts.html

Gnulib module: stdio, nonblocking, sigpipe

Portability problems fixed by Gnulib module stdio, together with module nonblocking:

• When writing to a non-blocking pipe whose buffer is full, this function fails with errno being set to ENOSPC instead of EAGAIN on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module stdio, together with module sigpipe:

• When writing to a pipe with no readers, this function fails, instead of obeying the current SIGPIPE handler, on some platforms: mingw, MSVC 14.
Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

10.890 putuxline

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/putuxline.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

10.891 putwc

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/putwc.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

10.892 putwchar

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/putwchar.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.
10.893 pwrite

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pwrite.html

Gnulib module: pwrite

Portability problems fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.
- On platforms where off_t is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.
- This function does not fail when an invalid (negative) offset is passed when large file support is enabled on some platforms: HP-UX 11.11.
- This function uses an arbitrary offset instead of the off_t argument when large file support is enabled on some platforms: HP-UX 11.11.

Portability problems not fixed by Gnulib:

10.894 qsort

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/qsort.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.895 quick_exit

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 6.4, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 9, Android 4.4.

10.896 raise

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/raise.html

Gnulib module: raise

Portability problems fixed by Gnulib:
- This function is missing on some old platforms.
- This function crashes when invoked with invalid arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:
10.897 rand

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/rand.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is only defined as an inline function on some platforms: Android 4.4.

10.898 rand_r

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/rand_r.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.4.

10.899 random

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/random.html

Gnulib module: random
Portability problems fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.
• This function is only defined as an inline function on some platforms: Android 4.4.

Portability problems not fixed by Gnulib:
• This function has a slightly incompatible declaration (the return type being ‘int’ instead of ‘long’) on some platforms: Cygwin 1.5.25, Haiku.

10.900 read

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/read.html

Gnulib module: read, stdio, nonblocking
Portability problems fixed by Gnulib module read:
• This function is declared in a different header file (namely, <io.h>) on some platforms: mingw, MSVC 14.
• This function crashes when invoked with invalid arguments on some platforms: MSVC 14.
Portability problems fixed by GnuLib module `stdio`, together with module `nonblocking`:

- When reading from a non-blocking pipe whose buffer is empty, this function fails with `errno` being set to `EINVAL` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems not fixed by GnuLib:

- This function may fail with error `EINTR`, even in programs that don’t install any signal handlers, on some platforms: macOS 11.1.

For handling `EINTR`, GnuLib provides a module ‘safe-read’ with a function `safe_read`.

### 10.901 readdir

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699997999/functions/readdir.html

GnuLib module: readdir

Portability problems fixed by GnuLib:

- This function is missing on some platforms: MSVC 14.
- On platforms where `off_t` is a 32-bit type, this function may not work correctly on huge directories 2 GiB and larger. Also, on platforms where `ino_t` is a 32-bit type, this function may report inode numbers incorrectly. This can occur with file systems such as XFS (typically on large disks) and NFS. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by GnuLib:

- Although POSIX places no restrictions on `d_ino` values, some older systems are rumored to return `d_ino` values equal to zero for directory entries that do not really exist. Although GnuLib formerly attempted to cater to these older systems, this caused misbehavior on standard systems and so GnuLib does not attempt to cater to them any more. If you know of any problems caused by this, please send a bug report.

### 10.902 readdir_r

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699997999/functions/readdir_r.html

GnuLib module: extensions

Portability problems fixed by GnuLib:

- This function is planned to be removed from POSIX and to be deprecated in glibc. Portable applications should use `readdir`.
- This function has an incompatible declaration on some platforms: Solaris 11.4 (when `_POSIX_PTHREAD_SEMANTICS` is not defined).
- On platforms where `off_t` is a 32-bit type, this function may not work correctly on huge directories 2 GiB and larger. Also, on platforms where `ino_t` is a 32-bit type, this function may report inode numbers incorrectly. This can occur with file systems such as XFS (typically on large disks) and NFS. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
10.903 readlink

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/readlink.html

Gnulib module: readlink

Portability problems fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.
- Some platforms mistakenly succeed on file names ending in /: FreeBSD 7.2, Solaris 9, Mac OS X 10.10.
- On some platforms, this function returns int instead of ssize_t: glibc 2.4, FreeBSD 6.0, OpenBSD 6.7, Cygwin 1.5.x, AIX 7.1.

Portability problems mostly fixed by Gnulib:
- On some platforms, this function fails and sets errno to ERANGE rather than returning truncated contents: AIX 7.2, HP-UX 11. The Gnulib replacement normally works as POSIX requires by returning the truncated contents. However, if the full link contents are unreasonably large (more than 4000 bytes) the replacement clears the entire buffer and returns the buffer size; although this is not a complete fix, it suffices for typical callers, which ignore the buffer contents anyway.

Portability problems not fixed by Gnulib:
- This function always fails on platforms that don’t support symlinks: mingw, MSVC 14.
- When this function is called on a directory: In the case of NFS mounted directories, Cygwin sets errno to ENOENT or EIO instead of EINVAL. To avoid this problem, check for a directory before calling this function.
- When this function is called on a file that is not a symbolic link: IRIX may set errno to ENXIO instead of EINVAL. Cygwin may set errno to EACCES instead of EINVAL.
- When this function fails because it is called on an existing non-directory’s name concatenated to /, it sets errno to EINVAL: AIX 7.2.
- Symlink contents do not always have a trailing null byte, and there is no indication if symlink contents were truncated if the return value matches the length. Furthermore, Linux sets errno to EINVAL if the requested length is zero. Use the gnulib module areadlink for improved ability to read symlink contents.

10.904 readlinkat

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/readlinkat.html

Gnulib module: readlinkat

Portability problems fixed by Gnulib:
- This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.9, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4. But the replacement function is not safe to be used in libraries and is not multithread-safe.
- Some platforms mistakenly succeed on file names ending in /: OS X 10.10.
• On some platforms, this function returns int instead of ssize_t: AIX 7.1.

Portability problems mostly fixed by Gnulib:

• On some platforms, this function fails and sets errno to ERANGE rather than returning truncated contents: AIX 7.2. The Gnulib replacement normally works as POSIX requires by returning the truncated contents. However, if the full link contents are unreasonably large (more than 4000 bytes) the replacement clears the entire buffer and returns the buffer size; although this is not a complete fix, it suffices for typical callers, which ignore the buffer contents anyway.

Portability problems not fixed by Gnulib:

• This function always fails on platforms that don’t support symlinks: mingw, MSVC 14.
• When this function is called on a directory: In the case of NFS mounted directories, Cygwin sets errno to ENOENT or EIO instead of EINVAL. To avoid this problem, check for a directory before calling this function.
• When this function is called on a file that is not a symbolic link: IRIX may set errno to ENXIO instead of EINVAL. Cygwin may set errno to EACCES instead of EINVAL.
• When this function fails because it is called on an existing non-directory’s name concatenated to /, it sets errno to EINVAL: AIX 7.2.
• When this function is called on an empty file name, it fails with error EBADF instead of ENOENT: Cygwin 3.4.6.
• Symlink contents do not always have a trailing null byte, and there is no indication if symlink contents were truncated if the return value matches the length. Furthermore, Linux sets errno to EINVAL if the requested length is zero. Use the gnulib module areadlink for improved ability to read symlink contents.

10.905 readv

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/readv.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14.

10.906 realloc

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/realloc.html

Gnulib module: realloc-posix

Portability problems fixed by Gnulib:

• Upon failure, the function does not set errno toENOMEM on some platforms: mingw, MSVC 14.
• On some platforms, `realloc (p, n)` can succeed even if `n` exceeds `PTRDIFF_MAX`. Although this behavior is arguably allowed by POSIX it can lead to behavior not defined by POSIX later, so `realloc-posix` does not allow going over the limit.

Without the ‘realloc-gnu’ module described below, it is not portable to call `realloc` with a size of 0. With a NULL pointer argument, this is the same ambiguity as `malloc (0)` on whether a unique zero-size object is created. With a non-NULL pointer argument `p`, C17 says that it is implementation-defined whether `realloc (p, 0)` frees `p`. Behavior varies on whether `realloc (p, 0)` always frees `p` and successfully returns a null pointer, or always fails and leaves `p` valid, or usually succeeds and returns a unique zero-size object; a program not suspecting these variations in semantics will leak memory (either the still-valid `p`, or the non-NULL return value).

Extension: Gnulib provides a module ‘realloc-gnu’ that substitutes a `realloc` implementation that behaves more like the glibc implementation. It fixes these portability problems:

• `realloc (NULL, 0)` returns `NULL` on success on some platforms: AIX 7.2.
• On some platforms, `realloc (p, 0)` with non-null `p` might not free `p`, or might clobber `errno`, or might not return `NULL`.

### 10.907 realpath

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/realpath.html

Gnulib module: canonicalize-lgpl

Portability problems fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14.
• This function does not allow for a NULL ‘resolved’ parameter on some platforms: Mac OS X 10.5, FreeBSD 6.4, OpenBSD 4.4, Solaris 10.
• This function does not always return an absolute path on some platforms: Solaris 10.
• This function fails to detect trailing slashes on non-directories on some platforms: glibc 2.3.5, macOS 11.1, OpenBSD 6.0.
• This function fails to recognize non-directories or symlinks to non-directories followed by ‘..’ on some platforms: Cygwin 2.9.
• This function misbehaves on consecutive slashes on some platforms: musl libc 1.2.2, AIX 7.

Portability problems not fixed by Gnulib:

• This function does not allow to determine the required size of output buffer; the use of a non-NULL ‘resolved’ buffer is non-portable, since `PATH_MAX`, if it is defined, is nothing more than a guess.

### 10.908 recv

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/receive.html

Gnulib module: recv
Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), error codes from this function are not placed in `errno`, and `WSAGetLastError` must be used instead.

Portability problems not fixed by Gnulib:

**10.909 recvfrom**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/recvfrom.html

Gnulib module: recvfrom

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), error codes from this function are not placed in `errno`, and `WSAGetLastError` must be used instead.
- On HP-UX 11, in 64-bit mode, when the macro `_HPUX_ALT_XOPEN_SOCKET_API` is not defined, this function behaves incorrectly because it is declared to take a pointer to a 64-bit wide `socklen_t` entity but in fact considers it as a pointer to a 32-bit wide `unsigned int` entity.

Portability problems not fixed by Gnulib:

- Some platforms don’t have a `socklen_t` type; in this case this function’s sixth argument type is `'int *'`.

**10.910 recvmsg**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/recvmsg.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

**10.911 regcomp**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/regcomp.html

Gnulib module: regex

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- Many regular expression implementations have bugs.

Portability problems not fixed by Gnulib:
10.912 **regerror**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/regerror.html

Gnulib module: regex

Portability problems fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

10.913 **regexec**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/regexec.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-regexec-2.html

Gnulib module: regex

Portability problems fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.
- Many regular expression implementations have bugs.

Portability problems not fixed by Gnulib:

10.914 **regfree**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/regfree.html

Gnulib module: regex

Portability problems fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

10.915 **remainder**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/remainder.html

Gnulib module: remainder or remainder-ieee

Portability problems fixed by either Gnulib module *remainder* or *remainder-ieee*:
- This function is missing on some platforms: MSVC 9.

Portability problems fixed by Gnulib module *remainder-ieee*:

Portability problems not fixed by Gnulib:
10.916 remainderf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/remainderf.html

Gnulib module: remainderf or remainderf-ieee

Portability problems fixed by either Gnulib module remainderf or remainderf-ieee:
- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, MSVC 9.
- This function is not declared on some platforms: IRIX 6.5.
- This function may go into an endless loop on some platforms: IRIX 6.5.

Portability problems fixed by Gnulib module remainderf-ieee:

Portability problems not fixed by Gnulib:

10.917 remainderl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/remainderl.html

Gnulib module: remainderl or remainderl-ieee

Portability problems fixed by either Gnulib module remainderl or remainderl-ieee:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.
- This function is not declared on some platforms: IRIX 6.5.
- This function returns completely wrong values on some platforms: OpenBSD 5.1/SPARC.
- This function produces results which are accurate to only 16 digits on some platforms: musl libc 1.2.2/arm64, musl libc 1.2.2/s390x.

Portability problems fixed by Gnulib module remainderl-ieee:

Portability problems not fixed by Gnulib:

10.918 remove

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/remove.html

Gnulib module: remove

Portability problems fixed by Gnulib:
- This function fails to reject trailing slashes on non-directories on some platforms: FreeBSD 7.2, Solaris 9.
- This function mistakenly removes a directory with remove("dir/../") on some platforms: Cygwin 1.5.x.
- This function does not remove empty directories on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
10.919 **remque**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/remque.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4.

10.920 **remquo**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/remquo.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.

10.921 **remquof**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/remquof.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

10.922 **remquol**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/remquol.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.
10.923 rename

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/rename.html

Gnulib module: rename

Portability problems fixed by Gnulib:
- This function does not allow trailing slashes when creating a destination directory, as in `rename("dir","new/")`: NetBSD 1.6.
- This function does not reject trailing slashes on the destination for non-directories on some platforms, as in `rename("file","new/")`: AIX 7.1, Solaris 11.3, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not reject trailing slashes on symlinks to non-directories on some platforms, as in `rename("link-to-file/","f")`: FreeBSD 7.2.
- This function ignores trailing slashes on symlinks on some platforms, such that `rename("link/","new")` corrupts link: Solaris 9.
- This function incorrectly reduces the link count when comparing two spellings of a hard link on some platforms: NetBSD 1.6, Cygwin 1.5.x.
- This function will not always replace an existing destination on some platforms: Cygwin 1.5.x, mingw, MSVC 14. However, the replacement is not atomic for directories, and may end up losing the empty destination if the source could not be renamed.
- This function mistakenly allows names ending in ‘.’ or ‘..’ on some platforms: Cygwin 1.5.x, mingw, MSVC 14.
- This function does not reject attempts to rename existing directories and non-directories onto one another on some platforms: Cygwin 1.5.x, mingw, MSVC 14.

Portability problems not fixed by Gnulib:
- POSIX requires that `rename("symlink-to-dir/","dir2")` rename dir and leave symlink-to-dir dangling: likewise, it requires that `rename("dir","dangling/")` rename dir so that dangling is no longer a dangling symlink. This behavior is counter-intuitive, so on some systems, `rename` fails with ENOTDIR if either argument is a symlink with a trailing slash: glibc, OpenBSD, Cygwin 1.7.
- POSIX requires that `rename` do nothing and return 0 if the source and destination are hard links to the same file. This behavior is counter-intuitive, and on some systems `renameat` is a no-op in this way only if the source and destination identify the same directory entry. On these systems, for example, although renaming `.f` to `f` is a no-op, renaming `f` to `g` deletes `f` when `f` and `g` are hard links to the same file: NetBSD 7.0.
- After renaming a non-empty directory over an existing empty directory, the old directory name is still visible through the `stat` function for 30 seconds after the rename, on NFS file systems, on some platforms: Linux 2.6.18.
- This function will not rename a source that is currently opened by any process: mingw, MSVC 14.

10.924 renameat

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/renameat.html
Gnulib module: renameat

Portability problems fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14. But the replacement function is not safe to be used in libraries and is not multithread-safe.

• This function is declared in `<unistd.h>`, not in `<stdio.h>`, on some platforms: NetBSD 7.0, Solaris 11.4.

• This function is declared in `<sys/stat.h>`, not in `<stdio.h>`, on some platforms: Android 4.3.

• This function does not reject trailing slashes on non-directories on some platforms, as in `renameat(fd,"file",fd,"new")`: Solaris 11.4.

• This function ignores trailing slashes on symlinks on some platforms, such that `renameat(fd,"link/",fd,"new")` corrupts `link`: Solaris 9.

Portability problems not fixed by Gnulib:

• POSIX requires that `renameat(fd,"symlink-to-dir/",fd,"dir2")` rename `dir` and leave `symlink-to-dir` dangling; likewise, it requires that `renameat(fd,"dir",fd,"dangling/")` rename `dir` so that `dangling` is no longer a dangling symlink. This behavior is counter-intuitive, so on some systems, `renameat` fails with `ENOTDIR` if either argument is a symlink with a trailing slash: glibc, OpenBSD, Cygwin 1.7.

• POSIX requires that `renameat` do nothing and return 0 if the source and destination are hard links to the same file. This behavior is counterintuitive, and on some systems `renameat` is a no-op in this way only if the source and destination identify the same directory entry. On these systems, for example, although renaming `.f` to `f` is a no-op, renaming `f` to `g` deletes `f` when `f` and `g` are hard links to the same file: NetBSD 7.0.

• After renaming a non-empty directory over an existing empty directory, the old directory name is still visible through the `stat` function for 30 seconds after the rename, on NFS file systems, on some platforms: Linux 2.6.18.

• This function will not rename a source that is currently opened by any process: mingw, MSVC 14.

10.925 `rewind`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/rewind.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
10.926 rewinddir

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/rewinddir.html
Gnulib module: rewinddir
Portability problems fixed by Gnulib:
• This function is missing on some platforms: MSVC 14.
• On Mac OS X platforms where long int is a 32-bit type, this function may not work correctly on huge directories 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:

10.927 rint

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/rint.html
Gnulib module: rint
Portability problems fixed by Gnulib:
• This function is missing on some platforms: MSVC 9.

Portability problems not fixed by Gnulib:

10.928 rintf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/rintf.html
Gnulib module: rintf
Portability problems fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, MSVC 9.
• This function is not declared on some platforms: IRIX 6.5.

Portability problems not fixed by Gnulib:

10.929 rintl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/rintl.html
Gnulib module: rintl
Portability problems fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, MSVC 9, Android 4.4.
• This function produces wrong results for negative numbers on some platforms: NetBSD 8.0.

Portability problems not fixed by Gnulib:
10.930 **rmdir**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/rmdir.html

Gnulib module: rmdir

Portability problems fixed by Gnulib:
- This function is declared in different header files (namely, `<io.h>` or `<direx.h>`) on some platforms: mingw, MSVC 14.
- This function mistakenly removes a directory with `rmdir("dir/./")` on some platforms: Cygwin 1.5.x.
- This function fails with **EINVAL** instead of the expected **ENOTDIR** for `rmdir("file/")` on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
- When `rmdir` fails because the specified directory is not empty, the **errno** value is system dependent.
- **POSIX** requires that `rmdir("link-to-empty/")` remove `empty` and leave `link-to-empty` as a dangling symlink. This is counter-intuitive, so some systems fail with **ENOTDIR** instead: glibc

10.931 **round**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/round.html

Gnulib module: round or round-ieee

Portability problems fixed by either Gnulib module `round` or `round-ieee`:
- This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, older IRIX 6.5, Solaris 9, MSVC 9.
- This function is not declared on some platforms: glibc 2.8, IRIX 6.5.
- This function returns a wrong result for `x = 1/2 - 2^-54` on some platforms: NetBSD 3.0, AIX 7.1.

Portability problems fixed by Gnulib module `round-ieee`:
- This function returns a positive zero for an argument between −0.5 and 0 on some platforms: AIX 7.1.

Portability problems not fixed by Gnulib:

10.932 **roundeven**

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.933 roundevenf

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.934 roundevenl

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.935 roundf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/roundf.html

Gnulib module: roundf or roundf-ieee

Portability problems fixed by either Gnulib module roundf or roundf-ieee:

• This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, MSVC 9.
• This function is not declared on some platforms: glibc 2.8, IRIX 6.5.
• This functions returns a wrong result for \( x = 1/2 - 2^{-25} \) on some platforms: mingw.

Portability problems fixed by Gnulib module roundf-ieee:

• This function returns a positive zero for an argument between \(-0.5\) and 0 on some platforms: AIX 7.1.

Portability problems not fixed by Gnulib:
### 10.936 roundl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/roundl.html

Gnulib module: roundl or roundl-ieee

Portability problems fixed by either Gnulib module roundl or roundl-ieee:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.
- This function is not declared on some platforms: glibc 2.8, IRIX 6.5.

Portability problems fixed by Gnulib module roundl-ieee:

- This function returns a positive zero for an argument between \(-0.5\) and \(0\) on some platforms: AIX 7.1.

Portability problems not fixed by Gnulib:

### 10.937 scalbln

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/scalbln.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9, Android 9.0.

### 10.938 scalblnf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/scalblnf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9, Android 9.0.

### 10.939 scalblnl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/scalblnl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 9.0.
10.940 scalbn

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/scalbn.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: AIX 5.1, IRIX 6.5, MSVC 9.

10.941 scalbnf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/scalbnf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

10.942 scalbnl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/scalbnl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.

10.943 scandir

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/scandir.html

Gnulib module: scandir

Portability problems fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Solaris 9, mingw, MSVC 14.

• On platforms where off_t is a 32-bit type, this function may not work correctly on huge directories 2 GiB and larger. Also, on platforms where ino_t is a 32-bit type, this function may report inode numbers incorrectly. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:

• The fourth parameter of this function is declared as int (*)(const void *, const void *) on some platforms: glibc 2.3.6, macOS 10.7, FreeBSD 6.0, NetBSD 7.1, OpenBSD 6.7.
• The fourth parameter of this function is declared as int (*)(void *, void *) on some platforms: AIX 5.1.

10.944 scanf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/scanf.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-scanf.html

Gnulib module: stdio, nonblocking
Portability problems fixed by Gnulib module stdio, together with module nonblocking:
• When reading from a non-blocking pipe whose buffer is empty, this function fails with errno being set to EINVAL instead of EAGAIN on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
• C99 and POSIX.1-2001 and later require end-of-file to be sticky, that is, they require this function to act as if it reads end-of-file if feof would return nonzero. However, on some systems this function attempts to read from the underlying file descriptor even if the stream’s end-of-file indicator is set. These systems include glibc and default Solaris.
• On Windows platforms (excluding Cygwin), this function does not set errno upon failure.
• On Windows, this function doesn’t support the hh, ll, j, t, z size specifiers.

10.945 sched_get_priority_max

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched_get_priority_max.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, HP-UX 11, mingw, MSVC 14.

10.946 sched_get_priority_min

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched_get_priority_min.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, HP-UX 11, mingw, MSVC 14.
10.947 sched_getparam

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched_getparam.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

10.948 schedGetscheduler

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched_getscheduler.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

10.949 sched_rr_get_interval

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched_rr_get_interval.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, mingw, MSVC 14.

10.950 sched_setparam

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched_setparam.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.
10.951 sched_setscheduler

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched_setscheduler.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sched-setscheduler.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

10.952 sched_yield

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched_yield.html

Gnulib module: sched_yield

Portability problems fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

10.953 seed48

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/seed48.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.954 seekdir

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/seekdir.html

Gnulib module: —

Portability problems fixed by Gnulib:

• On platforms where long int is a 32-bit type, this function may not work correctly on huge directories 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: MSVC 14, Android 5.1.
10.955 select

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/select.html

Gnulib module: select

Portability problems fixed by Gnulib:
- On Windows platforms (excluding Cygwin), select can only be called on descriptors created by the socket function, not on regular file descriptors.
- On Windows platforms (excluding Cygwin), error codes from this function are not placed in errno, and WSAGetLastError must be used instead.
- On some platforms, this function fails to detect invalid fds with EBADF, but only if they lie beyond the current maximum open fd: FreeBSD 8.2.

Portability problems not fixed by Gnulib:
- When you call select with a timeout, some implementations modify the timeout parameter so that upon return from the function, it contains the amount of time not slept. Other implementations leave the timeout parameter unmodified.
- Under Windows, when passing a pipe, Gnulib’s select replacement might return 0 even before the timeout has passed. Programs using it with pipes can thus busy wait.
- On Linux, when some file descriptor refers to a regular file, select may fail, setting errno to EBADF.

10.956 sem_close

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_close.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.957 sem_destroy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_destroy.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- This function is not implemented on some platforms: Mac OS X 10.11.
10.958 sem_getvalue

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_getvalue.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- This function is not implemented on some platforms: Mac OS X 10.11.

10.959 sem_init

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_init.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- This function is not implemented on some platforms: Mac OS X 10.11.

10.960 sem_open

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_open.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.961 sem_post

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_post.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
10.962 **sem_timedwait**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_timedwait.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, mingw, MSVC 14.

10.963 **sem_trywait**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_trywait.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.964 **sem_unlink**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_unlink.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14.

10.965 **sem_wait**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_wait.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
10.966 semctl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/semctl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

10.967 semget

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/semget.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

10.968 semop

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/semop.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

10.969 send

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/send.html

Gnulib module: send

Portability problems fixed by Gnulib:

• On Windows platforms (excluding Cygwin), error codes from this function are not placed in <tt>errno</tt>, and <tt>WSAGetLastError</tt> must be used instead.

Portability problems not fixed by Gnulib:

10.970 sendmsg

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sendmsg.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14.
10.971 sendto

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sendto.html

Gnulib module: sendto

Portability problems fixed by Gnulib:
- On Windows platforms (excluding Cygwin), error codes from this function are not placed in \texttt{errno}, and \texttt{WSAGetLastError} must be used instead.

Portability problems not fixed by Gnulib:

10.972 setbuf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setbuf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.973 setegid

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setegid.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: HP-UX 11.23, mingw, MSVC 14.

10.974 setenv

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setenv.html

Gnulib module: setenv

Portability problems fixed by Gnulib:
- This function is missing on some platforms: HP-UX 11.23, IRIX 6.5, Solaris 9, mingw, MSVC 14.
- On some platforms, this function does not fail with ‘\texttt{EINVAL}’ when passed an empty string or a string containing ‘=’: Mac OS X 10.5, FreeBSD 6.0, NetBSD 1.6, OpenBSD 6.7, Cygwin 1.5.x.
- On some platforms, this function removes a leading ‘=’ from the value argument: Cygwin 1.5.x.

Portability problems not fixed by Gnulib:
- Older versions of POSIX required that \texttt{setenv(NULL, ",", 0)} gracefully fail with \texttt{EINVAL}, but not all implementations guarantee this, and the requirement was removed.
Chapter 10: ISO C and POSIX Function Substitutes

10.975 seteuid
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/seteuid.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: HP-UX 11.23, mingw, MSVC 14.

10.976 setgid
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setgid.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.

10.977 setgrent
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setgrent.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

10.978 sethostent
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sethostent.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14, Android 8.1.

10.979 setitimer
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setitimer.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.
10.980 setjmp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setjmp.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:

• POSIX does not specify whether setjmp saves the signal mask in the jmp_buf. It does on BSD platforms, and on glibc platforms when _BSD_SOURCE (and/or _DEFAULT_SOURCE on glibc >= 2.19) is defined; in this case setjmp behaves like sigsetjmp(.,1), and functions _setjmp and _longjmp are available that don’t save or restore the signal mask. On System V platforms (excluding HP-UX), and on glibc platforms by default, setjmp doesn’t save the signal mask.

10.981 setkey

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setkey.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.34, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
• This function is not declared in <stdlib.h> (without -D_GNU_SOURCE) on some platforms: glibc (at least 2.11–2.13).

10.982 setlocale

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setlocale.html

Gnulib module: setlocale, setlocale-null
Portability problems fixed by Gnulib module setlocale:

• On Windows platforms (excluding Cygwin), setlocale(category,NULL) ignores the environment variables LC_ALL, category, and LANG.

• On Windows platforms (excluding Cygwin) and Cygwin 1.5.x, setlocale(LC_ALL,name) succeeds and sets the LC_CTYPE category to 'C' when it does not support the encoding, instead of failing.

• On Windows platforms (excluding Cygwin), setlocale understands different locale names, that are not based on ISO 639 language names and ISO 3166 country names.

• On Android < 5.0, which doesn’t have locales, the setlocale function always fails. The replacement, however, supports only the locale names "C" and "POSIX".

Portability problems fixed by Gnulib module setlocale or setlocale-null:

• Invocations of setlocale (..., NULL) are not multithread-safe on some platforms: musl libc, macOS, FreeBSD, NetBSD, OpenBSD, AIX, Haiku, Cygwin. To make these
invocations multithread-safe, you need the Gnulib module `setlocale`, or you need to change the code to invoke `setlocale_null` or `setlocale_null_r` instead.

Portability problems not fixed by Gnulib:
- On Cygwin 1.5.x, which doesn’t have locales, `setlocale(LC_ALL,NULL)` always returns "C".
- On Cygwin 1.7.0, only the charset portion of a locale designation is honored.
- On OpenBSD, `setlocale(LC_ALL,"")` will only update categories that are deemed appropriate for the LC_ALL environment value, even if there are other categories set to different values in the environment. In addition any value is accepted for LC_CTYPE, and so NULL is never returned to indicate a failure to set locale. To verify category values, each category must be set individually with `setlocale(LC_COLLATE,"")` etc.
- On Android 5.0 and newer, the default locale (i.e. the locale in use when `setlocale` was not called) is the "C.UTF-8" locale, not the "C" locale. Additionally, a `setlocale` call that is meant to set the "C" or "POSIX" locale actually sets an equivalent of the "C.UTF-8" locale.

10.983 setlogmask

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setlogmask.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.984 setnetent

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setnetent.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Cygwin 2.9, mingw, MSVC 14, Android 8.1.

10.985 setpayload

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.986 setpayloadf

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.987 setpayloadl

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.988 setpayloadsig

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.989 setpayloadsigf

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.990  setpayloadsigl

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.991  setpgid

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setpgid.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.992  setpgrp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setpgrp.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.993  setpriority

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setpriority.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14.
10.994 **setprotoent**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setprotoent.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 8.1.

10.995 **setpwent**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setpwent.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

10.996 **setregid**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setregid.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.997 **setreuid**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setreuid.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.998 **setrlimit**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setrlimit.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getrlimit-1.html

Gnulib module: —
Portability problems fixed by Gnulib:

- On platforms where rlim_t is a 32-bit type, this function does not allow to set limits 4 GiB and larger, such as for RLIMIT_FSIZE. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.999 setservent

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setservent.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.1000 setsid

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setsid.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.1001 setsockopt

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setsockopt.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-setsockopt-2.html

Gnulib module: setsockopt

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), error codes from this function are not placed in errno, and WSAGetLastError must be used instead.

Portability problems not fixed by Gnulib:

- Many socket options are not available on all platforms.
10.1002 setstate

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setstate.html

Gnulib module: random

Portability problems fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
• This function is not declared on some platforms: Cygwin 1.5.25.

Portability problems not fixed by Gnulib:
• This function has a slightly incompatible declaration (the argument type being ‘const char *’ instead of ‘char *’) on some platforms: macOS 11.1, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Solaris 11 OpenIndiana.

10.1003 setuid

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setuid.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.

10.1004 setutxent

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setutxent.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

10.1005 setvbuf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setvbuf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• On Windows platforms (excluding Cygwin), this function does not set errno upon failure.
• On Windows platforms (excluding Cygwin), _IOLBF (line-buffering) is treated as if it were _IOFBF (full buffering), possibly with a warning generated.
10.1006 **shm_open**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/shm_open.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

10.1007 **shm_unlink**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/shm_unlink.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

10.1008 **shmat**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/shmat.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.
- On Linux, the flag SHM_REMAP is needed in order to force `shmat` to replace existing memory mappings in the specify address range. On other platforms, it is not needed.

10.1009 **shmctl**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/shmctl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.
10.1010 **shmdt**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/shmdt.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

10.1011 **shmget**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/shmget.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.
- On many platforms (not Linux), SHMMAX is so small that it is unusable for reasonable applications, and/or **shmget** requires superuser privileges.

10.1012 **shutdown**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/shutdown.html

Gnulib module: shutdown

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), error codes from this function are not placed in **errno**, and **WSAGetLastError** must be used instead.

Portability problems not fixed by Gnulib:

10.1013 **sigaction**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigaction.html

Gnulib module: sigaction

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- POSIX recommends that when specifying **SA_RESETHAND**, **SA_NODEFER** must also be specified.
- Support for **SA_ONSTACK** is missing on some platforms: mingw, MSVC 14, cygwin.
- Support for **SA_SIGINFO** is missing on some platforms: mingw, MSVC 14.
• Support for SIGCHLD, and thus for SA_NOCLDSTOP and SA_NOCLDWAIT, is missing on some platforms: mingw, MSVC 14.
• Support for SA_RESETHAND is missing on some platforms: NonStop.
• Support for SA_RESTART is missing on some platforms: mingw, MSVC 14, NonStop.
• The symbolic value SIG_IGN for the SIGCHLD signal is equivalent to a signal handler
  
  ```c
  void handle_child (int sigchild)
  {
    while (waitpid (-1, NULL, WNOHANG) > 0)
      ;
  }
  ```

  except that SIG_IGN for SIGCHLD has the effect that the children execution times are not accounted in the `times` function. On some platforms (BSD? SystemV? Linux?), you need to use the `sigaction` flag SA_NOCLDWAIT in order to obtain this behavior.

### 10.1014 sigaddset

POSIX specification:

https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigaddset.html

Gnulib module: sigprocmask

Portability problems fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
• This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

### 10.1015 sigaltstack

POSIX specification:

https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigaltstack.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.x, mingw, MSVC 14.
• `sigaltstack` doesn’t work on HP-UX 11/IA-64 and OpenBSD 3.6/Sparc64.
• This function interprets the `ss_sp` member of `stack_t` as the upper bound instead of the lower bound of the alternate stack on some platforms: IRIX 6.5

### 10.1016 sigdelset

POSIX specification:

https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigdelset.html

Gnulib module: sigprocmask

Portability problems fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
• This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.
  Portability problems not fixed by Gnulib:

10.1017 **sigemptyset**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigemptyset.html
  Gnulib module: sigprocmask
  Portability problems fixed by Gnulib:
  • This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
  • This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.
  Portability problems not fixed by Gnulib:

10.1018 **sigfillset**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigfillset.html
  Gnulib module: sigprocmask
  Portability problems fixed by Gnulib:
  • This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
  • This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.
  Portability problems not fixed by Gnulib:

10.1019 **sighold**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sighold.html
  Gnulib module: —
  Portability problems fixed by Gnulib:
  Portability problems not fixed by Gnulib:
  • This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 7.1.

10.1020 **sigignore**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigignore.html
  Gnulib module: —
  Portability problems fixed by Gnulib:
  Portability problems not fixed by Gnulib:
  • This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 7.1.
10.1021 siginterrupt

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/siginterrupt.html

Gnulib module: —

Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

Note: POSIX recommends using sigaction with SA_RESTART instead of siginterrupt (sig, 0).

10.1022 sigismember

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigismember.html

Gnulib module: sigprocmask

Portability problems fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
• This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

10.1023 siglongjmp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/siglongjmp.html

Gnulib module: —

Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
• This is only provided as a macro on some platforms: Cygwin.

10.1024 signal

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/signal.html

Gnulib module: —

Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function crashes when invoked with invalid arguments on some platforms: MSVC 14.
• On System V platforms, when the signal is triggered, the kernel uninstalls the handler (i.e. resets the signal’s action to SIG_DFL) before invoking the handler. This opens the door to race conditions: undesired things happen if the signal is triggered twice and the signal handler was not quick enough reinstalling itself as a handler. On BSD platforms and glibc platforms, on the other hand, when the signal is triggered, the kernel blocks the signal before invoking the handler. This is saner, but POSIX still allows either behavior. To avoid this problem, use `sigaction` instead of `signal`.

10.1025 `signbit`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/signbit.html

Gnulib module: signbit

Portability problems fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.0, MSVC 9, Android 9.0.

Portability problems not fixed by Gnulib:

10.1026 `signgam`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/signgam.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This variable is missing on some platforms: macOS 10.13, Minix 3.1.8, AIX 5.1, IRIX 6.5, mingw, MSVC 14.

10.1027 `sigpause`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigpause.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sigpause-3.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 7.1.
10.1028 sigpending

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigpending.html
Gnulib module: sigprocmask
Portability problems fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.
Portability problems not fixed by Gnulib:

10.1029 sigprocmask

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigprocmask.html
Gnulib module: sigprocmask
Portability problems fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.
Portability problems not fixed by Gnulib:
• In case of failure, the return value is wrong on some platforms: NetBSD 9.0 when libpthread is in use.

Note: Although sigprocmask officially has undefined behaviour in multi-threaded programs, in practice it is essentially equivalent to pthread_sigmask, with only a difference regarding the error return convention. It’s simpler to use sigprocmask, since it does not require linking with -lpthread on some platforms: glibc, NetBSD, OpenBSD, AIX, IRIX.

10.1030 sigqueue

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigqueue.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 5.1.

10.1031 sigrelse

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigrelse.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 7.1.
10.1032 sigset

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigset.html

Gnulib module: —

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 7.1.

10.1033 sigsetjmp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigsetjmp.html

Gnulib module: —

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.1034 sigsuspend

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigsuspend.html

Gnulib module: —

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

10.1035 sigtimedwait

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigtimedwait.html

Gnulib module: —

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 5.1.
- Linux implements the meaning of NULL timeout by doing what sigwaitinfo does; other platforms may not do the same.
10.1036 sigwait

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigwait.html

Gnulib module: extensions

Portability problems fixed by Gnulib:
- This function has an incompatible declaration on some platforms: Solaris 11.4 (when
  \_POSIX_PTHREAD_SEMANTICS is not defined).

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- On Linux/glibc platforms before the advent of NPTL, signals could only be sent to one
  particular thread. In POSIX, signals are sent to the entire process and executed by any
  thread of the process that happens to have the particular signal currently unblocked.

10.1037 sigwaitinfo

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigwaitinfo.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8,
  mingw, MSVC 14, Android 5.1.

10.1038 sin

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sin.html

Gnulib module: sin

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.1039 sinf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sinf.html

Gnulib module: sin

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC
  14.

Portability problems not fixed by Gnulib:
10.1040  sinh

   POSIX specification:
   https://pubs.opengroup.org/onlinepubs/9699919799/functions/sinh.html
   Gnulib module: sinh
   Portability problems fixed by Gnulib:
   Portability problems not fixed by Gnulib:

10.1041  sinhf

   POSIX specification:
   https://pubs.opengroup.org/onlinepubs/9699919799/functions/sinhf.html
   Gnulib module: sinhf
   Portability problems fixed by Gnulib:
   • This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
   • This function is only defined as a macro with arguments on some platforms: MSVC 14.
   Portability problems not fixed by Gnulib:

10.1042  sinhl

   POSIX specification:
   https://pubs.opengroup.org/onlinepubs/9699919799/functions/sinhl.html
   Gnulib module: —
   Portability problems fixed by Gnulib:
   Portability problems not fixed by Gnulib:
   • This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
   • This function is only defined as a macro with arguments on some platforms: MSVC 14.

10.1043  sinl

   POSIX specification:
   https://pubs.opengroup.org/onlinepubs/9699919799/functions/sinl.html
   Gnulib module: sinl
   Portability problems fixed by Gnulib:
   • This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
   • This function is only defined as a macro with arguments on some platforms: MSVC 14.
   Portability problems not fixed by Gnulib:
10.1044 `sleep`

POSIX specification:

https://pubs.opengroup.org/onlinepubs/9699919799/functions/sleep.html

Gnulib module: `sleep`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw (2005 or newer), MSVC 14.
- This function takes milliseconds as argument and returns `void` on some platforms: mingw (2005 and older).
- This function cannot sleep longer than 49.7 days on some platforms: Cygwin 1.5.x.

Portability problems not fixed by Gnulib:

- According to POSIX, the `sleep` function may interfere with the program’s use of the `SIGALRM` signal. On Linux, it doesn’t; on other platforms, it may.

10.1045 `snprintf`

POSIX specification:

https://pubs.opengroup.org/onlinepubs/9699919799/functions/snprintf.html

Gnulib module: `snprintf` or `snprintf-posix` or `snprintf-gnu`

Portability problems fixed by either Gnulib module `snprintf` or `snprintf-posix` or `snprintf-gnu`:

- This function is missing on some platforms: MSVC 14.
- This function does not support format directives that access arguments in an arbitrary order, such as "%%2$s", on some platforms: NetBSD 3.0, mingw.
- This function does not return a byte count as specified in C99 on some platforms: HP-UX 11, IRIX 6.5, Solaris 9, mingw.

Portability problems fixed by either Gnulib module `snprintf-posix` or `snprintf-gnu`:

- This function does not support size specifiers as in C99 (hh, 11, j, t, z) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not support size specifiers as in C23 (w8, w16, w32, w64, wf8, wf16, wf32, wf64) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw.
- `printf` of `long double` numbers is unsupported on some platforms: mingw, MSVC 14.
- `printf` "%f", "%e", "%g" of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.4, mingw, MSVC 14.
- This function does not support the ‘a’ and ‘A’ directives on some platforms: glibc-2.3.6, Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
• This function does not support the ‘F’ directive on some platforms: NetBSD 3.0, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14.

• This function does not support the ‘n’ directive on some platforms: glibc when used with _FORTIFY_SOURCE >= 2 (set by default on Ubuntu), macOS 11.1, MSVC 14.

• This function does not support the ‘ls’ directive on some platforms: OpenBSD 4.0, IRIX 6.5, Cygwin 1.5.x, Haiku.

• This function does not support precisions in the ‘ls’ directive correctly on some platforms: Solaris 11.4.

• This function doesn’t support the ‘f’ flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.

• This function does not round the argument of the ‘a’ directive correctly on some platforms: Mac OS X 10.12, FreeBSD 13.0.

• printf "%.10f" of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC/clang.

• This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: AIX 7.1, Solaris 10/x86, mingw, MSVC/clang.

• This function mishandles large floating point precisions (for example, formatting 1.0 with "%.511f") on some platforms: Solaris 10.

• This function produces wrong output for the ‘lc’ directive with a NUL wide character argument on some platforms: glibc 2.35, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

• This function can crash in out-of-memory conditions on some platforms: FreeBSD 13.0, NetBSD 5.0.

• This function does not truncate the result as specified in C99 on some platforms: mingw, MSVC 14.

• This function does not fully support the ‘n’ directive on some platforms: HP-UX 11, mingw, MSVC 14.

Portability problems fixed by Gnulib module snprintf-gnu:

• This function does not support the ‘B’ directive on some platforms: glibc 2.34, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems not fixed by Gnulib:

• The %m directive is not portable, use %s mapped to an argument of strerror(errno) (or a version of strerror_r) instead.

• Formatting noncanonical ‘long double’ numbers produces nonmeaningful results on some platforms: glibc and others, on x86, x86_64, IA-64 CPUs.

• When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.
Chapter 10: ISO C and POSIX Function Substitutes

10.1046  **sockatmark**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sockatmark.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

10.1047  **socket**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/socket.html

Gnulib module: socket

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), the descriptors returned by the `socket` function cannot be used in calls to `read`, `write`, and `close`; you have to use `recv`, `send`, `closesocket` in these cases instead.

- On Windows platforms (excluding Cygwin), error codes from this function are not placed in `errno`, and `WSAGetLastError` must be used instead.

Portability problems not fixed by Gnulib:

10.1048  **socketpair**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/socketpair.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

10.1049  **sprintf**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sprintf.html

Gnulib module: sprintf-posix or sprintf-gnu

Portability problems fixed by either Gnulib module sprintf-posix or sprintf-gnu:

- This function does not support size specifiers as in C99 (`hh`, `ll`, `j`, `t`, `z`) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, mingw, MSVC 14.

- This function does not support size specifiers as in C23 (`w8`, `w16`, `w32`, `w64`, `wf8`, `wf16`, `wf32`, `wf64`) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- `printf` of `long double` numbers is unsupported on some platforms: mingw, MSVC 14.
- `printf` of `%f`, `%e`, `%g` of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.4, mingw, MSVC 14.
- This function does not support the `a` and `A` directives on some platforms: glibc-2.3.6, Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the `b` directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the `F` directive on some platforms: NetBSD 3.0, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the `l`s` directive on some platforms: OpenBSD 4.0, IRIX 6.5, Cygwin 1.5.x, Haiku.
- This function does not support precisions in the `l`s` directive correctly on some platforms: Solaris 11.4.
- This function does not support format directives that access arguments in an arbitrary order, such as `%2$s`, on some platforms: NetBSD 3.0, mingw, MSVC 14.
- This function doesn’t support the `f` flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not round the argument of the `a` directive correctly on some platforms: Mac OS X 10.12, FreeBSD 13.0.
- `printf` of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC/clang.
- This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: AIX 7.1, Solaris 10/x86, mingw, MSVC/clang.
- This function mishandles large floating point precisions (for example, formatting 1.0 with "%.511f") on some platforms: Solaris 10.
- This function produces wrong output for the `l%c` directive with a NUL wide character argument on some platforms: glibc 2.35, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.
- This function can crash in out-of-memory conditions on some platforms: FreeBSD 13.0, NetBSD 5.0.
- The compiler warns that this function is deprecated: macOS 13.0.

Portability problems fixed by GnuLib module `sprintf-gnu`:
- This function does not support the `B` directive on some platforms: glibc 2.34, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems not fixed by GnuLib:
- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
• Formatting noncanonical ‘long double’ numbers produces nonmeaningful results on some platforms: glibc and others, on x86, x86-64, IA-64 CPUs.
• When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.

10.1050 sqrt

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sqrt.html
Gnulib module: sqrt
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:

10.1051 sqrtf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sqrtf.html
Gnulib module: sqrtf
Portability problems fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
• This function is only defined as a macro with arguments on some platforms: MSVC 14.
Portability problems not fixed by Gnulib:

10.1052 sqrtl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sqrtl.html
Gnulib module: sqrtl
Portability problems fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
• This function is only defined as a macro with arguments on some platforms: MSVC 14.
• This function produces very imprecise results on some platforms: OpenBSD 5.1/SPARC.
Portability problems not fixed by Gnulib:

10.1053 srand

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/srand.html
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is only defined as an inline function on some platforms: Android 4.4.

10.1054 srand48

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/srand48.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

10.1055 srandom

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/srandom.html

Gnulib module: random

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- This function is only defined as an inline function on some platforms: Android 4.4.

Portability problems not fixed by Gnulib:

- This function has a slightly incompatible declaration (the return type being ‘long’ instead of ‘void’) on some platforms: Cygwin 1.5.25.
- The parameter is unsigned long instead of unsigned int on some platforms: MidnightBSD 2.0.

10.1056 sscanf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/scanf.html

LSB specification:
https://refsspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sscanf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not set errno upon failure.
- On Windows, this function doesn’t support the hh, ll, j, t, z size specifiers.
10.1057 stat

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/stat.html

Gnulib module: stat

Portability problems fixed by Gnulib:

- On platforms where off_t is a 32-bit type, stat may not correctly report the size of files or block devices 2 GiB and larger. See Section 14.2 [Large File Support], page 753.
- On Linux/x86 and Linux/x86_64, applications compiled in 32-bit mode cannot access files that happen to have a 64-bit inode number. This can occur with file systems such as XFS (typically on large disks) and NFS. See Section 14.2 [Large File Support], page 753.
- The st_atime, st_ctime, st_mtime fields are affected by the current time zone and by the DST flag of the current time zone on some platforms: mingw, MSVC 14 (when the environment variable TZ is set).
- On MSVC 14, this function fails with error ENOENT on files such as ‘C:\pagefile.sys’ and on directories such as ‘C:\System Volume Information’.
- On some platforms, stat("link-to-file/",buf) succeeds instead of failing with ENOTDIR. macOS 11.1, FreeBSD 7.2, AIX 7.1, Solaris 9, mingw64.
- On some platforms, stat(".",buf) and stat("./",buf) give different results: mingw, MSVC 14.
- On Solaris 11.4, when this function yields a timestamp with a nonpositive tv_sec value, tv_nsec might be in the range −1000000000..−1, representing a negative nanoseconds offset from tv_sec.

Portability problems not fixed by Gnulib:

- See Section 9.65 [sys/stat.h], page 75, for general portability problems with struct stat.
- Cygwin’s stat function sometimes sets errno to EACCES when ENOENT would be more appropriate.
- Because of the definition of struct stat, it is not possible to portably replace stat via an object-like macro. Therefore, expressions such as (islnk ? lstat : stat) (name, buf) are not portable, and should instead be written islnk ? lstat (name, buf) : stat (name, buf).

10.1058 statvfs

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/statvfs.html

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where f_blocks in ‘struct statvfs’ is a 32-bit value, this function may not work correctly on files systems larger than 4 TiB. See Section 14.2 [Large File Support], page 753. This affects glibc/Hurd, HP-UX 11, Solaris.
Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, mingw, MSVC 14, Android 4.3.
- This function can hang if it stats all preceding entries in /proc/mounts, and any of those file systems are hard-mounted and not available. This affects Linux < 2.6.36.

Gnulib provides a module `fsusage` that provides similar information as `statvfs`.

10.1059 stderr

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/stderr.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- `stderr` is created in 32-bit mode instead of 64-bit mode: Cygwin 1.5.x. One workaround is to use freopen(NULL, “r+”, stderr) on Cygwin 1.5.21 or newer. Another is to use the gnulib `ftello` module and do ftello(stderr).
- POSIX states that a setuid application can guarantee that fd 2 is open, but some systems guarantee this even for non-setuid programs. If an application is executed with fd 2 closed, use of `stderr` can affect an unrelated file that happened to be assigned to fd 2. The gnulib *-safer modules may be used to guarantee that fd 2 stays reserved for `stderr`.

10.1060 stdin

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/stdin.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- `stdin` is created in 32-bit mode instead of 64-bit mode: Cygwin 1.5.x. One workaround is to use freopen(NULL, “r”, stdin) on Cygwin 1.5.21 or newer. Another is to use the gnulib `ftello` module and do ftello(stdin).
- POSIX states that a setuid application can guarantee that fd 0 is open, but some systems guarantee this even for non-setuid programs. If an application is executed with fd 0 closed, use of `stdin` can affect an unrelated file that happened to be assigned to fd 0. The gnulib *-safer modules may be used to guarantee that fd 0 stays reserved for `stdin`.

10.1061 stdout

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/stdout.html

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- stdout is created in 32-bit mode instead of 64-bit mode: Cygwin 1.5.x. One workaround is to use freopen(NULL, “w”, stdout) on Cygwin 1.5.21 or newer. Another is to use the gnulib ftello module and do ftello(stdout).
- POSIX states that a setuid application can guarantee that fd 1 is open, but some systems guarantee this even for non-setuid programs. If an application is executed with fd 1 closed, use of stdout can affect an unrelated file that happened to be assigned to fd 1. The gnulib *-safer modules may be used to guarantee that fd 1 stays reserved for stdout.

10.1062 stpcpy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/stpcpy.html
Gnulib module: stpcpy

Portability problems fixed by Gnulib:

- This function is missing on some platforms: NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4.
- This function has an incompatible return value on some platforms: AIX 5.1.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

10.1063 stpncpy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/stpncpy.html
Gnulib module: stpncpy

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

10.1064 strcasecmp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcasecmp.html
Gnulib module: strcase

Portability problems fixed by Gnulib:

- This function is missing on some platforms: MSVC 14.
Portability problems not fixed by Gnulib:

- This function cannot work correctly on character strings in multibyte locales. Gnulib provides an alternative function `mbscasecmp` that does a case insensitive comparison of character strings and that works in all locales.

10.1065 `strcasecmp_l`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcasecmp_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1.

10.1066 `strcat`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcat.html

Gnulib module: string

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

10.1067 `strchr`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strchr.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function cannot work correctly on character strings in some multibyte locales. Gnulib provides an alternative function `mbschr` that works on character strings in all locales.

10.1068 `strcmp`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcmp.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
10.1069 strcoll

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcoll.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function fails, setting errno to EILSEQ, on Solaris 10, in UTF-8 locales, when at least one of the strings contains a Unicode character in a block that was not assigned in Unicode 4.0.

10.1070 strcoll_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcoll_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

10.1071 strcpy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcpy.html

Gnulib module: string

Portability problems fixed by Gnulib:

• This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: strcpy (dst, src) is only safe to use when you can guarantee that there are at least strlen (src) + 1 bytes allocated at dst.

10.1072 strcspn

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcspn.html

Gnulib module: strcspn

Portability problems fixed by Gnulib:

• This function is missing on some old platforms.

Portability problems not fixed by Gnulib:

• This function cannot work correctly on character strings in multibyte locales. Gnulib provides an alternative function mbscspn that works on character strings in all locales.
10.1073 strdup

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strdup.html

Gnulib module: strdup or strdup-posix

Portability problems fixed by either Gnulib module strdup or strdup-posix:
- This function has no prototype in <string.h> on some old platforms.

Portability problems fixed by Gnulib module strdup-posix:
- Upon failure, the function does not set errno to ENOMEM on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

10.1074 strerror

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strerror.html

Gnulib module: strerror

Portability problems fixed by Gnulib:
- This function does not support the error values that are specified by POSIX but not defined by the system, on some platforms: OpenBSD 4.0, NonStop Kernel, Cygwin 1.5.x, mingw, MSVC 14.
- This function reports failure for strerror(0) (by setting errno or using a string similar to out-of-range values), although POSIX requires this to leave errno unchanged and report success, on some platforms: FreeBSD 8.2, NetBSD 9.0, OpenBSD 4.7, macOS 11.1.
- This function fails to return a string for out-of-range integers on some platforms: HP-UX 11, IRIX 6.5. (Some return NULL which is a POSIX violation, others return the empty string which is valid but not as useful); this can still cause bugs because most programs call strerror without setting and testing errno.)

Portability problems not fixed by Gnulib:

10.1075 strerror_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strerror_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: glibc 2.5, macOS 11.1, FreeBSD 12.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1.
10.1076  strerror_r

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strerror_r.html

LSB specification:
- https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-strerror-r.html
- https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib---xpg-strerror-r.html

Gnulib module: strerror_r-posix

Portability problems fixed by Gnulib:
- This function is missing on some platforms: NetBSD 3.0, Minix 3.1.8, HP-UX 11.23, IRIX 6.5, Solaris 9, mingw, MSVC 14.
- glibc, Cygwin, and Android have an incompatible version of this function. The POSIX compliant code
  
  ```c
  char *s = (strerror_r (err, buf, buflen) == 0 ? buf : NULL);
  ```
  
is essentially equivalent to this code using the glibc function:
  
  ```c
  char *s = strerror_r (err, buf, buflen);
  ```

- This function clobbers the strerror buffer on some platforms: Cygwin 1.7.9.
- This function is sometimes not declared in `<string.h>` on some platforms: glibc 2.8.
- The third argument is of type `int` instead of `size_t` on some platforms: AIX 5.1.
- When this function fails, it returns −1 and sets `errno`, instead of returning the error number, on some platforms: glibc 2.12 with `-D_POSIX_C_SOURCE=200112L`, AIX 6.1.
- When this function fails, it corrupts `errno`, on some platforms: Solaris 10.
- This function does not support many error values defined in `<errno.h>` on some platforms: MSVC 14.
- This function does not support the error values that are specified by POSIX but not defined by the system, on some platforms: OpenBSD 4.0, NonStop Kernel, Cygwin 1.5.x.
- This function reports failure for `strerror_r(0, buf, len)`, although POSIX requires this to succeed, on some platforms: FreeBSD 8.2.
- This function produces a different string for 0 than `strerror` on some platforms: macOS 11.1.
- This function always fails when the third argument is less than 80 on some platforms: HP-UX 11.31.
- When the buffer is too small and the value is in range, this function does not fail, but instead truncates the result and returns 0 on some platforms: AIX 6.1, Haiku 2017.
- When the value is not in range or the buffer is too small, this function fails to leave a NUL-terminated string in the buffer on some platforms: glibc 2.13, FreeBSD 8.2, Solaris 10.
- When the value is out of range but the buffer is too small, this function does not always return the longest possible string on some platforms: OpenBSD 4.7.

Portability problems not fixed by Gnulib:
10.1077  strfmon

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strfmon.html

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.7.1, mingw, MSVC 14, Android 9.0.

10.1078  strfmon_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strfmon_l.html

Gnulib module: strfmon
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function ignores the locale argument on some platforms: FreeBSD 13.0, Cygwin 2.9.
- This function uses a wrong locale for the numbers on some platforms: glibc 2.23.

Portability problems not fixed by Gnulib:
- This function is missing on many platforms: FreeBSD 6.0, NetBSD 7.1, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

10.1079  strfromd

Documentation:
- man strfromd.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.1080  strfromf

Documentation:
- man strfromf.
Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.1081 strftime

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Printing-of-Floats.html,

• man strftime.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.1082 strftime

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strftime.html

Gnulib module: strftime-fixes

Portability problems fixed by Gnulib:

• On native Windows platforms (mingw, MSVC), this function works incorrectly when the environment variable TZ has been set by Cygwin.

Portability problems not fixed by Gnulib:

• The Windows C runtime library (which is used by MinGW) does not support the %e specifier (and possibly the other more recent SUS specifiers too, i.e., %C, %D, %h, %n, %r, %R, %t, and %T).

• Native Windows platforms (mingw, MSVC) support only a subset of time zones supported by GNU or specified by POSIX. See Section 10.1192 [tzset], page 443.

Extension: Gnulib offers a module ‘nstrftime’ that provides an nstrftime function with various GNU extensions.
10.1083 strftime_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strftime_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

10.1084 strlen

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strlen.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.1085 strncasecmp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strncasecmp.html

Gnulib module: strcase

Portability problems fixed by Gnulib:

• This function is missing on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

• This function cannot work correctly on character strings in multibyte locales. Gnulib provides alternative functions mbsncasecmp and mbspcasecmp that do a case insensitive comparison of character strings and that work in all locales.

10.1086 strncasecmp_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strncasecmp_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1.
10.1087 strncat

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strncat.html

Gnulib module: strncat

Portability problems fixed by Gnulib:
- This function dereferences too much memory on some platforms: Solaris 11.4 on SPARC, Solaris 11.0 on x86.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

10.1088 strncmp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strncmp.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.1089 strncpy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strncpy.html

Gnulib module: string

Portability problems fixed by Gnulib:
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function was designed for the use-case of filling a fixed-size record with a string, before writing it to a file. This function is not appropriate for copying a string into a bounded memory area, because you have no guarantee that the result will be NUL-terminated. Even if you add the NUL byte at the end yourself, this function is inefficient (as it spends time clearing unused memory) and will allow silent truncation to occur, which is not a good behavior for GNU programs. For more details, see https://meyering.net/crusade-to-eliminate-strncpy/.

10.1090 strndup

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strndup.html

Gnulib module: strndup
Portability problems fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.
- This function does not NUL-terminate the result on some platforms: AIX 5.1.

Portability problems not fixed by Gnulib:

### 10.1091 `strnlen`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strnlen.html

Gnulib module: strnlen

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, HP-UX 11, IRIX 6.5, Solaris 10, mingw.

Portability problems not fixed by Gnulib:

### 10.1092 `strpbrk`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strpbrk.html

Gnulib module: strpbrk

Portability problems fixed by Gnulib:

- This function is missing on some old platforms.

Portability problems not fixed by Gnulib:

- This function cannot work correctly on character strings in multibyte locales. Gnulib provides an alternative function `mbspbrk` that works on character strings in all locales.

### 10.1093 `strptime`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strptime.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-strptime-3.html

Gnulib module: strftime

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
10.1094 **strrchr**

POSIX specification:  
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strrchr.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function cannot work correctly on character strings in some multibyte locales. Gnulib provides an alternative function `mbsrchr` that works on character strings in all locales.

10.1095 **strsignal**

POSIX specification:  
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strsignal.html

Gnulib module: `strsignal`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, IRIX 6.5, mingw, MSVC 14.
- This function does not return a string for out-of-range numbers on some platforms: Solaris, AIX 5.1.
- This function is declared in `unistd.h` instead of `string.h` on some platforms: NetBSD 5.0.

Portability problems not fixed by Gnulib:

- This function returns `const char *` instead of `char *` on some platforms: cygwin 1.5.25.

10.1096 **strspn**

POSIX specification:  
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strspn.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function cannot work correctly on character strings in multibyte locales. Gnulib provides an alternative function `mbsspnpn` that works on character strings in all locales.

10.1097 **strstr**

POSIX specification:  
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strstr.html

Gnulib module: `strstr` or `strstr-simple`

Portability problems fixed by either Gnulib module `strstr-simple` or `strstr`:

- This function can trigger memchr bugs on some platforms: glibc 2.10.
• This function can trigger false positives for long periodic needles on some platforms: glibc 2.12, Cygwin 1.7.7.
• This function may fail to find matches on some platforms: glibc 2.28.

Portability problems fixed by GnuLib module `strstr`:
• This function has quadratic instead of linear worst-case complexity on some platforms: glibc 2.8, macOS 12.5, FreeBSD 11.4, NetBSD 9.0, OpenBSD 6.1, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.

Portability problems not fixed by GnuLib:
• This function cannot work correctly on character strings in most multibyte locales. GnuLib provides an alternative function `mbsstr` that works on character strings in all locales.

10.1098 `strtod`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtod.html

GnuLib module: `strtod` or `strtod-obsolete`

Portability problems fixed by either GnuLib module `strtod` or `strtod-obsolete`:
• This function mis-parses strings with leading ‘+’ on some old platforms: Old versions of Linux.
• This function returns a wrong end pointer on some old platforms.
• This function consumes whitespace even when there is nothing that should be parsed on some platforms: IRIX 6.5.
• This function allows whitespace between ‘e’ and the exponent on some platforms: HP-UX 11.11, IRIX 6.5.
• This function returns the wrong end pointer for ‘-0x’ on some platforms: glibc 2.4, Mac OS X 10.5, FreeBSD 6.2, AIX 7.1, Cygwin < 1.5.25-11.
• This function returns +0.0 (not −0.0) for ‘-0’ on some platforms: IRIX 6.5.
• This function fails to parse Infinities and plain NaNs on some platforms: OpenBSD 4.0, HP-UX 11.11, IRIX 6.5, Solaris 9, mingw, MSVC 14.
• This function fails to parse ‘`NaN()`’ on some platforms: glibc-2.3.6, Mac OS X 10.5, FreeBSD 6.2, OpenBSD 4.0, AIX 7.1, HP-UX 11.11, IRIX 6.5, Cygwin < 1.5.25-11, mingw, MSVC 14.
• This function fails to parse ‘`NaN(n-char-sequence)`’ on some platforms: OpenBSD 4.0, HP-UX 11.11, IRIX 6.5, mingw, MSVC 14.
• This function parses ‘`NaN(n-char-sequence)`’, but returns the wrong end pointer on some platforms: glibc-2.4, AIX 7.1.
• This function fails to parse C99 hexadecimal floating point on some platforms: NetBSD 5.0, OpenBSD 4.0, AIX 5.1, HP-UX 11.11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14.
• In hexadecimal floats, this function allows whitespace between ‘p’ and the exponent on some platforms: HP-UX 11.31/ia64.
• This function returns the wrong end pointer for ‘0x1p’ on some platforms: AIX 7.1.
Portability problems fixed by Gnulib module **strtod-obsolete**:
- This function is missing on some old platforms.

Portability problems not fixed by Gnulib:
- This function returns +0.0 (not −0.0) for negative underflow on some platforms: glibc 2.7, Cygwin 1.5.x, mingw, MSVC 14.
- This function cannot distinguish between “nan” and “-nan” on some platforms: glibc 2.7, IRIX 6.5, mingw, MSVC 14.
- This function fails to correctly parse very long strings on some platforms: Mac OS X 10.5, FreeBSD 6.2, NetBSD 5.0, OpenBSD 4.0, IRIX 6.5, Cygwin, mingw, MSVC 14.
- The replacement function does not always return correctly rounded results.

### 10.1099 **strtof**

**POSIX specification:** [https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtof.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtof.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9, Android 4.4.

### 10.1100 **strtoimax**

**POSIX specification:** [https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtoimax.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtoimax.html)

Gnulib module: strtoimax

Portability problems fixed by Gnulib:
- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, IRIX 6.5, Solaris 9, MSVC 9.
- This function fails on valid input strings on some platforms: AIX 5.1.

Portability problems not fixed by Gnulib:
- This function is only defined as a macro on some platforms: HP-UX 11.11.

### 10.1101 **strtok**

**POSIX specification:** [https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtok.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtok.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
10.1102 `strtok_r`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtok_r.html

Gnulib module: `strtok_r`

Portability problems fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.
- This function crashes when invoked from code compiled with optimization enabled on some platforms: glibc 2.7.

Portability problems not fixed by Gnulib:
- This function cannot work correctly on character strings in multibyte locales. Gnulib provides an alternative function `mbstok_r` that works on character strings in all locales.

10.1103 `strtol`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtol.html

Gnulib module: `strtol`

Portability problems fixed by Gnulib:
- This function is missing on some old platforms.
- This function does not parse the leading '0' when the input string is "0x" and the base is 16 or 0 on some platforms: Minix 3.3, mingw, MSVC 14.
- This function does not parse binary integers (with a '0b' or '0B' prefix) when the base is 2 or 0 on many platforms.

Portability problems not fixed by Gnulib:

10.1104 `strtold`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtold.html

Gnulib module: `strtold`

Portability problems fixed by Gnulib:
- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, older IRX 6.5, Solaris 9, older Cygwin 1.7.x, MSVC 9, Android 4.4.
- This function returns a struct, not a `long double`, on some platforms: HP-UX 11.31/hppa.
- This function consumes whitespace even when there is nothing that should be parsed on some platforms: IRX 6.5.
- This function allows whitespace between 'e' and the exponent on some platforms: HP-UX 11.31/ia64, IRX 6.5.
- This function returns the wrong end pointer for '-0x' on some platforms: glibc-2.3.2, Mac OS X 10.5, Haiku.
- This function returns +0.0 (not −0.0) for '-0' on some platforms: IRX 6.5.
• This function fails to parse Infinities and plain NaNs on some platforms: HP-UX 11.31/ia64, IRIX 6.5.
• This function fails to parse ‘NaN(’ on some platforms: glibc-2.3.2, IRIX 6.5, mingw, Haiku.
• This function fails to parse ‘NaN(n-char-sequence)’ on some platforms: IRIX 6.5.
• This function parses ‘NaN(n-char-sequence)’, but returns the wrong end pointer on some platforms: glibc-2.3.2, mingw, Haiku.
• This function fails to parse C99 hexadecimal floating point on some platforms: IRIX 6.5, mingw.
• In hexadecimal floats, this function allows whitespace between ‘p’ and the exponent on some platforms: HP-UX 11.31/ia64.
• This function fails to set errno upon underflow on some platforms: Cygwin 2.9.

Portability problems not fixed by GnuLib:
• The replacement function does not always return correctly rounded results.

### 10.1105 `strtoll`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtoll.html

GnuLib module: strtoll

Portability problems fixed by GnuLib:
• This function is missing on some platforms: HP-UX 11.11, MSVC 9.
• This function does not parse the leading ‘0’ when the input string is "0x" and the base is 16 or 0 on some platforms: Minix 3.3, mingw, MSVC 14.
• This function does not parse binary integers (with a ‘0b’ or ‘0B’ prefix) when the base is 2 or 0 on many platforms.

Portability problems not fixed by GnuLib:

### 10.1106 `strtoul`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtoul.html

GnuLib module: strtoul

Portability problems fixed by GnuLib:
• This function is missing on some old platforms.
• This function does not parse the leading ‘0’ when the input string is "0x" and the base is 16 or 0 on some platforms: Minix 3.3, mingw, MSVC 14.
• This function does not parse binary integers (with a ‘0b’ or ‘0B’ prefix) when the base is 2 or 0 on many platforms.

Portability problems not fixed by GnuLib:
10.1107 **strtoull**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtoull.html

Gnulib module: strtoull

Portability problems fixed by Gnulib:
- This function is missing on some platforms: HP-UX 11.11, MSVC 9.
- This function does not parse the leading ‘0’ when the input string is "0x" and the base is 16 or 0 on some platforms: Minix 3.3, mingw, MSVC 14.
- This function does not parse binary integers (with a ‘0b’ or ‘0B’ prefix) when the base is 2 or 0 on many platforms.

Portability problems not fixed by Gnulib:

10.1108 **strtoumax**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtoumax.html

Gnulib module: strtoumax

Portability problems fixed by Gnulib:
- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.

Portability problems not fixed by Gnulib:
- This function is only defined as a macro on some platforms: HP-UX 11.11.

10.1109 **strxfrm**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strxfrm.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function has a wrong return value on some platforms: Haiku.

10.1110 **strxfrm_l**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/strxfrm_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
10.1111 swab

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/swab.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Android 8.1.

10.1112 swprintf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/swprintf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x.

• This function has a different signature on some platforms: MSVC 9.

• This function is only defined as a macro on some platforms: MSVC 14.

• This function does not support the ‘n’ directive on some platforms: glibc when used with _FORTIFY_SOURCE >= 2 (set by default on Ubuntu), macOS 11.1, MSVC 14.

• This function sometimes returns a wrong value through the ‘n’ directive on some platforms:
  musl libc 1.2.3.

• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

• On Windows, this function does not take a buffer size as second argument.

• This function produces wrong values for the ‘La’ directive on some platforms: glibc 2.15, Haiku.

• This function does not support size specifiers as in C23 (w8, w16, w32, w64, wf8, wf16, wf32, wf64) on some platforms:

• This function ignores the minimum field width in the ‘1c’ directive on some platforms:
  musl libc 1.2.3.

• This function is broken when it produces output that contains null wide characters on some platforms:

• This function does not support the ‘b’ directive, required by ISO C23, on some platforms:
  glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.

• The %m directive is not portable, use %s mapped to an argument of strerror(errno) (or a version of strerror_r) instead.
• In the C or POSIX locales, the %c and %s conversions may fail on some platforms: glibc 2.35, musl libc 1.2.4, FreeBSD 13.2, NetBSD 9.3, OpenBSD 7.2, Cygwin 2.9.0.
• The %lc directive may fail on some platforms: musl libc 1.2.4, FreeBSD 13.2, NetBSD 9.3, OpenBSD 7.2.
• When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.

10.1113 swscanf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/swscanf.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-swscanf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x.
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1114 symlink

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/symlink.html

Gnulib module: symlink

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• On some systems, symlink(value,"name/") mistakenly creates a symlink: macOS 11.1, FreeBSD 7.2, AIX 7.1, Solaris 9.
• This function is missing on some platforms; however, the replacement always fails with EPERM: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
• Some file systems do not support symbolic links.

10.1115 symlinkat

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/symlinkat.html

Gnulib module: symlinkat

Portability problems fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4. But the replacement function is not safe to be used in libraries and is not multithread-safe.
• Some platforms declare this function in `stdio.h` instead of `unistd.h`: Cygwin 1.7.1.
• On some systems, `symlinkat(value, fd, "name/")` mistakenly creates a symlink: macOS 11.1, AIX 7.1.

Portability problems not fixed by Gnulib:
• This function always fails with ‘ENOSYS’ on platforms that don’t support symlinks: mingw, MSVC 14.

### 10.1116 sync

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sync.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.

### 10.1117 sysconf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sysconf.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sysconf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.

### 10.1118 syslog

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/syslog.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.
10.1119 system

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/system.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-system-3.html

Gnulib module: system-posix

Portability problems fixed by Gnulib:

- The macros WIFSIGNALED, WIFEXITED, WIFSTOPPED, WTERMSIG, WEXITSTATUS, WNOHANG, WUNTRACED, WSTOPSIG are not defined in <stdlib.h> (only in <sys/wait.h>) on some platforms: MirBSD 10.

Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), the command processor used by the system function is cmd.exe, not /bin/sh. Accordingly, the rules for quoting shell arguments containing spaces, quote or other special characters are different.

10.1120 tan

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tan.html

Gnulib module: tan

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.1121 tanf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tanf.html

Gnulib module: tanf

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

10.1122 tanh

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tanh.html

Gnulib module: tanh

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
10.1123 tanhf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tanhf.html

Gnulib module: tanhf

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

10.1124 tanhl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tanhl.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

10.1125 tanl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tanl.html

Gnulib module: tanl

Portability problems fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

10.1126 tcdrain

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tcdrain.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
- On some platforms, tcdrain on a non-tty fails with errno set to EINVAL or, on Mac OS X, also EOPNOTSUPP or ENODEV, rather than ENOTTY.
10.1127 tcflow

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tcflow.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14, Android 4.4.

10.1128 tcflush

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tcflush.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
• On some platforms, tcflush of TCI_FLUSH on a non-tty fails with errno set to EINVAL rather than ENOTTY.
• On some platforms, tcflush of TCO_FLUSH on a non-tty fails with errno set to EINVAL or, on IRIX, also ENOSYS, or, on Mac OS X, also ENOPNOTSUPP or ENODEV, rather than ENOTTY.

10.1129 tcgetattr

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tcgetattr.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14, Android 4.4.

10.1130 tcgetpgrp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tcgetpgrp.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
10.1131 tcgetsid

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tcgetsid.html

Gnulib module: tcgetsid

Portability problems fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, OpenBSD 4.5, Minix 3.1.8, Cygwin 1.7.9, mingw, MSVC 14, Android 4.4.
• The declaration of this function in C++ compilation units has C++ linkage, not C linkage, on some platforms: HP-UX 11.00.

Portability problems not fixed by Gnulib:
• This function always fails on some platforms: FreeBSD 6.0, Cygwin 1.7.8, mingw, MSVC 14.
• This function returns int instead of pid_t on some platforms: Cygwin 1.7.11.

10.1132 tcsendbreak

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tcsendbreak.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14, Android 4.4.

10.1133 tcsetattr

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tcsetattr.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14, Android 4.4.

10.1134 tcsetpgrp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tcsetpgrp.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
10.1135 tdelete

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tdelete.html

Gnulib module: tsearch

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.0.4.
- tdelete returns NULL when removing the last element of a tree on some platforms: OpenBSD 4.0.

Portability problems not fixed by Gnulib:

10.1136 telldir

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/telldir.html

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where long int is a 32-bit type, this function may not work correctly on huge directories 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: MSVC 14, Android 5.1.

10.1137 tempnam

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tempnam.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
- This function is not appropriate for creating temporary files. (It has security risks.) Better use mkstemp instead.

10.1138 tfind

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tfind.html

Gnulib module: tsearch

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.0.4.

Portability problems not fixed by Gnulib:
10.1139 tgamma
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tgamma.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

10.1140 tgammaf
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tgammaf.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

10.1141 tgammal
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tgammal.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.

10.1142 thrd_create
Documentation:
Gnulib module: thrd
Portability problems fixed by Gnulib:
• This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
• This function uses an incorrectly defined thrd_start_t on some platforms: AIX 7.2.
Portability problems not fixed by Gnulib:
10.1143 thrd_current

Documentation:

Gnulib module: thrd
Portability problems fixed by Gnulib:
• This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

10.1144 thrd_detach

Documentation:

Gnulib module: thrd
Portability problems fixed by Gnulib:
• This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

10.1145 thrd_equal

Documentation:

Gnulib module: thrd
Portability problems fixed by Gnulib:
• This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

10.1146 thrd_exit

Documentation:

Gnulib module: thrd
Portability problems fixed by Gnulib:
• This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
Portability problems not fixed by Gnulib:

10.1147 thrd_join

Documentation:

Gnulib module: thrd

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function never stores an exit code on some platforms: AIX 7.2.
- This function crashes when the second argument is NULL on some platforms: Solaris 11.4.

Portability problems not fixed by Gnulib:

10.1148 thrd_sleep

Documentation:

Gnulib module: thrd

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

10.1149 thrd_yield

Documentation:

Gnulib module: thrd

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:
10.1150 time

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/time.html

Gnulib module: time

Portability problems fixed by Gnulib:
- This function is not consistent with gettimeofday and timespec_get on some platforms: glibc 2.31 or newer on Linux, AIX 7.2, native Windows. Namely, in the first 1 to 2.5 milliseconds of every second (or, on AIX and Windows, in the first 5 milliseconds of every second), time returns a value that is one less than the tv_sec part of the return value of gettimeofday or timespec_get.

Portability problems not fixed by Gnulib:

10.1151 timegm

Documentation:
- man timegm.

Gnulib module: timegm

Portability problems fixed by Gnulib:
- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, mingw, MSVC 14, Android 3.0.

Portability problems not fixed by Gnulib:

10.1152 timer_create

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/timer_create.html

Gnulib module: timer-time

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Mac OS X 10.11, FreeBSD 6.4, Minix 3.1.8, mingw, MSVC 14.
- This function fails with ENOSYS on some platforms: OpenBSD 4.9.

10.1153 timer_delete

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/timer_delete.html

Gnulib module: timer-time
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.11, FreeBSD 6.4, Minix 3.1.8, mingw, MSVC 14.
- This function fails with ENOSYS on some platforms: OpenBSD 4.9.

10.1154 timer_getoverrun

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/timer_getoverrun.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.11, FreeBSD 6.0, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14.

10.1155 timer_gettime

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/timer_gettime.html

Gnulib module: timer-time

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.11, FreeBSD 6.4, Minix 3.1.8, mingw, MSVC 14.
- This function fails with ENOSYS on some platforms: OpenBSD 4.9.

10.1156 timer_settime

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/timer_settime.html

Gnulib module: timer-time

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.11, FreeBSD 6.4, Minix 3.1.8, mingw, MSVC 14.
- This function fails with ENOSYS on some platforms: OpenBSD 4.9.
10.1157 times

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/times.html

Gnulib module: times

Portability problems fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
- There is no function on Windows to measure consumed process child times, thus the tms_cutime and tms_cstime will always be 0 when the module is used.

10.1158 timespec_getres

ISO C23 specification:
http://www.open-std.org/jtc1/sc22/wg14/www/docs/n3047.pdf section 7.29.2.7

Gnulib module: timespec_getres

Portability problems fixed by Gnulib:
- This function is missing on some platforms: glibc 2.33, macOS 12, FreeBSD 13.0, NetBSD 9.2, OpenBSD 7.0, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:
- On some platforms, this function returns a value other than the clock resolution of timespec_get, i.e., the minimum distance between differing timestamps. For example, on GNU/Linux it typically returns 1 nanosecond regardless of the actual clock resolution.

The Gnulib module gettime-res is a partial substitute; it implements the TIME_UTC functionality of timespec_getres.

10.1159 timezone

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/timezone.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This variable is missing on some platforms: IRIX 6.5, mingw.
- The address of this variable is not a compile-time constant on some platforms: mingw.
- Native Windows platforms (mingw, MSVC) support only a subset of time zones supported by GNU or specified by POSIX. See Section 10.1192 [tzset], page 443.

A more portable way of getting the UTC offset is to use strftime with the %z format. See Section 10.1082 [strftime], page 409.
10.1160 tmpfile

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tmpfile.html

Gnulib module: tmpfile

Portability problems fixed by Gnulib:
- This function always fails on some platforms: Android 4.3.
- This function often fails for trivial reasons on some platforms: mingw, MSVC 14.
- On platforms where off_t is a 32-bit type, tmpfile may not work correctly to create files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.

Portability problems not fixed by Gnulib:

10.1161 tmpnam

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tmpnam.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is not appropriate for creating temporary files. (It has security risks.) Better use mkstemp instead.

10.1162 toascii

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/toascii.html

Gnulib module: ctype

Portability problems fixed by Gnulib:
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

10.1163 tolower

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tolower.html

Gnulib module: ctype

Portability problems fixed by Gnulib:
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function’s behaviour depends on the locale, but does not support the multibyte characters that occur in strings in locales with MB_CUR_MAX > 1 (this includes all the common UTF-8 locales). There are four alternative APIs:
c_tolower
This function operates in a locale independent way and returns a different value
than the argument only for uppercase ASCII characters. It is provided by the
Gnulib module ‘c-ctype’.

towlower
This function operates in a locale dependent way, on wide characters. In order
to use it, you first have to convert from multibyte to wide characters, using the
mbrtowc function. It is provided by the Gnulib module ‘wctype’.

c32tolower
This function operates in a locale dependent way, on 32-bit wide characters.
In order to use it, you first have to convert from multibyte to 32-bit wide
characters, using the mbrtoc32 function. It is provided by the Gnulib module
‘c32tolower’.

uc_tolower
This function operates in a locale independent way, on Unicode characters. It
is provided by the Gnulib module ‘unicase/tolower’.

10.1164 tolower_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tolower_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0,
  Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC
  14, Android 4.4.

10.1165 totalorder

Documentation:
html.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD
  13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris
  11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

• This function has a different signature on some platforms: glibc 2.30.
10.1166 totalorderf

Documentation: 

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

• This function has a different signature on some platforms: glibc 2.30.

10.1167 totalorderl

Documentation: 

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

• This function has a different signature on some platforms: glibc 2.30.

10.1168 totalordermag

Documentation: 

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

• This function has a different signature on some platforms: glibc 2.30.
# 10.1169 totalordermagf

Documentation: 

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function has a different signature on some platforms: glibc 2.30.

# 10.1170 totalordermagl

Documentation: 

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function has a different signature on some platforms: glibc 2.30.

# 10.1171 toupper

POSIX specification: 
https://pubs.opengroup.org/onlinepubs/9699919799/functions/toupper.html

Gnulib module: ctype

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Note: This function’s behaviour depends on the locale, but does not support the multi-byte characters that occur in strings in locales with `MB_CUR_MAX > 1` (this includes all the common UTF-8 locales). There are four alternative APIs:

**c_toupper**

This function operates in a locale independent way and returns a different value than the argument only for lowercase ASCII characters. It is provided by the Gnulib module ‘c-ctype’.
towupper  This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the `mbrtoc32` function. It is provided by the Gnulib module `wctype`.

c32toupper  This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the `mbrtoc32` function. It is provided by the Gnulib module `c32toupper`.

uc_toupper  This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module `unicase/toupper`.

10.1172 toupper_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/toupper_l.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

10.1173 towctrans

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/towctrans.html
Gnulib module: towctrans
Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, mingw, MSVC 9, Android 7.1.
Portability problems not fixed by Gnulib:
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1174 towctrans_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/towctrans_l.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 7.1.
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1175 towlower

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/towlower.html

Gnulib module: wctype-h

Portability problems fixed by Gnulib:
• This function returns values of which the upper 16 bits are incorrect on some platforms: mingw.
• This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function c32tolower, provided by Gnulib module c32tolower, operates on 32-bit wide characters and therefore does not have this limitation.
• This function returns wrong values even for the ASCII characters in a zh_CN.GB18030 locale on some platforms: NetBSD 9.0.

10.1176 towlower_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/towlower_l.html

Gnulib module: —

Portability problems not fixed by Gnulib:
• This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1177 towupper

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/towupper.html

Gnulib module: wctype-h

Portability problems fixed by Gnulib:
• This function returns values of which the upper 16 bits are incorrect on some platforms: mingw.
• This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.
Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function \texttt{c32toupper}, provided by Gnulib module \texttt{c32toupper}, operates on 32-bit wide characters and therefore does not have this limitation.
- This function returns wrong values even for the ASCII characters in a zh\_CN.GB18030 locale on some platforms: NetBSD 9.0.

\textbf{10.1178 towupper\_l}

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/towupper\_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

\textbf{10.1179 trunc}

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/trunc.html

Gnulib module: trunc or trunc-ieee

Portability problems fixed by either Gnulib module \texttt{trunc} or \texttt{trunc-ieee}:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, OpenBSD 3.8, Solaris 9, MSVC 9.
- This function is not declared (without \texttt{-D\_GNU\_SOURCE}) on some platforms: glibc 2.8.

Portability problems fixed by Gnulib module \texttt{trunc-ieee}:

Portability problems not fixed by Gnulib:

\textbf{10.1180 truncate}

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/truncate.html

Gnulib module: truncate

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4 with \texttt{AC\_SYS\_LARGEFILE} in effect.
- On platforms where \texttt{off\_t} is a 32-bit type, this function is not applicable to arbitrary lengths for files 2 GiB and larger. See Section 14.2 [Large File Support], page 753.
• This function does not fail when the file name argument ends in a slash and (without the slash) names a non-directory, on some platforms: AIX 7.2.

Portability problems not fixed by Gnulib:

10.1181 trunfc

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/trunfc.html

Gnulib module: trunfc or trunfc-ieee

Portability problems fixed by either Gnulib module trunfc or trunfc-ieee:
• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 9, MSVC 9.
• This function is not declared (without -D_GNU_SOURCE) on some platforms: glibc 2.8.

Portability problems fixed by Gnulib module trunfc-ieee:

Portability problems not fixed by Gnulib:

10.1182 truncl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/truncl.html

Gnulib module: truncl or truncl-ieee

Portability problems fixed by either Gnulib module truncl or truncl-ieee:
• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.
• This function is not declared (without -D_GNU_SOURCE) on some platforms: glibc 2.8.

Portability problems fixed by Gnulib module truncl-ieee:

Portability problems not fixed by Gnulib:

10.1183 tsearch

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tsearch.html

Gnulib module: tsearch

Portability problems fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.0.4.

Portability problems not fixed by Gnulib:
Chapter 10: ISO C and POSIX Function Substitutes

10.1184 tss_create

Documentation:

Gnulib module: tss
Portability problems fixed by Gnulib:
- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

10.1185 tss_delete

Documentation:

Gnulib module: tss
Portability problems fixed by Gnulib:
- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

10.1186 tss_get

Documentation:

Gnulib module: tss
Portability problems fixed by Gnulib:
- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

10.1187 tss_set

Documentation:

Gnulib module: tss
Portability problems fixed by Gnulib:
- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
Portability problems not fixed by Gnulib:

10.1188 ttyname

POSIX specification: https://pubs.opengroup.org/onlinepubs/9699919799/functions/ttyname.html

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.
- This function is just a stub that produces an error message on standard error on some platforms: Android 4.3.

10.1189 ttyname_r

POSIX specification: https://pubs.opengroup.org/onlinepubs/9699919799/functions/ttyname_r.html

Gnulib module: ttyname_r
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: NetBSD 3.0, Minix 3.1.8, mingw, MSVC 14.
- This function is not declared unless _REENTRANT is defined, on some platforms: HP-UX 11.
- This function has an incompatible declaration on some platforms: Solaris 11.4 (when _POSIX_PTHREAD_SEMANTICS is not defined).
- This function refuses to do anything when the output buffer is less than 128 bytes large, on some platforms: Solaris 11 2010-11.
- This function is just a stub that produces an error message on standard error on some platforms: Android 4.3.

Portability problems not fixed by Gnulib:

10.1190 twalk

POSIX specification: https://pubs.opengroup.org/onlinepubs/9699919799/functions/twalk.html

Gnulib module: tsearch
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.4.
10.1191 tzname

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tzname.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This variable is missing on some platforms: IRIX 6.5, mingw.
- The address of this variable is not a compile-time constant on some platforms: Cygwin, mingw.
- Native Windows platforms (mingw, MSVC) support only a subset of time zones supported by GNU or specified by POSIX. See Section 10.1192 [tzset], page 443.

A more portable way of getting the time zone abbreviation is to use strftime with the %Z format. See Section 10.1082 [strftime], page 409.

10.1192 tzset

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/tzset.html

Gnulib module: tzset

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- On native Windows platforms (mingw, MSVC), this function works incorrectly when the environment variable TZ has been set by Cygwin.
- Native Windows platforms (mingw, MSVC) support only a subset of POSIX-specified values for the TZ environment variable, consisting of a time zone abbreviation containing exactly three ASCII letters with no daylight saving time or angle brackets, and with no support for tz database settings like TZ='America/New_York'. Even this subset does not work on applications built via the Universal Windows Platform, as it does not make environment variables like TZ available to applications.
- Older POSIX platforms do not support angle brackets in TZ values, as this feature was added in IEEE Std 1003.1-2001.

10.1193 ufromfp

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.1194 ufromfpf

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.1195 ufromfpl

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.1196 ufromfpx

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.1197 ufromfpxf

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
10.1198 ufromfpxl

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.1199 ulimit

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ulimit.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

10.1200 umask

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/umask.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.1201 uname

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/uname.html

Gnulib module: uname

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
10.1202 ungetc

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ungetc.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• On Windows platforms (excluding Cygwin), this function does not set errno upon failure.

10.1203 ungetwc

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ungetwc.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1204 unlink

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/unlink.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-unlink-3.html

Gnulib module: unlink

Portability problems fixed by Gnulib:
• This function is declared in a different header file (namely, <stdio.h>) on some platforms: MSVC 14.
• Some systems mistakenly succeed on unlink("link-to-file/"): GNU/Hurd, FreeBSD 7.2, AIX 7.1, Solaris 9.
• On Mac OS X 10.10, in a writable HFS mount, unlink("..") succeeds without doing anything.

Portability problems not fixed by Gnulib:
• Some systems allow a superuser to unlink directories, even though this can cause file system corruption. The error given if a process is not permitted to unlink directories varies across implementations; it is not always the POSIX value of EPERM. Meanwhile, if a process has the ability to unlink directories, POSIX requires that unlink("symlink-to-dir/") remove dir and leave symlink-to-dir dangling; this behavior is counter-intuitive. The gnulib module unlinkdir can help determine whether code must be cautious of unlinking directories.
• Removing an open file is non-portable: On Unix this allows the programs that have the file already open to continue working with it; the file’s storage is only freed when the no process has the file open any more. On Windows, the attempt to remove an open file fails.

10.1205 unlinkat

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/unlinkat.html

Gnulib module: unlinkat

Portability problems fixed by Gnulib:
• This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14. But the replacement function is not safe to be used in libraries and is not multithread-safe.
• This function is declared in <fcntl.h>, not in <unistd.h>, on some platforms: Cygwin 1.7.1, Android 4.3.
• On Mac OS X 10.10, in a writable HFS mount, unlinkat(fd, ".", 0) succeeds without doing anything.

Portability problems not fixed by Gnulib:
• When unlinkat(fd,name,AT_REMOVEDIR) fails because the specified directory is not empty, the errno value is system dependent.
• POSIX requires that unlinkdir(fd,"link-to-empty/",AT_REMOVEDIR) remove empty and leave link-to-empty as a dangling symlink. This is counter-intuitive, so some systems fail with ENOTDIR instead: glibc
• Some systems allow a superuser to unlink directories, even though this can cause file system corruption. The error given if a process is not permitted to unlink directories varies across implementations; it is not always the POSIX value of EPERM. Meanwhile, if a process has the ability to unlink directories, POSIX requires that unlinkat(fd,"symlink-to-dir/",0) remove dir and leave symlink-to-dir dangling; this behavior is counter-intuitive. The gnulib module unlinkdir can help determine whether code must be cautious of unlinking directories.
• Removing an open file is non-portable: On Unix this allows the programs that have the file already open to continue working with it; the file's storage is only freed when the no process has the file open any more. On Windows, the attempt to remove an open file fails.

10.1206 unlockpt

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/unlockpt.html

Gnulib module: unlockpt
Portability problems fixed by GnuLib:
- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, mingw, MSVC 14.

Portability problems not fixed by GnuLib:
- This function reports success for invalid file descriptors on some platforms: NetBSD 5.1, Cygwin 1.7.9.

10.1207 unsetenv

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/unsetenv.html

GnuLib module: unsetenv

Portability problems fixed by GnuLib:
- This function is missing on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, mingw, MSVC 14.
- This function has the return type ‘void’ instead of ‘int’ on some platforms: FreeBSD 6.0, NetBSD 1.6, OpenBSD 3.8.
- On some platforms, this function does not fail with ‘EINVAL’ when passed an empty string or a string containing ‘=’: FreeBSD 6.0, NetBSD 1.6, OpenBSD 4.7.
- This function removes only the first value association for the given environment variable, not all of them, on some platforms: Solaris 11.4, Haiku.

Portability problems not fixed by GnuLib:
- Older versions of POSIX required that `unsetenv(NULL)` gracefully fail with `EINVAL`, but not all implementations guarantee this, and the requirement was removed.

10.1208 uselocale

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/uselocale.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:
- This function is missing on many platforms: FreeBSD 9.0, NetBSD 9.0, OpenBSD 6.1, Minix 3.1.8, AIX 6.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.5.x, mingw, MSVC 14, Android 4.4.
- This function is not documented and leads to crashes in subsequent `setlocale` invocations on some platforms: AIX 7.2.
- This function is useless because the `locale_t` type is not defined on some platforms: z/OS.
- This function is useless because the `locale_t` type contains basically no information on some platforms: OpenBSD 6.3.
10.1209 utime

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/utime.html

Gnulib module: utime

Portability problems fixed by Gnulib:
- The times that are set on the file are affected by the current time zone and by the
  DST flag of the current time zone on some platforms: mingw, MSVC 14 (when the
  environment variable TZ is set).
- On some platforms, the prototype for utime omits const for the second argument:
  mingw, MSVC 14.
- On some platforms, utime("link-to-file/",buf) succeeds instead of failing with
  ENOTDIR, macOS 11.1.

Portability problems not fixed by Gnulib:
- On some platforms, this function mis-handles a trailing slash: Solaris 9.
- This function cannot set full timestamp resolution. Use utimensat(AT_FDCWD,file,times,0), or the
  gnulib module utimens, instead.

10.1210 utimensat

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/utimensat.html

Gnulib module: utimensat

Portability problems fixed by Gnulib:
- This function is missing on some platforms: glibc 2.5, Mac OS X 10.5, FreeBSD 6.0,
  NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10,
  Cygwin 1.5.x, mingw, MSVC 14, Android 3.0. However, the replacement function may
  end up truncating timestamps to worse resolution than supported by the file system.
  Furthermore, the replacement function is not safe to be used in libraries and is not
  multithread-safe.
- This function returns a bogus value instead of failing with ENOSYS on some platforms:
  Linux kernel 2.6.21.
- This function fails with ENOSYS if passed the flag AT_SYMLINK_NOFOLLOW on a regular
  file: Linux kernel 2.6.22.
- When using UTIME_OMIT or UTIME_NOW, some systems require the tv_sec argument
  to be 0, and don’t necessarily handle all file permissions in the manner required by
  POSIX: Linux kernel 2.6.25.
- When using UTIME_OMIT for the modification time, but specifying an access time, some
  systems fail to update the change time: Linux kernel 2.6.32, macOS 11.1, NetBSD 9.0,
  Solaris 11.1.
- Out-of-range values of tv_nsec do not lead to a failure on some platforms: Linux kernel
  2.6.22.19 on hppa.
- On some platforms, this function mis-handles a trailing slash: AIX 7.2.
Portability problems not fixed by Gnulib:

- On some platforms, timestamps of symbolic links cannot be modified, so the replacement fails with ENOSYS if passed the flag AT_SYMLINK_NOFOLLOW on a symlink.
- The mere act of using lstat modifies the access time of symlinks on some platforms, so utimensat with AT_SYMLINK_NOFOLLOW can only effectively change modification time: Cygwin.
- The mere act of using stat modifies the access time of directories on some platforms, so utimensat can only effectively change directory modification time: Cygwin 1.5.x.

The gnulib module fdutimensat provides a similar interface.

**10.1211 utimes**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/utimes.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- On some platforms, this function mis-handles a trailing slash: FreeBSD 7.2, Solaris 9.
- This function cannot set full timestamp resolution. In particular, some platforms incorrectly round rather than truncate. Use utimensat(AT_FDCWD,file,times,0), or the gnulib module utimens, instead.
- On some platforms, utimes (file, NULL) fails to set the file’s timestamp to the current time: glibc 2.3.3.
- On some platforms, utimes failed on read-only files when utime worked fine. glibc 2.2.5.
- On OS/2, this function cannot set the timestamp to earlier than the year 1980 in local time.
- On OS/2, this function cannot set the timestamp to an odd number of seconds.
- On OS/2, this function does not work on an opened file.

Extension: Gnulib provides a module ‘utimens’ that works around these problems and allows to set the time with nanosecond resolution (as far as supported by the file system).

**10.1212 va_arg**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/va_arg.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• The second argument of `va_arg` must be a type that is invariant under the “default argument promotions” (ISO C 99 6.5.2.2 paragraph 6). This means that the following are not valid here:

  `'float'`  Use `'double'` instead.
  `'bool'`  Use `'int'` instead.

  Integer types smaller than `'int'`.
  Use `'int'` or `'unsigned int'` instead.

  This is a portability problem because you don’t know the width of some abstract types like `uid_t`, `gid_t`, `mode_t`. So, instead of

  ```c
  mode = va_arg (ap, mode_t);
  ```

  you have to write

  ```c
  mode = (sizeof (mode_t) < sizeof (int) 
      ? va_arg (ap, int) 
      : va_arg (ap, mode_t));
  ```

10.1213 va_copy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/va_copy.html

Gnulib module: stdarg

Portability problems fixed by Gnulib:

• This macro is missing on some platforms: AIX 5.1 with cc or xlc, HP-UX 11 with cc, IRIX 6.5 with cc.

Portability problems not fixed by Gnulib:

10.1214 va_end

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/va_end.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

10.1215 va_start

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/va_start.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
10.1216 vdprintf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/vdprintf.html

Gnulib module: vdprintf or vdprintf-posix or vdprintf-gnu

Portability problems fixed by either Gnulib module vdprintf or vdprintf-posix or vdprintf-gnu:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.5.6, mingw, MSVC 14.

Portability problems fixed by either Gnulib module vdprintf-posix or vdprintf-gnu:

- This function does not support size specifiers as in C23 (w8, w16, w32, w64, wf8, wf16, wf32, wf64) on some platforms: glibc, musl libc, macOS 11.3, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, Solaris 11.4, Cygwin 2.9.0.
- printf "%f", "%e", "%g" of Infinity and NaN yields an incorrect result on some platforms: Solaris 11.4.
- This function does not support the ‘a’ and ‘A’ directives on some platforms: glibc-2.3.6, Solaris 11.4.
- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, Solaris 11.4, Cygwin 2.9.0.
- This function does not support the ‘n’ directive on some platforms: glibc when used with _FORTIFY_SOURCE >= 2 (set by default on Ubuntu), macOS 11.1.
- This function does not support precisions in the ‘ls’ directive correctly on some platforms: Solaris 11.4.
- printf "%010f" of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Solaris 11.4.
- This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: AIX 7.1.
- This function produces wrong output for the ‘lc’ directive with a NUL wide character argument on some platforms: glibc 2.35, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems fixed by Gnulib module vdprintf-gnu:

- This function does not support the ‘B’ directive on some platforms: glibc 2.34, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems not fixed by Gnulib:

- The %m directive is not portable, use %s mapped to an argument of strerror(errno) (or a version of strerror_r) instead.
- Formatting noncanonical ‘long double’ numbers produces nonmeaningful results on some platforms: glibc and others, on x86, x86_64, IA-64 CPUs.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.
On some platforms, this function does not set \texttt{errno} or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

\textbf{10.1217 \texttt{vfprintf}}

POSIX specification: https://pubs.opengroup.org/onlinepubs/9699919799/functions/vfprintf.html

Gnulib module: \texttt{vfprintf-posix} or \texttt{vfprintf-gnu} or \texttt{stdio, nonblocking, sigpipe}

Portability problems fixed by either Gnulib module \texttt{vfprintf-posix} or \texttt{vfprintf-gnu}:

- This function does not support size specifiers as in C99 (\texttt{hh}, \texttt{ll}, \texttt{j}, \texttt{t}, \texttt{z}) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not support size specifiers as in C23 (\texttt{w8}, \texttt{w16}, \texttt{w32}, \texttt{w64}, \texttt{wf8}, \texttt{wf16}, \texttt{wf32}, \texttt{wf64}) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- printf of \texttt{`long double'} numbers is unsupported on some platforms: mingw, MSVC 14.
- printf \texttt{"%f", "%e", "%g"} of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.4, mingw, MSVC 14.
- This function does not support the \texttt{`a'} and \texttt{`A'} directives on some platforms: glibc-2.3.6, Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the \texttt{`b'} directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the \texttt{`F'} directive on some platforms: NetBSD 3.0, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the \texttt{`n'} directive on some platforms: glibc when used with \_\texttt{FORTIFY\_SOURCE} >= 2 (set by default on Ubuntu), macOS 11.1, MSVC 14.
- This function does not support the \texttt{`1s'} directive on some platforms: OpenBSD 4.0, IRIX 6.5, Cygwin 1.5.x, Haiku.
- This function does not support precisions in the \texttt{`1s'} directive correctly on some platforms: Solaris 11.4.
- This function does not support format directives that access arguments in an arbitrary order, such as \texttt{"%\$2$s"}, on some platforms: NetBSD 3.0, mingw, MSVC 14.
- This function doesn't support the \texttt{'} flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not round the argument of the \texttt{`a'} directive correctly on some platforms: Mac OS X 10.12, FreeBSD 13.0.
- printf \texttt{"%010f"} of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC/clang.
• This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: AIX 7.1, Solaris 10/x86, mingw, MSVC/clang.

• This function mishandles large floating point precisions (for example, formatting 1.0 with "%.511f") on some platforms: Solaris 10.

• This function produces wrong output for the ‘\c’ directive with a NUL wide character argument on some platforms: glibc 2.35, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

• This function can crash in out-of-memory conditions on some platforms: FreeBSD 13.0, NetBSD 5.0.

Portability problems fixed by Gnulib module vfprintf-gnu:

• This function does not support the ‘B’ directive on some platforms: glibc 2.34, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems fixed by Gnulib module stdio or vfprintf-posix or vfprintf-gnu, together with module nonblocking:

• When writing to a non-blocking pipe whose buffer is full, this function fails with errno being set to ENOSPC instead of EAGAIN on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module stdio or vfprintf-posix or vfprintf-gnu, together with module sigpipe:

• When writing to a pipe with no readers, this function fails, instead of obeying the current SIGPIPE handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

• The %m directive is not portable, use %s mapped to an argument of strerror(errno) (or a version of strerror_r) instead.

• Formatting noncanonical ‘long double’ numbers produces nonmeaningful results on some platforms: glibc and others, on x86, x86_64, IA-64 CPUs.

• When formatting an integer with grouping flag, this function inserts thousands separators even in the “C” locale on some platforms: NetBSD 5.1.

• Attempting to write to a read-only stream fails with EOF but does not set the error flag for ferror on some platforms: glibc 2.13, cygwin 1.7.9.

10.1218 vfscanf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/vfscanf.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vfscanf.html

Gnulib module: vscanf, nonblocking

Portability problems fixed by Gnulib module vfscanf, together with module nonblocking:

• When reading from a non-blocking pipe whose buffer is empty, this function fails with errno being set to EINVAL instead of EAGAIN on some platforms: mingw, MSVC 14.
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, IRIX 6.5.
- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- On Windows, this function doesn’t support the `hh`, `11`, `j`, `t`, `z` size specifiers.

10.1219 `vfwprintf`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/vfwprintf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.
- This function does not support size specifiers as in C23 (`w8`, `w16`, `w32`, `w64`, `wf8`, `wf16`, `wf32`, `wf64`) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- In the C or POSIX locales, the `%c` and `%s` conversions may fail on some platforms: glibc 2.35.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

10.1220 `vfwscanf`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/vfwscanf.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vfwscanf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Cygwin 1.5.x, Android 4.4.
On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1221 vprintf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/vprintf.html

Gnulib module: vprintf-posix or vprintf-gnu or stdio, nonblocking, sigpipe

Portability problems fixed by either Gnulib module vprintf-posix or vprintf-gnu:

- This function does not support size specifiers as in C99 (hh, ll, j, t, z) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not support size specifiers as in C23 (w8, w16, w32, w64, wf8, wf16, wf32, wf64) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- printf of ‘long double’ numbers is unsupported on some platforms: mingw, MSVC 14.
- printf "%.f", "%.e", "%.g" of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.4, mingw, MSVC 14.
- This function does not support the ‘a’ and ‘A’ directives on some platforms: glibc-2.3.6, Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support precisions in the ‘hs’ directive correctly on some platforms: Solaris 11.4.
- This function does not support format directives that access arguments in an arbitrary order, such as "%2$s", on some platforms: NetBSD 3.0, mingw, MSVC 14.
- This function doesn’t support the ‘\’ flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not round the argument of the ‘a’ directive correctly on some platforms: Mac OS X 10.12, FreeBSD 13.0.
- printf "%010f" of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC/clang.
• This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: AIX 7.1, Solaris 10/x86, mingw, MSVC/clang.
• This function mishandles large floating point precisions (for example, formatting 1.0 with "%.511f") on some platforms: Solaris 10.
• This function produces wrong output for the ‘lc’ directive with a NUL wide character argument on some platforms: glibc 2.35, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.
• This function can crash in out-of-memory conditions on some platforms: FreeBSD 13.0, NetBSD 5.0.

Portability problems fixed by Gnulib module vprintf-gnu:
• This function does not support the ‘B’ directive on some platforms: glibc 2.34, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems fixed by Gnulib module stdio or vprintf-posix or vprintf-gnu, together with module nonblocking:
• When writing to a non-blocking pipe whose buffer is full, this function fails with errno being set to ENOSPC instead of EAGAIN on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module stdio or vprintf-posix or vprintf-gnu, together with module sigpipe:
• When writing to a pipe with no readers, this function fails, instead of obeying the current SIGPIPE handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:
• The %n directive is not portable, use %s mapped to an argument of strerror(errno) (or a version of strerror_r) instead.
• Formatting noncanonical ‘long double’ numbers produces nonmeaningful results on some platforms: glibc and others, on x86, x86_64, IA-64 CPUs.
• When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.
• Attempting to write to a read-only stream fails with EOF but does not set the error flag for ferror on some platforms: glibc 2.13, cygwin 1.7.9.

10.1222 vscanf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/vscanf.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vscanf.html

Gnulib module: vscanf, nonblocking

Portability problems fixed by Gnulib module vscanf, together with module nonblocking:
• When reading from a non-blocking pipe whose buffer is empty, this function fails with errno being set to EINVAL instead of EAGAIN on some platforms: mingw, MSVC 14.
Portability problems not fixed by Gnulib:

- This function is missing on some platforms: IRIX 6.5.
- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- On Windows, these functions don’t support the `hh`, `ll`, `j`, `t`, `z` size specifiers.

### 10.1223 vsnprintf

POSIX specification:  
https://pubs.opengroup.org/onlinepubs/9699919799/functions/vsnprintf.html  
Gnulib module: vsnprintf or vsnprintf-posix or vsnprintf-gnu

Portability problems fixed by either Gnulib module vsnprintf or vsnprintf-posix or vsnprintf-gnu:

- This function does not support format directives that access arguments in an arbitrary order, such as `"%2$s"`, on some platforms: NetBSD 3.0, mingw, MSVC 14.
- This function does not return a byte count as specified in C99 on some platforms: HP-UX 11, IRIX 6.5, Solaris 9, mingw, MSVC 14.

Portability problems fixed by either Gnulib module vsnprintf-posix or vsnprintf-gnu:

- This function does not support size specifiers as in C99 (`hh, ll, j, t, z`) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not support size specifiers as in C23 (`w8, w16, w32, w64, wf8, wf16, wf32, wf64`) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- `printf` of `long double` numbers is unsupported on some platforms: mingw, MSVC 14.
- `printf` `"%f", "%e", "%g"` of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.4, mingw, MSVC 14.
- This function does not support the `a` and `A` directives on some platforms: glibc-2.3.6, Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the `F` directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the `1s` directive on some platforms: OpenBSD 4.0, IRIX 6.5, Cygwin 1.5.x, Haiku.
- This function does not support precisions in the `1s` directive correctly on some platforms: Solaris 11.4.
- This function doesn’t support the ` ' flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.
• This function does not round the argument of the ‘a’ directive correctly on some platforms: Mac OS X 10.12, FreeBSD 13.0.

• printf "%010f" of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC/clang.

• This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: AIX 7.1, Solaris 10/x86, mingw, MSVC/clang.

• This function does not truncate the result as specified in C99 on some platforms: mingw, MSVC 14.

10.1224 vsprintf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/vsprintf.html

Gnulib module: vsprintf-posix or vsprintf-gnu

Portability problems fixed by either Gnulib module vsprintf-posix or vsprintf-gnu:
• This function does not support size specifiers as in C99 (hh, 11, j, t, z) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, mingw, MSVC 14.
• This function does not support size specifiers as in C23 (w8, w16, w32, w64, wf8, wf16, wf32, wf64) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.

• printf of ‘long double’ numbers is unsupported on some platforms: mingw, MSVC 14.

• printf “%f”, “%e”, “%g” of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.4, mingw, MSVC 14.

• This function does not support the ‘a’ and ‘A’ directives on some platforms: glibc-2.3.6, Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.

• This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.

• This function does not support the ‘F’ directive on some platforms: NetBSD 3.0, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14.

• This function does not support the ‘n’ directive on some platforms: glibc when used with _FORTIFY_SOURCE >= 2 (set by default on Ubuntu), macOS 11.1, MSVC 14.

• This function does not support the ‘ls’ directive on some platforms: OpenBSD 4.0, IRIX 6.5, Cygwin 1.5.x, Haiku.

• This function does not support precisions in the ‘ls’ directive correctly on some platforms: Solaris 11.4.

• This function does not support format directives that access arguments in an arbitrary order, such as "%2$s", on some platforms: NetBSD 3.0, mingw, MSVC 14.

• This function doesn’t support the ‘f’ flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.

• This function does not round the argument of the ‘a’ directive correctly on some platforms: Mac OS X 10.12, FreeBSD 13.0.

• printf "%010f" of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC/clang.

• This function does not support precisions larger than 512 or 1024 in integer, floating-point, and pointer output on some platforms: AIX 7.1, Solaris 10/x86, mingw, MSVC/clang.

• This function mishandles large floating point precisions (for example, formatting 1.0 with ‘”%.511f”’) on some platforms: Solaris 10.

• This function produces wrong output for the ‘l charismatic’ directive with a NUL wide character argument on some platforms: glibc 2.35, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

• This function can crash in out-of-memory conditions on some platforms: FreeBSD 13.0, NetBSD 5.0.

• The compiler warns that this function is deprecated: macOS 13.0.

Portability problems fixed by Gnu lib module vspprintf-gnu:
• This function does not support the ‘B’ directive on some platforms: glibc 2.34, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems not fixed by Gnulib:
• The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
• Formatting noncanonical ‘long double’ numbers produces nonmeaningful results on some platforms: glibc and others, on x86, x86_64, IA-64 CPUs.
• When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.

10.1225 vsscanf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/vsscanf.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vsscanf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: MSVC 14.
• On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
• On Windows, these functions don’t support the hh, 11, j, t, z size specifiers.

10.1226 vswprintf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/vswprintf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x.
• On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.
• On Windows, this function does not take a buffer size as second argument.
• This function does not support size specifiers as in C23 (w8, w16, w32, w64, wf8, wf16, wf32, wf64) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
• This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
• The %m directive is not portable, use %s mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.

• In the C or POSIX locales, the %c and %s conversions may fail on some platforms: glibc 2.35.

• When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.

10.1227 vswscanf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/vswscanf.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vswscanf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Cygwin 1.5.x, MSVC 14, Android 4.4.

• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1228 vwprintf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/vwprintf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.7.

• This function exists, but does not support wide arguments on some platforms: Cygwin 1.5.x.

• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

• This function does not support size specifiers as in C23 (w8, w16, w32, w64, wf8, wf16, wf32, wf64) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.

• This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.

• The %m directive is not portable, use %s mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
In the C or POSIX locales, the %c and %s conversions may fail on some platforms: glibc 2.35.

When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.

On some platforms, this function does not set errno or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

10.1229 vwscanf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/vwscanf.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vwscanf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Cygwin 1.5.x, Android 4.4.

- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1230 wait

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wait.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

10.1231 waitid

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/waitid.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 7.1, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14.

- As of 2005, no system is known on which waitid with flag WNOWAIT works correctly.
10.1232 waitpid

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/waitpid.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-waitpid-3.html

Gnulib module: waitpid

Portability problems fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

10.1233 wcpcpy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcpcpy.html

Gnulib module: wcpcpy

Portability problems fixed by Gnulib:
• This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD
  9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw,
  MSVC 14.
  • This function is not declared (without -D_GNU_SOURCE) on some platforms: glibc 2.13.

Portability problems not fixed by Gnulib:
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot
  accommodate all Unicode characters.

10.1234 wcpncpy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcpncpy.html

Gnulib module: wcpncpy

Portability problems fixed by Gnulib:
• This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD
  9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw,
  MSVC 14.
  • This function is not declared (without -D_GNU_SOURCE) on some platforms: glibc 2.13.

Portability problems not fixed by Gnulib:
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot
  accommodate all Unicode characters.
10.1235 wcrtomb

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcrtomb.html

Gnulib module: wcrtomb

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, mingw.
- This function produces wrong characters in the C locale on some platforms: Android 4.3.
- This function returns 0 when the first argument is NULL in some locales on some platforms: Solaris 11.3.
- This function does not ignore the second argument when the first argument is NULL on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the ISO C11 function c32rtomb, provided by Gnulib module c32rtomb, operates on 32-bit wide characters and therefore does not have this limitation.

10.1236 wcscasecmp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcscasecmp.html

Gnulib module: wcscasecmp

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14.

Portability problems not fixed by Gnulib:
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1237 wcscasecmp_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcscasecmp_l.html

Gnulib module: —

Portability problems not fixed by Gnulib:
- This function is missing on many non-glibc platforms: Mac OS X 10.5, FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.
10.1238 wcsat

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsat.html
Gnulib module: wcsat
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1239 wcschr

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcschr.html
Gnulib module: wcschr
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1240 wcscmp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcscmp.html
Gnulib module: wcscmp
Portability problems fixed by Gnulib:
• This function compares the wide characters as if they were unsigned, although wchar_t is signed, on some platforms: glibc 2.14.1 on x86 or x86_64, musl libc 1.2.3, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, Solaris 11.4.
• This function may return a wrong result if the two arguments are of different length, on some platforms: AIX 7.2 in 64-bit mode.
Portability problems not fixed by Gnulib:
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1241 wcscoll

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcscoll.html
Gnulib module: wcscoll
Portability problems fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8.
Portability problems not fixed by Gnulib:
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.
10.1242 wcscoll_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcscoll_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1243 wcscpy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcscpy.html

Gnulib module: wcscpy

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

Note: wcscpy (dst, src) is only safe to use when you can guarantee that there are at least wcslen (src) + 1 wide characters allocated at dst.

10.1244 wcscspn

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcscspn.html

Gnulib module: wcscspn

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1245 wcsdup

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsdup.html

Gnulib module: wcsdup

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x.
Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1246 wcsftime

**POSIX specification:**

https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsftime.html

**GnuLib module:** wcsftime

Portability problems fixed by GnuLib:

- On native Windows platforms (mingw, MSVC), this function works incorrectly when the environment variable `TZ` has been set by Cygwin.

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.
- Native Windows platforms (mingw, MSVC) support only a subset of time zones specified by POSIX. See Section 10.1192 [tzset], page 443.

### 10.1247 wcslen

**POSIX specification:**

https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcslen.html

**GnuLib module:** wcslen

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1248 wcsncasecmp

**POSIX specification:**

https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsncasecmp.html

**GnuLib module:** wcsncasecmp

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14.

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.
10.1249 wcsncasecmp_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsncasecmp_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many non-glibc platforms: Mac OS X 10.5, FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1.

• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1250 wcsncat

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsncat.html

Gnulib module: wcsncat

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1251 wcsncmp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsncmp.html

Gnulib module: wcsncmp

Portability problems fixed by Gnulib:

• This function compares the wide characters as if they were unsigned, although wchar_t is signed, on some platforms: glibc 2.14.1 on x86 or x86_64, musl libc 1.2.3, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, Solaris 11.4.

• This function may return a wrong result if the two arguments are of different length, on some platforms: AIX 7.2 in 64-bit mode.

Portability problems not fixed by Gnulib:

• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.
10.1252 wcsncpy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsncpy.html

Gnulib module: wcsncpy
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

Note: This function has no real use: It cannot be used for filling a fixed-size record with a wide string, before writing it to a file, because the wide string encoding is platform dependent and, on some platforms, also locale dependent. And this function is not appropriate for copying a wide string into a bounded memory area, because you have no guarantee that the result will be null-terminated. Even if you add the null character at the end yourself, this function is inefficient (as it spends time clearing unused memory) and will allow silent truncation to occur, which is not a good behavior for GNU programs.

10.1253 wcsnlen

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsnlen.html

Gnulib module: wcsnlen
Portability problems fixed by Gnulib:
- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 7.1, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw.
Portability problems not fixed by Gnulib:
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1254 wcsnrtombs

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsnrtombs.html

Gnulib module: wcsnrtombs
Portability problems fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4.
- This function cannot consume valid sequences of wide characters on some platforms: Solaris 11.4.
- In C++ mode, the system’s <wchar.h> defines std::wcsnrtombs but not ::wcsnrtombs on some platforms: Solaris 11 OpenIndiana.
Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, \texttt{wchar_t} is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the GnuLib function \texttt{c32snrtombs}, provided by GnuLib module \texttt{c32snrtombs}, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.1255 wcsbrk

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsbrk.html

GnuLib module: wcsbrk

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, \texttt{wchar_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1256 wcsrchr

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsrchr.html

GnuLib module: wcsrchr

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, \texttt{wchar_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1257 wcsrtombs

**POSIX specification:**
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsrtombs.html

GnuLib module: wcsrtombs

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, mingw.
- This function does not ignore the length argument if the destination argument is NULL on some platforms: mingw.
- This function updates the source pointer also if the destination argument is NULL on some platforms: HP-UX 11.

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, \texttt{wchar_t} is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the GnuLib function \texttt{c32srtombs}, provided by GnuLib module \texttt{c32srtombs}, operates on 32-bit wide characters and therefore does not have this limitation.
10.1258 wcsspn

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsspn.html

Gnulib module: wcsspn
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1259 wcsstr

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsstr.html

Gnulib module: wcsstr or wcsstr-simple
Portability problems fixed by either Gnulib module wcsstr-simple or wcsstr:
- This function is missing on some platforms: HP-UX 11.00.
Portability problems fixed by Gnulib module wcsstr:
- This function has quadratic instead of linear worst-case complexity on some platforms: glibc 2.37, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
Portability problems not fixed by Gnulib:
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1260 wcstod

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstod.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1261 wcstof

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstof.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, MSVC 9, Android 4.4.
On Windows and 32-bit AIX platforms, \texttt{wchar_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

\subsection*{10.1262 \texttt{wcstomax}}

POSIX specification:
\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstomax.html}

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, MSVC 9, Android 4.4.
- On Windows and 32-bit AIX platforms, \texttt{wchar_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

\subsection*{10.1263 \texttt{wcstok}}

POSIX specification:
\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstok.html}

Gnulib module: \texttt{wcstok}

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Cygwin 1.5.x.
- This function takes only two arguments on some platforms: mingw, older MSVC.
- This function may use hidden state, ignoring the third argument, and thus exhibit a bug when two or more \texttt{wcstok} iteration loops are being performed in the same thread, on some platforms: HP-UX 11.31.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, \texttt{wchar_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

\subsection*{10.1264 \texttt{wcstol}}

POSIX specification:
\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstol.html}

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, \texttt{wchar_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.
10.1265 wcstold

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstold.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1266 wcstoll

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstoll.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.11, Solaris 9, Cygwin 1.5.x, MSVC 9, Android 4.4.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1267 wcstombs

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstombs.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function c32stombs, provided by Gnulib module c32stombs, operates on 32-bit wide characters and therefore does not have this limitation.

10.1268 wcstoul

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstoul.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
• On Windows and 32-bit AIX platforms, \texttt{wchar_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1269 \texttt{wcstoull}

POSIX specification:  
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstoull.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, HP-UX 11.11, Solaris 9, Cygwin 1.5.x, MSVC 9, Android 4.4.

• On Windows and 32-bit AIX platforms, \texttt{wchar_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1270 \texttt{wcstoumax}

POSIX specification:  
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstoumax.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, MSVC 9, Android 4.4.

• On Windows and 32-bit AIX platforms, \texttt{wchar_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1271 \texttt{wcswidth}

POSIX specification:  
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcswidth.html

Gnulib module: wcswidth

Portability problems fixed by Gnulib:

• This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

• On Windows and 32-bit AIX platforms, \texttt{wchar_t} is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function \texttt{c32swidth}, provided by Gnulib module \texttt{c32swidth}, operates on 32-bit wide characters and therefore does not have this limitation.
10.1272 wcsxfrm

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsxfrm.html

Gnulib module: wcsxfrm

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.

Portability problems not fixed by Gnulib:
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1273 wcsxfrm_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsxfrm_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1274 wctob

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wctob.html

Gnulib module: wctob

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, mingw.
- This function clobbers caller-owned registers on some platforms: Cygwin 1.7.5.
- This function does not work on some platforms: Solaris 9.
- This function is missing a declaration on some platforms: IRIX 6.5.

Portability problems not fixed by Gnulib:
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function c32tob, provided by Gnulib module c32tob, operates on 32-bit wide characters and therefore does not have this limitation.
10.1275 wctomb

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wctomb.html

Gnulib module: wctomb

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Android 4.4.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1276 wctrans

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wctrans.html

Gnulib module: wctrans

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, mingw, MSVC 9, Android 7.1.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1277 wctrans_l

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wctrans_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 7.1.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1278 wctype

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wctype.html

Gnulib module: wctype

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, MSVC 9.
• This function is declared in `<wchar.h>`, not in `<wctype.h>`, on some platforms: HP-UX 11.00.

Portability problems not fixed by Gnulib:
• On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1279 `wctype_l`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wctype_l.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
• On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1280 `wcwidth`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcwidth.html

Gnulib module: wcwidth

Portability problems fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
• This function is not declared (without `-D_GNU_SOURCE`) on some platforms: glibc 2.8.
• This function handles combining characters in UTF-8 locales incorrectly on some platforms: macOS 12.5, NetBSD 9.0, OpenBSD 5.8, MidnightBSD 1.1.
• This function returns 2 for characters with ambiguous east asian width, even in Western locales, on some platforms: Solaris 11.4.

Portability problems not fixed by Gnulib:
• On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32width`, provided by Gnulib module `c32width`, operates on 32-bit wide characters and therefore does not have this limitation.
• This function treats zero-width spaces like control characters on some platforms: AIX 7.2.
10.1281 wmemchr

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wmemchr.html

Gnulib module: wmemchr

Portability problems fixed by Gnulib:
• This function is missing on some platforms: HP-UX 11.00, IRIX 6.5, MSVC 14.

Portability problems not fixed by Gnulib:
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1282 wmemcmp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wmemcmp.html

Gnulib module: wmemcmp

Portability problems fixed by Gnulib:
• This function is missing on some platforms: HP-UX 11.00, IRIX 6.5, MSVC 14.
• This function compares the wide characters as if they were unsigned, although wchar_t is signed, on some platforms: glibc 2.14.1 on x86 or x86_64, musl libc 1.2.3, NetBSD 9.0, OpenBSD 7.2, Solaris 11.4.

Portability problems not fixed by Gnulib:
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1283 wmemcpy

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wmemcpy.html

Gnulib module: wmemcpy

Portability problems fixed by Gnulib:
• This function is missing on some platforms: HP-UX 11.00, IRIX 6.5, MSVC 9.

Portability problems not fixed by Gnulib:
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1284 wmemmove

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wmemmove.html

Gnulib module: wmemmove

Portability problems fixed by Gnulib:
• This function is missing on some platforms: HP-UX 11.00, IRIX 6.5, MSVC 9.
Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1285 wmemset

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wmemset.html

Gnulib module: wmemset

Portability problems fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11.00, IRIX 6.5, MSVC 9.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

10.1286 wordexp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wordexp.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.
- On some platforms, this function does not set errno or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

10.1287 wordfree

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wordfree.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

10.1288 wprintf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wprintf.html

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11.00, IRIX 6.5.
- This function exists, but does not support wide arguments on some platforms: Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.
- This function does not support size specifiers as in C23 (w8, w16, w32, w64, wf8, wf16, wf32, wf64) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- The %a directive is not portable, use %s mapped to an argument of strerror(errno) (or a version of strerror_r) instead.
- In the C or POSIX locales, the %c and %s conversions may fail on some platforms: glibc 2.35.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.
- On some platforms, this function does not set errno or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

10.1289 write

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/write.html

Gnulib module: write, nonblocking, sigpipe

Portability problems fixed by Gnulib module write:

- This function is declared in a different header file (namely, <io.h>) on some platforms: mingw, MSVC 14.
- This function crashes when invoked with invalid arguments on some platforms: MSVC 14.

Portability problems fixed by Gnulib module stdio, together with module nonblocking:

- When writing to a non-blocking pipe whose buffer is full, this function fails with errno being set to ENOSPC instead of EAGAIN on some platforms: mingw, MSVC 14.
- When writing to a non-blocking pipe on which no reader is currently waiting an amount of bytes that exceeds the pipe buffer’s size, then—even if the pipe’s buffer is empty—this function fails, instead of performing a partial write into the pipe buffer, on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module stdio, together with module sigpipe:

- When writing to a pipe with no readers, this function fails with error EINVAL, instead of obeying the current SIGPIPE handler, on some platforms: mingw, MSVC 14.
Portability problems not fixed by Gnulib:

- This function may fail with error EINTR, even in programs that don’t install any signal handlers, on some platforms: macOS 11.1.

For handling EINTR, Gnulib provides a module ‘safe-write’ with a function `safe_write`.

### 10.1290 writev

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/writev.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.1291 wscanf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wscanf.html

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-wscanf.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x.

- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1292 y0

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/y0.html

Gnulib module: y0

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
10.1293  \textit{y1}

POSIX specification:  
https://pubs.opengroup.org/onlinepubs/9699919799/functions/y1.html

Gnulib module: y1  
Portability problems fixed by Gnulib:  
Portability problems not fixed by Gnulib:  
• This function is missing on some platforms: Minix 3.1.8.

10.1294  \textit{yn}

POSIX specification:  
https://pubs.opengroup.org/onlinepubs/9699919799/functions/yn.html

Gnulib module: yn  
Portability problems fixed by Gnulib:  
Portability problems not fixed by Gnulib:  
• This function is missing on some platforms: Minix 3.1.8.
11 Past POSIX Function Substitutes

This chapter describes which functions and function-like macros specified by older versions of POSIX are substituted by Gnulib, which portability pitfalls are fixed by Gnulib, and which (known) portability problems are not worked around by Gnulib.

The notation “Gnulib module: —” means that Gnulib does not provide a module providing a substitute for the function. When the list “Portability problems not fixed by Gnulib” is empty, such a module is not needed: No portability problems are known. Otherwise, it indicates that such a module would be useful but is not available: No one so far found this function important enough to contribute a substitute for it. If you need this particular function, you may write to <bug-gnulib at gnu dot org>.

11.1 bcmp
- POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/bcmp.html
- Gnulib module: —
- Portability problems fixed by Gnulib:
- Portability problems not fixed by Gnulib:
  - This function is missing on some platforms: mingw, MSVC 14, Android 9.0.
  - This function is marked as “legacy” in POSIX. Better use memcmp instead.

11.2 bcopy
- POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/bcopy.html
- Gnulib module: bcopy
- Portability problems fixed by Gnulib:
  - This function is missing on some platforms: mingw, MSVC 14, Android 9.0.
- Portability problems not fixed by Gnulib:
  - This function is marked as “legacy” in POSIX. Better use memcpy or memmove instead.

11.3 bsd_signal
- POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/bsd_signal.html
- Gnulib module: —
- Portability problems fixed by Gnulib:
- Portability problems not fixed by Gnulib:
  - This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 7.1, Cygwin 2.9, mingw, MSVC 14.
11.4 bzero

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/bzero.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14, Android 9.0.
• This function is marked as “legacy” in POSIX. Better use memset instead.

11.5 ecvt

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/ecvt.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 13.0, NetBSD 9.0, Android 9.0.
• This function is not declared on some platforms: Cygwin 2.9.
• This function is marked as “legacy” in POSIX. Better use sprintf instead.

11.6 fcvt

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/fcvt.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: FreeBSD 13.0, NetBSD 9.0, Android 9.0.
• This function is not declared on some platforms: Cygwin 2.9.
• This function is marked as “legacy” in POSIX. Better use sprintf instead.

11.7 ftime

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/ftime.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Android 9.0.
• This function is not declared on some platforms: Android 13.
• On native Windows platforms (mingw, MSVC), this function works incorrectly when the environment variable TZ has been set by Cygwin.
• This function is marked as “legacy” in POSIX. Better use gettimeofday or clock_gettime instead, and use ftime only as a fallback for portability to Windows platforms.

11.8 gcvt

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/gcvt.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, Android 9.0.
• This function is not declared on some platforms: Cygwin 2.9.
• This function is marked as “legacy” in POSIX. Better use sprintf instead.

11.9 getcontext

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/getcontext.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: OpenBSD 6.7, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

11.10 gethostbyaddr

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/gethostbyaddr.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.

11.11 gethostbyname

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/gethostbyname.html

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.
11.12 `getwd`

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/getwd.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 9.0.
- The size of the buffer required for this function is not a compile-time constant. Also, the function truncates a result that would be larger than the minimum buffer size. For these reasons, this function is marked as “legacy” in POSIX. Better use the `getcwd` function instead.

11.13 `h_errno`

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/h_errno.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.34, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

11.14 `index`

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/index.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 9.0.
- This function is not declared on some platforms: Android 13.
- This function is marked as “legacy” in POSIX. Better use `strchr` instead.

11.15 `makecontext`

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/makecontext.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
Chapter 11: Past POSIX Function Substitutes

11.16 mktemp
   POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/mktemp.html
   GnuC module: —
   Portability problems fixed by GnuC:
   Portability problems not fixed by GnuC:
   • This function is not appropriate for creating temporary files. (It has security risks.)
     Therefore it is marked as “legacy” in POSIX. Better use mkstemp instead.

11.17 pthread_attr_getstackaddr
   POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/pthread_attr_getstackaddr.html
   GnuC module: —
   Portability problems fixed by GnuC:
   Portability problems not fixed by GnuC:
   • This function is missing on some platforms: HP-UX 11, Cygwin 1.7.9, mingw, MSVC 14, Android 9.0.
   • This function is not declared on some platforms: Android 13.

11.18 pthread_attr_setstackaddr
   POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/pthread_attr_setstackaddr.html
   GnuC module: —
   Portability problems fixed by GnuC:
   Portability problems not fixed by GnuC:
   • This function is missing on some platforms: HP-UX 11, Cygwin 1.7.9, mingw, MSVC 14, Android 9.0.
   • This function is not declared on some platforms: Android 13.

11.19 rindex
   POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/rindex.html
   GnuC module: —
   Portability problems fixed by GnuC:
   Portability problems not fixed by GnuC:
   • This function is missing on some platforms: mingw, MSVC 14, Android 9.0.
   • This function is marked as “legacy” in POSIX. Better use strchr instead.
11.20 scalb

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/scalb.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

11.21 setcontext

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/setcontext.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: OpenBSD 6.7, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

• The effects of this call are system and compiler optimization dependent, since it restores the contents of register-allocated variables but not the contents of stack-allocated variables.

11.22 swapcontext

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/swapcontext.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: OpenBSD 6.7, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

11.23 ualarm

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/ualarm.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: mingw, MSVC 14, Android 9.0.
11.24 usleep

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/usleep.html

Gnulib module: usleep

Portability problems fixed by Gnulib:
- On some systems, `usleep` rejects attempts to sleep longer than 1 second, as allowed by POSIX: NetBSD 9.0, mingw.

Portability problems not fixed by Gnulib:
- According to POSIX, the `usleep` function may interfere with the program’s use of the SIGALRM signal. On Linux, it doesn’t; on other platforms, it may.

11.25 vfork

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/vfork.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: IRIX 6.5, mingw, MSVC 14.

11.26 wcswcs

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/wcswcs.html

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function is not declared on some platforms: Android 13.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.
- This function is marked as “legacy” in POSIX. Better use `wcsstr` instead.
12 Glibc Header File Substitutes

This chapter describes which header files contained in GNU libc but not specified by ISO C or POSIX are substituted by GnuLib, which portability pitfalls are fixed by GnuLib, and which (known) portability problems are not worked around by GnuLib.

The notation "GnuLib module: —" means that GnuLib does not provide a module providing a substitute for the header file. When the list "Portability problems not fixed by GnuLib" is empty, such a module is not needed: No portability problems are known. Otherwise, it indicates that such a module would be useful but is not available: No one so far found this header file important enough to contribute a substitute for it. If you need this particular header file, you may write to <bug-gnulib at gnu dot org>.

12.1 a.out.h

Describes the structure of executables (and object files?) in the old a.out format.

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This header file is missing on some platforms: macOS 11.1, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This header file is useless because most executables and object files are in ELF format on some platforms: glibc 2.3.6, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7.

12.2 aliases.h

Defines the type struct aliasent and declares the functions setaliasent, endaliasent, getaliasent, getaliasent_r, getaliasbyname, getaliasbyname_r.

Documentation:

- man setaliasent.

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This header file is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.

12.3 alloca.h

Declares the alloca function of function-like macro.

Documentation:

- man alloca.
Gnulib module: alloca

Portability problems fixed by Gnulib:
• This header file is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

12.4  ar.h

Describes the structure of files produced by the ‘ar’ program. Defines the type struct ar_hdr and the macros ARMA, SARMAG, ARFMAG.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This header file is missing on some platforms: mingw, MSVC 14.

12.5  argp.h

Documentation:

Gnulib module: argp

Portability problems fixed by Gnulib:
• This header file is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

12.6  argz.h

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html,
• man argz.

Gnulib module: argz

Portability problems fixed by Gnulib:
• This header file is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

• The argz functions do not work on some platforms: Cygwin.

Portability problems not fixed by Gnulib:
12.7 byteswap.h

Defines the functions or function-like macros `bswap_16`, `bswap_32`, `bswap_64`.

Gnulib module: byteswap

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

12.8 crypt.h

Defines the type `struct crypt_data` and declares the functions `crypt`, `crypt_r`, `setkey`, `setkey_r`, `encrypt`, `encrypt_r`.

Documentation:

- man crypt, man encrypt.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.
- The functions `crypt`, `setkey`, `encrypt` are missing on some platforms: HP-UX 11.
- The type `struct crypt_data` and the functions `crypt_r`, `setkey_r`, `encrypt_r` are missing on some platforms: IRIX 6.5, Solaris 11.4, Cygwin.

12.9 endian.h

Describes the platform’s endianness (byte ordering of words stored in memory). Defines the macros `BYTE_ORDER`, `LITTLE_ENDIAN`, `BIG_ENDIAN`, `PDP_ENDIAN`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14.
12.10 envz.h

Documentation:

- man envz.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

12.11 err.h

Declares the functions warn, vwarn, warnx, vwarnx, err, verr, errx, verrx.

Documentation:

- man err.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

12.12 error.h

Declares the functions error, error_at_line and the variables error_print_programe, error_message_count, error_one_per_line.

Documentation:

- man error.

Gnulib module: error-h

Portability problems fixed by Gnulib:

- This header file is missing on many platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14.

Portability problems not fixed by Gnulib:
12.13 execinfo.h
Declares the functions backtrace, backtrace_symbols, backtrace_symbols_fd.

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Backtraces.html,
- man backtrace.

Gnulib module: —

Portability problems fixed by Gnulib:
- This header file is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:
- On platforms where the header file is missing, the Gnulib substitute implementation is just a stub, and does nothing.

12.14 fpu_control.h
Handling of the FPU control word. Defines the fpu_control_t type, declares the __fpu_control variable, and defines the _FPU_GETCW, _FPU_SETCW macros.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This header file is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.

12.15 fstab.h
Defines the type struct fstab, the macros FSTAB_*, _PATH_FSTAB, and declares the functions setfsent, endfsent, getfsent, getfsspec, getfsfile.

Documentation:
- man setfsent.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This header file is missing on some platforms: Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.
- The macro _PATH_FSTAB is missing on some platforms: AIX 5.1, HP-UX 11.
12.16  fts.h

Defines the types FTS, FTSENT and the macros FTS_*, and declares the functions fts_open, fts_read, fts_children, fts_set, fts_close.

Documentation:
• man fts.

Gnulib module: fts

Portability problems fixed by Gnulib:
• This header file is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

12.17  getopt.h

Defines the type struct option and declares the variables optarg, optind, opterr, optopt and the functions getopt, getopt_long, getopt_long_only.

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Getopt.html,
• man getopt.

Gnulib module: getopt-gnu

Portability problems fixed by Gnulib:
• This header file is missing on some platforms: AIX 7.2, HP-UX 11, MSVC 14.
• The function getopt_long is missing on some platforms: IRIX 6.5, Solaris 9.
• The function getopt_long_only is missing on some platforms: FreeBSD 5.2.1, NetBSD 9.0, IRIX 6.5, Solaris 9, mingw.
• The method to reset options is incompatible on some platforms: FreeBSD 6.0, NetBSD 9.0(?), OpenBSD 6.7, Cygwin 1.5.x, mingw.
• The function getopt does not handle a leading ‘+’ character in the options string on some platforms: Solaris 11 2010-11.

Portability problems not fixed by Gnulib:

12.18  gshadow.h

Defines the type struct sgrp and declares the functions setsgent, endsgent, getsgent, getsgnam, sgetsgent, fgetsgent, putsgent, getsgent_r, getsgnam_r, sgetsgent_r, fgetsgent_r.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This header file is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.
12.19 ieee754.h

Defines the types `union ieee754_float`, `union ieee754_double`, `union ieee854_long_double`.

Gnulib module: —

Portability problems fixed by Gnulib:
- This header file is missing on all non-glibc platforms: glibc/sparc64 in 32-bit mode, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:
- The substitute for this header file has not been tested for `long double` and does not work on some platforms.
- The substitute for this header file returns nonsense on (now-quite-rare) platforms that do not use IEEE floating point.

12.20 ifaddrs.h

Defines the type `struct ifaddrs` and declares the functions `getifaddrs`, `freeifaddrs`.

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This header file is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14.

12.21 libintl.h

Defines the macros `__USE_GNU_GETTEXT`, `__GNU_GETTEXT_SUPPORTED_REVISION`, and declares the functions `gettext`, `dgettext`, `dcgettext`, `ngettext`, `dngettext`, `dcngettext`, `textdomain`, `bindtextdomain`, `bind_textdomain_codeset`.

Documentation:

Gnulib module: gettext

Portability problems fixed by Gnulib, if GNU gettext is installed:
- This header file is missing on some platforms: macOS 11.1, FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14, Android 9.0.
- The functions cannot deal with GNU .mo files with system-dependent strings (of major version 1 or of minor version 1) on some non-glibc platforms: NetBSD 3.0, Solaris 10.

Portability problems not fixed by Gnulib:
12.22 link.h

Defines the type struct dl_phdr_info, and declares the function dl_iterate_phdr.

Documentation: —

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This header file is missing on some platforms: macOS 11.1, AIX 7.1, HP-UX 11.31, IRIX 6.5, Cygwin 2.9.0, mingw, MSVC 14.

12.23 malloc.h

Declares the function memalign and functions for customizing the malloc behavior.

Documentation:

Gnulib module: malloc-h

Portability problems fixed by Gnulib:
- This header file is missing on some platforms: macOS 11.1, OpenBSD 6.7.

Portability problems not fixed by Gnulib:

12.24 mcheck.h

Defines the type enum mcheck_status and declares the functions mcheck, mcheck_pedantic, mcheck_check_all, mprobe, mtrace, muntrace.

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This header file is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.

12.25 mntent.h

Defines the type struct mntent and the macros MNTTAB, MOUNTED, MNTTYPE_*, MNTOPT_*, and declares the functions setmntent, getmntent, getmntent_r, addmntent, endmntent, hasmntopt.

Documentation:
- man setmntent.
Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Solaris 11.4, mingw, MSVC 14.
- The function `getmntent_r` is missing on all non-glibc platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin, Android 9.0.

Gnulib module `mountlist` provides a higher-level abstraction.

12.26 obstack.h

Documentation:


Gnulib module: obstack

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

12.27 paths.h

Defines the macros `_PATH_*`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: Minix 3.1.8, HP-UX 11, Solaris 11 2010-11, mingw, MSVC 14.
- The set of `_PATH_*` macros is platform dependent.

12.28 printf.h

Defines the type `struct printf_info` and the macros and enum values `PA_*`, and declares the functions `printf_function`, `printf_arginfo_function`, `register_printf_function`, `parse_printf_format`, `printf_size`, `printf_size_info`.

Documentation:


Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.

12.29  pty.h

Declares the functions openpty and forkpty.

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/Pseudo_Terminal-Pairs.html,
- man openpty.

Gnulib module: pty

Portability problems fixed by Gnulib:

- This header file is missing on some platforms that declare the forkpty and openpty functions in util.h or libutil.h instead: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7.
- This header file is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4.

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

12.30  resolv.h

Defines the types res_sendhookact, res_send_qhook, res_send_rhook, res_state, struct res_sym and the macros _PATH_RESCONF, RES_*, and declares the functions res_close, res_init, res_mkquery, res_query, res_querydomain, res_search, res_send.

Documentation:

- man res_init.

Gnulib module: —

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: Cygwin 1.5.x, mingw, MSVC 14.
- The functions are missing on some platforms: HP-UX 11.
12.31  shadow.h

Defines the type struct spwd and declares the functions setspent, endspent, getspent, 
getspent_r, getspnam, getspnam_r, sgetspent, sgetspent_r, fgetspent, fgetspent_r, 
putspent, lckpwdf, ulckpwdf.

Documentation:
• man setspent.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This header file is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 
  9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, Cygwin, mingw, MSVC 14, Android 9.0.
• The functions getspent_r, getspnam_r, sgetspent_r, fgetspent, fgetspent_r, 
  putspent are missing on some platforms: HP-UX 11.
• The functions sgetspent, sgetspent_r are missing on some platforms: HP-UX 11, 
  IRIX 6.5, Solaris 11.4.

12.32  sys/file.h

Declares the function flock.

Gnulib module: sys_file

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This header file is missing on some platforms: MSVC 14.

12.33  sys/ioctl.h

Declares the function ioctl.

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/IOCTLs.html,
• man ioctl.

Gnulib module: sys_ioctl

Portability problems fixed by Gnulib:
• This header file is missing on some platforms: mingw, MSVC 14.
• This header file does not declare the ioctl function on some platforms: AIX 5.1, 

Portability problems not fixed by Gnulib:
12.34  sys/random.h
Declares the function `getrandom` and the flags for it.

Documentation:
- `man getrandom`

Gnulib module: sys_random

Portability problems fixed by Gnulib:
- This header file is missing on some platforms: glibc 2.24, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.11, IRIX 6.5, Cygwin 2.6.x, mingw, MSVC 14.
- This header file is not self-contained on some platforms: uClibc, macOS 11.1.

Portability problems not fixed by Gnulib:

12.35  sysexits.h
Defines the `EX_*` macros, including `EX_OK`.

Gnulib module: sysexits

Portability problems fixed by Gnulib:
- This header file is missing on some platforms: mingw, MSVC 14.
- This header file defines no `EX_*` macros if `_BSD_SOURCE` is not defined on some platforms: Haiku.
- The macro `EX_CONFIG` is missing on some platforms: HP-UX 11.

Portability problems not fixed by Gnulib:

12.36  ttyent.h
Defines the type `struct ttyent` and declares the functions `setttyent`, `endttyent`, `getttyent`, `getttynam`.

Documentation:
- `man setttyent`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This header file is missing on some platforms: HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.
12.37 utmp.h

Defines functions for login and logout (to a tty session) and for examining the history of logins and logouts.

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html,
- man utmp.

Gnulib module: utmp

Portability problems fixed by Gnulib:
- This header file is missing on some platforms: FreeBSD 13.0, mingw, MSVC 14.
- <sys/types.h> is a prerequisite of <utmp.h> on some platforms: FreeBSD 8.0, OpenBSD 7.2.

Portability problems not fixed by Gnulib:
13 Glibc Function Substitutes

This chapter describes which functions and function-like macros provided as extensions by at least GNU libc are also supported by Gnulib, which portability pitfalls are fixed by Gnulib, and which (known) portability problems are not worked around by Gnulib.

The notation "Gnulib module: —" means that Gnulib does not provide a module providing a substitute for the function. When the list "Portability problems not fixed by Gnulib" is empty, such a module is not needed: No portability problems are known. Otherwise, it indicates that such a module would be useful but is not available: No one so far found this function important enough to contribute a substitute for it. If you need this particular function, you may write to <bug-gnulib at gnu dot org>.

This list of functions is sorted according to the header that declares them.

13.1 Glibc Extensions to <aio.h>

13.1.1 aio_init

Documentation:

- man aio_init.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.2 Glibc <aliases.h>

13.2.1 endaliasent

Documentation:

man endaliasent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
### 13.2.2 `getaliasbyname`

Documentation:
`man getaliasbyname`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.2.3 `getaliasbyname_r`

Documentation:
`man getaliasbyname`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.2.4 `getaliasent`

Documentation:
`man getaliasent`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.2.5 `getaliasent_r`

Documentation:
`man getaliasent`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.2.6 setaliasent

Documentation:
man setaliasent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.3 Glibc <argp.h>

13.3.1 argp_err_exit_status

Documentation:

Gnulib module: argp

Portability problems fixed by Gnulib:

- This variable is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

13.3.2 argp_error

Documentation:

Gnulib module: argp

Portability problems fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

13.3.3 argp_failure

Documentation:

Gnulib module: argp

Portability problems fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
Portability problems not fixed by Gnutip:

13.3.4 argp_help

Documentation:

Gnutip module: argp
Portability problems fixed by Gnutip:
- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnutip:

13.3.5 argp_parse

Documentation:

Gnutip module: argp
Portability problems fixed by Gnutip:
- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnutip:

13.3.6 argp_program_bug_address

Documentation:

Gnutip module: argp
Portability problems fixed by Gnutip:
- This variable is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnutip:

13.3.7 argp_program_version

Documentation:

Gnutip module: argp
Portability problems fixed by Gnutip:
- This variable is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnutip:
13.3.8 argp_program_version_hook

Documentation:

Gnulib module: argp
Portability problems fixed by Gnulib:
- This variable is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

13.3.9 argp_state_help

Documentation:

Gnulib module: argp
Portability problems fixed by Gnulib:
- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

13.3.10 argp_usage

Documentation:

Gnulib module: argp
Portability problems fixed by Gnulib:
- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

13.4 Glibc <argz.h>

13.4.1 argz_add

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/ baselib-argz-add.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html,
- man argz_add.
Gnulib module: argz

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

13.4.2 argz_add_sep

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html,
- man argz_add_sep.

Gnulib module: argz

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

13.4.3 argz_append

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html,
- man argz_append.

Gnulib module: argz

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:
13.4.4 argz_count

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html

Documentation:
- man argz_count.

Gnulib module: argz

Portability problems fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

13.4.5 argz_create

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html

Documentation:
- man argz_create.

Gnulib module: argz

Portability problems fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

13.4.6 argz_create_sep

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html

Documentation:
- man argz_create_sep.

Gnulib module: argz

Portability problems fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
• This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

13.4.7 argz_delete

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html,
• man argz_delete.

Gnulib module: argz

Portability problems fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
• This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

13.4.8 argz_extract

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html,
• man argz_extract.

Gnulib module: argz

Portability problems fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
• This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

13.4.9 argz_insert

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html,
• man argz_insert.
Gnulib module: argz

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

13.4.10 argz_next

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html,
- man argz_next.

Gnulib module: argz

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

13.4.11 argz_replace

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html,
- man argz_replace.

Gnulib module: argz

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:
13.4.12 argz_stringify

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html,
- man argz_stringify.

Gnulib module: argz

Portability problems fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

13.5 Glibc Extensions to <arpa/inet.h>

13.5.1 inet_aton

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-inet-aton-3.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Host-Address-Functions.html,
- man inet_aton.

Gnulib module: —

Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.

13.5.2 inet_lnaof

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Host-Address-Functions.html,
- man inet_lnaof.

Gnulib module: —

Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 4.4.
13.5.3  **inet_makeaddr**

Documentation:
- man inet_makeaddr.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.4.

13.5.4  **inet_net_ntop**

Documentation:
man inet_net_ntop

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.5.5  **inet_net_pton**

Documentation:
man inet_net_pton

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.5.6  **inet_netof**

Documentation:
- man inet_netof.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.4.
13.5.7 inet_network

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Host-Address-Functions.html,
- man inet_network.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.

13.5.8 inet_nsap_addr

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, HP-UX 11.00, Cygwin 2.9, mingw, MSVC 14.

13.5.9 inet_nsap_ntoa

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, HP-UX 11.00, Cygwin 2.9, mingw, MSVC 14.

13.6 Glibc <byteswap.h>

13.6.1 bswap_16

Documentation:
man bswap_16

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.6.2 bswap_32

Documentation:
man bswap_32

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.6.3 bswap_64

Documentation:
man bswap_64

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.7 Glibc Extensions to <complex.h>

13.7.1 clog10

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib---clog10.html

Documentation:
- man clog10.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 9, Android 9.0.

13.7.2 clog10f

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib---clog10f.html
13.7.3 \texttt{clog10l}

**LSB specification:**
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib--clog10l.html

**Documentation:**
- man clog10l.

**Gnulib module:** —

**Portability problems fixed by Gnulib:**

**Portability problems not fixed by Gnulib:**

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 9, Android 9.0.

13.8 Glibc Extensions to \texttt{<ctype.h>}

13.8.1 \texttt{isctype}

**Gnulib module:** —

**Portability problems fixed by Gnulib:**

**Portability problems not fixed by Gnulib:**

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.9 Glibc Extensions to \texttt{<dirent.h>}

13.9.1 getdirentries

Documentation:
man getdirentries

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- On platforms where off_t is a 32-bit type, this function may not work correctly on huge directories larger than 2 GB. The fix is to use the AC_SYS_LARGEFILE macro.

13.9.2 scandirat

Documentation:
man scandirat

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.14, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 1.7.10, mingw, MSVC 14, Android 6.0.

13.9.3 versionsort

Documentation:
- man versionsort.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

13.10 Glibc Extensions to <dlfcn.h>

13.10.1 dladdr

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dladdr-3.html

Documentation:
man dladdr
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, IRIX 6.5, Cygwin 1.7.x, mingw, MSVC 14.

13.10.2 dladdr1
Documentation:
man dladdr1
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.10.3 dlinfo
Documentation:
man dlinfo
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.10.4 dlmopen
Documentation:
man dlmopen
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.10.5 dlvsym
LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dlvsym-1.html
Documentation:
man dlvsym
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 6.0.

13.11 Glibc <envz.h>

13.11.1 envz_add

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-envz-add.html

Documentation:
- man envz_add.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

13.11.2 envz_entry

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-envz-add.html

Documentation:
- man envz_entry.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
13.11.3 envz_get

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-envz-add.html

Documentation:
- man envz_get.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

13.11.4 envz_merge

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-envz-add.html

Documentation:
- man envz_merge.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

13.11.5 envz_remove

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-envz-add.html

Documentation:
- man envz_remove.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
13.11.6 envz_strip

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-envz-add.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Envz-Functions.html,
• man envz_strip.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

13.12 Glibc <err.h>

13.12.1 err

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-err-3.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html,
• man err.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

13.12.2 errx

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-errx-3.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html,
• man errx.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.
13.12.3 verr

Documentation:
- man verr.

Gnulib module: —
Portability problems fixed by Gnulib:
- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

13.12.4 verrx

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-verrx-3.html

Documentation:
- man verrx.

Gnulib module: —
Portability problems fixed by Gnulib:
- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

13.12.5 vwarn

Documentation:
- man vwarn.

Gnulib module: —
Portability problems fixed by Gnulib:
- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

13.12.6 vwarnx

Documentation:
- man vwarnx.
Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

### 13.12.7 `warn`

LSB specification:

https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-warn-3.html

Documentation:

- man `warn`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

### 13.12.8 `warnx`

LSB specification:

https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-warnx-3.html

Documentation:

- man `warnx`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

### 13.13 Glibc Extensions to `<errno.h>`

#### 13.13.1 `program_invocation_name`

Documentation:

- man `program_invocation_name`.
GnuLib module: —
Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

• This variable is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.7, mingw, MSVC 14, Android 9.0.

13.13.2 program_invocation_short_name

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html,
• man program_invocation_short_name.

GnuLib module: —
Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

• This variable is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.7, mingw, MSVC 14, Android 9.0.

13.14 Glibc <error.h>

13.14.1 error

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-error-n.html

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html,
• man error.

GnuLib module: error
Portability problems fixed by GnuLib:

• This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14, Android 5.1.

• This function outputs an extra space if error_print_progam is set, on some platforms: Android 11.

Portability problems not fixed by GnuLib:

13.14.2 error_at_line

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html,
• man error_at_line.
Gnulib module: error

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14, Android 5.1.

Portability problems not fixed by Gnulib:

13.14.3 error_message_count

Documentation:

- man error_message_count.

Gnulib module: error

Portability problems fixed by Gnulib:

- This variable is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14, Android 5.1.

Portability problems not fixed by Gnulib:

13.14.4 error_one_per_line

Documentation:

- man error_one_per_line.

Gnulib module: error

Portability problems fixed by Gnulib:

- This variable is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14, Android 5.1.

Portability problems not fixed by Gnulib:

13.14.5 error_print_progname

Documentation:

man error_print_progname

Gnulib module: error

Portability problems fixed by Gnulib:

- This variable is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14, Android 5.1.

Portability problems not fixed by Gnulib:
13.15 Glibc <execinfo.h>

13.15.1 backtrace

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-backtrace-1.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Backtraces.html,
• man backtrace.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on many platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.15.2 backtrace_symbols

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-backtrace-1.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Backtraces.html,
• man backtrace_symbols.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on many platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.15.3 backtrace_symbols_fd

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-backtrace-1.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Backtraces.html,
• man backtrace_symbols_fd.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.16 Glibc Extensions to `<fcntl.h>`

#### 13.16.1 fallocate

Documentation:

man fallocate

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function exists only on Linux and is therefore missing on older glibc versions and many non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.4.

• On platforms where `off_t` is a 32-bit type, this function may not work correctly across the entire data range of files larger than 2 GB. The fix is to use the `AC_SYS_LARGEFILE` macro.

#### 13.16.2 name_to_handle_at

Documentation:

man name_to_handle_at

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.13, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.16.3 readahead

Documentation:

man readahead

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function exists only on Linux and is therefore missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.0.4.
13.16.4 open_by_handle_at

Documentation:
man open_by_handle_at

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function exists only on Linux and is therefore missing on all non-glibc platforms:
glibc 2.13, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.16.5 sync_file_range

Documentation:
man sync_file_range

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function exists only on Linux and is therefore missing on many non-glibc platforms:
glibc 2.5, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.3.

13.17 Glibc Extensions to <fenv.h>

13.17.1 fedisableexcept

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fedisableexcept.html

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Control-Functions.html,
• man fedisableexcept.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.7, mingw, MSVC 14, Android 4.4.

13.17.2 feenableexcept

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-feenableexcept.html
Chapter 13: Glibc Function Substitutes

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/Control-Functions.html,
- man feenableexcept.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.7, mingw, MSVC 14, Android 4.4.

13.17.3 fegetexcept

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/ baselib-fegetexcept.html

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/Control-Functions.html,
- man fegetexcept.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.7, mingw, MSVC 14, Android 4.4.

13.18 Glibc Extensions to <fmtmsg.h>

13.18.1 addseverity

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/Adding-Severity-Classes.html,
- man addseverity.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.19 Glibc <fstab.h>

13.19.1 endfsent

Documentation:
- man endfsent.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.19.2 getfsent

Documentation:
- man getfsent.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.19.3 getfsfile

Documentation:
- man getfsfile.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.19.4 getfsspec

Documentation:
- man getfsspec.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.19.5 setfsent

Documentation:
- man setfsent.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.20 Glibc <fts.h>

13.20.1 fts_children

Documentation:
man fts_children
Gnulib module: fts
Portability problems fixed by Gnulib:
- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, mingw, MSVC 14.

Portability problems not fixed by Gnulib:
- On platforms where off_t is a 32-bit type, this function may not correctly report the size of files or block devices larger than 2 GB and may not work correctly on huge directories larger than 2 GB. Also, on platforms where ino_t is a 32-bit type, this function may report inode numbers incorrectly. The fix is to use the AC_SYS_LARGEFILE macro (only on Mac OS X systems).

13.20.2 fts_close

Documentation:
man fts_close
Gnulib module: fts
Portability problems fixed by Gnulib:
- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

13.20.3 fts_open

Documentation:
man fts_open
Gnulib module: fts
Portability problems fixed by Gnulib:
- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, mingw, MSVC 14.
Portability problems not fixed by Gnulib:

13.20.4  fts_read

Documentation:
man fts_read

Gnulib module: fts

Portability problems fixed by Gnulib:
• This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, mingw, MSVC 14.

Portability problems not fixed by Gnulib:
• On platforms where off_t is a 32-bit type, this function may not correctly report the size of files or block devices larger than 2 GB and may not work correctly on huge directories larger than 2 GB. Also, on platforms where ino_t is a 32-bit type, this function may report inode numbers incorrectly. The fix is to use the AC_SYS_LARGEFILE macro (only on Mac OS X systems).

13.20.5  fts_set

Documentation:
man fts_set

Gnulib module: fts

Portability problems fixed by Gnulib:
• This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

13.21  Glibc <getopt.h>

13.21.1  getopt_long

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getopt-long-3.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Getopt-Long-Options.html,
• man getopt_long.

Gnulib module: getopt-gnu

Portability problems fixed by Gnulib:
• This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, MSVC 14.
• The function getopt_long does not obey the combination of ‘+’ and ‘:’ flags in the options string on some platforms: glibc 2.11.
• The use of ‘W;’ in the optstring argument to does not always allow --foo to behave synonymously with --foo: glibc 2.11.
• The function `getopt_long` does not support the ‘+’ flag in the options string on some platforms: macOS 11.1, AIX 5.2, Solaris 10.
• The value of `optind` after a missing required argument is wrong on some platforms: macOS 11.1.
• The function `getopt_long` does not obey the ‘-’ flag in the options string when `POSIXLY_CORRECT` is set on some platforms: Cygwin 1.7.0.
• Some implementations fail to reset state, including re-checking `POSIXLY_CORRECT`, when `optind` is set to ‘0’: NetBSD, Cygwin 1.7.0.
• The function `getopt_long` does not support options with optional arguments on some platforms: macOS 11.1, OpenBSD 4.0, AIX 5.2, IRIX 6.5, Solaris 11 2010-11, Cygwin 1.5.x.
• This function crashes if the option string includes `W`; but there are no long options, on some platforms: glibc 2.14.

Portability problems not fixed by Gnulib:

13.21.2 getopt_long_only

LSB specification:
https://refsspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getopt-long-only-3.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Getopt-Long-Options.html,
• man getopt_long_only.

Gnulib module: getopt-gnu

Portability problems fixed by Gnulib:
• The function `getopt_long_only` does not obey the combination of ‘+’ and ‘:’ flags in the options string on some platforms: glibc 2.11.
• The use of ‘W;’ in the optstring argument to does not always allow `-W foo` to behave synonymously with `--foo`: glibc 2.11.
• The function `getopt_long_only` does not support the ‘+’ flag in the options string on some platforms: macOS 11.1, AIX 5.2, Solaris 10.
• The value of `optind` after a missing required argument is wrong on some platforms: macOS 11.1.
• The function `getopt_long_only` does not obey the ‘-’ flag in the options string when `POSIXLY_CORRECT` is set on some platforms: Cygwin 1.7.0.
• Some implementations fail to reset state, including re-checking `POSIXLY_CORRECT`, when `optind` is set to ‘0’: NetBSD, Cygwin 1.7.0.
• The function `getopt_long_only` does not support options with optional arguments on some platforms: macOS 11.1, OpenBSD 4.0, AIX 5.2, Solaris 11 2010-11, Cygwin 1.5.x.
• This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 9.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.
• This function crashes if the option string includes \texttt{W}; but there are no long options, on some platforms: glibc 2.14.

Portability problems not fixed by GnuLib:
• Some implementations return success instead of reporting an ambiguity if user’s option is a prefix of two long options with the same outcome: FreeBSD.
• The GNU Coding Standards discourage the use of \texttt{getopt_long_only} in new programs.

### 13.22 Glibc Extensions to \texttt{<glob.h>}

#### 13.22.1 \texttt{glob_pattern_p}

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:
• This function is missing on most non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 13.23 Glibc Extensions to \texttt{<gnu/libc-version.h>}

#### 13.23.1 \texttt{gnu_get_libc_release}

LSB specification:
\url{https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gnu-get-libc-version-1.html}

Documentation:
\texttt{man gnu_get_libc_release}

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.23.2 \texttt{gnu_get_libc_version}

LSB specification:
\url{https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gnu-get-libc-version-1.html}

Documentation:
\texttt{man gnu_get_libc_version}

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.24 Glibc Extensions to <grp.h>

13.24.1 fgetgrent

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Scanning-All-Groups.html,
• man fgetgrent.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.24.2 fgetgrent_r

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Scanning-All-Groups.html,
• man fgetgrent_r.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.24.3 getgrent_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getgrent-r-1.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Scanning-All-Groups.html,
• man getgrent_r.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.24.4 getgrouplist

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getgrouplist-3.html

Documentation:
- man getgrouplist.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function takes int instead of gid_t parameters on some platforms: OS X 10.11.
- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.0, Cygwin 1.7.9, mingw, MSVC 14.

The Gnulib module getugroups provides a similar API.

13.24.5 initgroups

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-initgroups-3.html

Documentation:
- man initgroups.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is unsafe to call between fork and exec if the parent process is multi-threaded. Instead, use getgroups or getgrouplist (or use the gnulib module mgetgroups) before forking, and setgroups in the child.
- This function is missing on some platforms: mingw, MSVC 14.

13.24.6 putgrent

Documentation:
man putgrent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.24.7 setgroups

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-setgroups-2.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Setting-Groups.html,
• man setgroups.

Gnulib module: —

Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: AIX 5.1, mingw, MSVC 14.
• On very old systems, this function operated on an array of `int`, even though that was a different size than an array of `gid_t`; you can use autoconf's AC_TYPE_GETGROUPS to set GETGROUPS_T to the appropriate size (since getgroups and setgroups share the same bug).

13.25 Glibc <gshadow.h>

13.25.1 endsgent

Gnulib module: —

Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.25.2 fgetsgent

Gnulib module: —

Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.25.3 fgetsgent_r

Gnulib module: —

Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.25.4 getsgent
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.25.5 getsgent_r
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.25.6 getsgnam
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.25.7 getsgnam_r
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.25.8 putsgent
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.25.9 setsgent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.25.10 sgetsgent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.25.11 sgetsgent_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.26 Glibc <ifaddrs.h>

13.26.1 getifaddrs

LSB specification:

https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getifaddrs.html

Documentation:

man getifaddrs

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 6.0.
13.26.2 freeifaddrs

Documentation:
man freeifaddrs
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 6.0.

13.27 Glibc <libintl.h>

13.27.1 bind_textdomain_codeset

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/ baselib-bind-textdomain-codeset.html
Future POSIX specification:
https://www.austingroupbugs.net/view.php?id=1122
Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Charset-conversion-in-gettext.html,
• man bind_textdomain_codeset.
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.27.2 bindtextdomain

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/ baselib-bindtextdomain.html
Future POSIX specification:
https://www.austingroupbugs.net/view.php?id=1122
Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Locating-gettext-catalog.html,
• man bindtextdomain.
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.27.3 dcgettext

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dcgettext.html

Future POSIX specification:
https://www.austingroupbugs.net/view.php?id=1122

Documentation:
- man dcgettext.

Gnulib module: —
Portability problems fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.27.4 dcngettext

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dcngettext.html

Future POSIX specification:
https://www.aistingroupbugs.net/view.php?id=1122

Documentation:
- man dcngettext.

Gnulib module: —
Portability problems fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.27.5 dgettext

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dgettext.html

Future POSIX specification:
https://www.aistingroupbugs.net/view.php?id=1122

Documentation:
• man dgettext.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.27.6 dngettext

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dngettext.html

Future POSIX specification:
https://www.austingroupbugs.net/view.php?id=1122

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Advanced-gettext-functions.html,

• man dngettext.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.27.7 gettext

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gettext.html

Future POSIX specification:
https://www.austingroupbugs.net/view.php?id=1122

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Translation-with-gettext.html,

• man gettext.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.27.8 **gettext**

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ngettext.html

Future POSIX specification:
https://www.austingroupbugs.net/view.php?id=1122

Documentation:
- man ngettext.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.27.9 **textdomain**

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-textdomain.html

Future POSIX specification:
https://www.austingroupbugs.net/view.php?id=1122

Documentation:
- man textdomain.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.28 **Glibc <link.h>**

13.28.1 **dl_iterate_phdr**

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dl-iterate-phdr-1.html

Documentation:
man dl_iterate_phdr

Gnulib module: —
Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 4.4.

13.29 Glibc <malloc.h>

13.29.1 mallinfo

Documentation:
- man mallinfo.

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11 2010-11, mingw, MSVC 14.

13.29.2 mallinfo2

Documentation:
- man mallinfo2.

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on all non-glibc platforms: glibc 2.32, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.29.3 malloc_info

Documentation:
- man malloc_info

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on many non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 5.1.
13.29.4 malloc_stats

Documentation:
man malloc_stats

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

13.29.5 malloc_trim

Documentation:
man malloc_trim

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

13.29.6 malloc_usable_size

Documentation:
man malloc_usable_size

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.00, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 4.1.

13.29.7 mallopt

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Malloc-Tunable-Parameters.html,
• man mallopt.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11 2010-11, mingw, MSVC 14, Android 7.1.
13.29.8 memalign

Documentation:
- man memalign.

Gnulib module: memalign

Portability problems fixed by Gnulib:
- This function is declared in <stdlib.h> instead of <malloc.h> on some platforms: Solaris 11.
- This function doesn’t accept an alignment of 1 or 2 on some platforms: Solaris 11.

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.00, mingw, MSVC 14.

The Gnulib module aligned-malloc provides functions for allocating and freeing blocks of suitably aligned memory.

13.29.9 pvalloc

Documentation:
man pvalloc

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.30 Glibc Extensions to <math.h>

13.30.1 drem

LSB specification: https://refsspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-drem.html

Documentation:
- man drem.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Solaris 11.4, mingw, MSVC 14.
13.30.2 dremf

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dremf.html

Documentation:
- man dremf.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14.

13.30.3 dreml

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dreml.html

Documentation:
- man dreml.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

13.30.4 exp10

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-exp10.html

Documentation:
- man exp10.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

13.30.5 exp10f

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-exp10f.html

Documentation:

• man exp10f.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

13.30.6 exp10l

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-exp10l.html

Documentation:

• man exp10l.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

13.30.7 finite

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-finite.html

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Floating-Point-Classes.html,
• man finite.
  GnuNew module: —
  Portability problems fixed by GnuNew:
  Portability problems not fixed by GnuNew:
• This function is missing on some platforms: Minix 3.1.8, HP-UX 11, MSVC 14.

13.30.8 finitef
LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-finitef.html
Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Floating-Point-Classes.html,
• man finitef.
  GnuNew module: —
  Portability problems fixed by GnuNew:
  Portability problems not fixed by GnuNew:
• This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14.

13.30.9 finitel
LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-finitel.html
Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Floating-Point-Classes.html,
• man finitel.
  GnuNew module: —
  Portability problems fixed by GnuNew:
  Portability problems not fixed by GnuNew:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

13.30.10 gamma
LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gamma.html
Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html,
Chapter 13: Glibc Function Substitutes

- man gamma.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

13.30.11 gammaf

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-gammaf.html

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html,

- man gammaf.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

13.30.12 gammal

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-gammal.html

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html,

- man gammal.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.30.13 isinff

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/Floating-Point-Classes.html,

- man isinff.
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 4.4.
- This function is not declared on some platforms: Android 9.0.

### 13.30.14 isinf1

Documentation:
- `man isinf1`

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- This function is not declared on some platforms: Android 9.0.

### 13.30.15 isnanf

Documentation:
- `man isnanf`

Gnulib module: isnanf
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, MSVC 14.

### 13.30.16 isnanl

Documentation:
- `man isnanl`

Gnulib module: isnanl
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.x, MSVC 14, Android 4.4.
• This function is not declared on some platforms: Android 9.0.

Portability problems not fixed by Gnulib:

13.30.17 j0f

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-j0f.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html,
• man j0f.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

13.30.18 j0l

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-j0l.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html,
• man j0l.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.30.19 j1f

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-j1f.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html,
• man j1f.
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

13.30.20  j11

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-j1l.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html,
• man j1l.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.30.21  jnf

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-jnf.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html,
• man jnf.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

13.30.22  jnl

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-jnl.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html,
Chapter 13: Glibc Function Substitutes

- man jnl.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.30.23 lgamma_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-lgamma-r.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html,
- man lgamma_r.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Mac OS X 10.5 x86, Minix 3.1.8, IRIX 6.5, mingw, MSVC 14.

13.30.24 lgammaf_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-lgammaf-r.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html,
- man lgammaf_r.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Mac OS X 10.5, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.
13.30.25 lgammal_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-lgammal-r.html

Documentation:
- man lgammal_r.

Gnulib module: —
Portability problems fixed by Gnulib:
- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1.

13.30.26 matherr

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-matherr-1.html

Documentation:
man matherr

Gnulib module: —
Portability problems fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, mingw, MSVC 14, Android 9.0.

13.30.27 pow10

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-pow10.html

Documentation:
man pow10

Gnulib module: —
Portability problems fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.
13.30.28 pow10f

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-pow10f.html

Documentation:
man pow10f

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0,
OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x,
mingw, MSVC 14, Android 9.0.

13.30.29 pow10l

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-pow10l.html

Documentation:
man pow10l

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0,
NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4,
Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

13.30.30 scalbf

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-scalbf.html

Documentation:

  html,

• man scalbf.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX
11, IRIX 6.5, mingw, MSVC 14.
13.30.31 scalbl

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-scalbl.html

Documentation:
- man scalbl.

Gnulib module: —

Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0,
  OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.x, mingw, MSVC 14,
  Android 9.0.

13.30.32 significand

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-significand.html

Documentation:
- man significand.

Gnulib module: —

Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

13.30.33 significandf

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-significandf.html

Documentation:
- man significandf.

Gnulib module: —

Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX
  11, IRIX 6.5, mingw, MSVC 14.
13.30.34 significandl

  LSB specification:
  https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
  baselib-significandl.html

  Documentation:
  - man significandl.

  Gnulib module: —

  Portability problems fixed by Gnulib:

  Portability problems not fixed by Gnulib:
  - This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0,
    OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14.

13.30.35 sincos

  LSB specification:
  https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
  baselib-sincos.html

  Documentation:
  - https://www.gnu.org/software/libc/manual/html_node/Trig-Functions.html,
  - man sincos.

  Gnulib module: —

  Portability problems fixed by Gnulib:

  Portability problems not fixed by Gnulib:
  - This function is missing on some platforms: macOS 11.1, FreeBSD 11.0, NetBSD 9.0,
    OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

13.30.36 sincosf

  LSB specification:
  https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
  baselib-sincosf.html

  Documentation:
  - https://www.gnu.org/software/libc/manual/html_node/Trig-Functions.html,
  - man sincos.

  Gnulib module: —

  Portability problems fixed by Gnulib:

  Portability problems not fixed by Gnulib:
  - This function is missing on some platforms: macOS 11.1, FreeBSD 11.0, NetBSD 9.0,
    OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.
13.30.37 sincosl

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sincosl.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Trig-Functions.html,
- man sincosl.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 11.0, NetBSD 9.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.x, mingw, MSVC 14.

13.30.38 y0f

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-y0f.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html,
- man y0f.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

13.30.39 y0l

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-y0l.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html,
- man y0l.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.30.40 y1f

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-y1f.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html,
- man y1f.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

13.30.41 y1l

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-y1l.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html,
- man y1l.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.30.42 ynf

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ynf.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html,
- man ynf.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.
13.30.43 ynl

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ynl.html

Documentation:
- man ynl.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.31 Glibc <mcheck.h>

13.31.1 mcheck

Documentation:
- man mcheck.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.31.2 mcheck_check_all

Documentation:
man mcheck_check_all

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.31.3 mcheck_pedantic

Documentation:
man mcheck_pedantic

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.31.4 mprobe

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Heap-Consistency-Checking.html,
• man mprobe.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.31.5 mtrace

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Tracing-malloc.html,
• man mtrace.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.31.6 muntrace

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Tracing-malloc.html,
• man muntrace.

Gnulib module: —
Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

• This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.32 Glibc <mntent.h>

13.32.1 addmntent

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/mtab.html,
• man addmntent.

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.32.2 endmntent

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/mtab.html,
• man endmntent.

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Solaris 11.4, mingw, MSVC 14, Android 4.4.

13.32.3 getmntent

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/mtab.html,
• man getmntent.

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.
13.32.4 getmntent_r

Documentation:
- man getmntent_r.

Gnulib module: —

Portability problems fixed by Gnulib:
- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

13.32.5 hasmntopt

Documentation:
- man hasmntopt.

Gnulib module: —

Portability problems fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 7.1.

13.32.6 setmntent

Documentation:
- man setmntent.

Gnulib module: —

Portability problems fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Solaris 11.4, mingw, MSVC 14, Android 4.4.

13.33 Glibc Extensions to <netdb.h>

13.33.1 endnetgrent

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Lookup-Netgroup.html,
- man endnetgrent.
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.33.2 gethostbyaddr_r

**LSB specification:**
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gethostbyaddr-r-3.html

**Documentation:**
- man gethostbyaddr_r.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 5.1.

### 13.33.3 gethostbyname2

**LSB specification:**
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gethostbyname2-3.html

**Documentation:**
- man gethostbyname2.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.

### 13.33.4 gethostbyname2_r

**LSB specification:**
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gethostbyname2-r-3.html

**Documentation:**
- man gethostbyname2_r.
Chapter 13: Glibc Function Substitutes

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 5.1.

13.33.5 gethostbyname_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gethostbyname-r-3.html

Documentation:
• man gethostbyname_r.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14.

13.33.6 gethostent_r

Documentation:
man gethostent_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.33.7 getnetbyaddr_r

Documentation:
man getnetbyaddr_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.33.8 getnetbyname\_r

Documentation:
man getnetbyname\_r
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.33.9 getnetent\_r

Documentation:
man getnetent\_r
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.33.10 getnetgrent

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Lookup-Netgroup.html,
• man getnetgrent.
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.33.11 getnetgrent\_r

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Lookup-Netgroup.html,
• man getnetgrent\_r.
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.33.12 getprotobynumbyname_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-getprotobynumbyname-r.html

Documentation:
man getprotobynumbyname_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, Minix 3.1.8,
  HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.33.13 getprotobynumber_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-getprotobynumber-r.html

Documentation:
man getprotobynumber_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, Minix 3.1.8,
  HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.33.14 getprotoent_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-getprotoent-r.html

Documentation:
man getprotoent_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, Minix 3.1.8,
  HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.33.15 getservbyname_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-getservbyname-r.html

Documentation:
man getservbyname_r
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.33.16 getservbyport_r
LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getservbyport-r.html

Documentation:
man getservbyport_r

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.33.17 getservent_r
LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getservent-r.html

Documentation:
man getservent_r

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.33.18 herror
Documentation:
man herror

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
13.33.19  hstrerror

Documentation:
man hstrerror

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, HP-UX 11, mingw, MSVC 14.

13.33.20  innetgr

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Netgroup-Membership.html,
• man innetgr.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.33.21  rcmd

Documentation:
man rcmd

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14, Android 9.0.

13.33.22  rcmd_af

Documentation:
man rcmd_af

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11.11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.
13.33.23 rexec
   Documentation:
   man rexec
   Gnulib module: —
   Portability problems fixed by Gnulib:
   Portability problems not fixed by Gnulib:
   • This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

13.33.24 rexec_af
   Documentation:
   man rexec_af
   Gnulib module: —
   Portability problems fixed by Gnulib:
   Portability problems not fixed by Gnulib:
   • This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.33.25 rresvport
   Documentation:
   man rresvport
   Gnulib module: —
   Portability problems fixed by Gnulib:
   Portability problems not fixed by Gnulib:
   • This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 9.0.

13.33.26 rresvport_af
   Documentation:
   man rresvport_af
   Gnulib module: —
   Portability problems fixed by Gnulib:
   Portability problems not fixed by Gnulib:
   • This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11.11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.
13.33.27 ruserok

Documentation:

man ruserok

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 9.0.

13.33.28 ruserok_af

Documentation:

man ruserok_af

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.33.29 setnetgrent

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Lookup-Netgroup.html,

• man setnetgrent.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.34 Glibc <netinet/ether.h>

13.34.1 ether_aton

Documentation:

man ether_aton

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 2.3.
13.34.2 ether_aton_r

Documentation:
man ether_aton_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 2.3.

13.34.3 ether_hostton

Documentation:
man ether_hostton

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.34.4 ether_line

Documentation:
man ether_line

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.34.5 ether_ntoa

Documentation:
man ether_ntoa

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 2.3.
13.34.6 ether_ntoa_r

Documentation:
man ether_ntoa_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 2.3.

13.34.7 ether_ntohost

Documentation:
man ether_ntohost

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.35 Glibc Extensions to <netinet/in.h>

13.35.1 bindresvport

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-bindresvport-3.html

Documentation:
man bindresvport

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Cygwin 1.5.x, mingw, MSVC 14.

13.35.2 getipv4sourcefilter

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.35.3 getsourcefilter

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.35.4 in6addr_any

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This constant is missing on some platforms: macOS 10.13, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 6.0.

13.35.5 in6addr_loopback

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This constant is missing on some platforms: macOS 10.13, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 6.0.

13.35.6 inet6_option_alloc

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.35.7 inet6_option_append

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.35.8  **inet6_option_find**
Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.35.9  **inet6_option_init**
Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.35.10 **inet6_option_next**
Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.35.11 **inet6_option_space**
Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.35.12 **inet6_opt_append**
Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.35.13 **inet6_opt_find**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.35.14 **inet6_opt_finish**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.35.15 **inet6_opt_get_val**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.35.16 **inet6_opt_init**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.35.17 **inet6_opt_next**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.35.18 inet6_opt_set_val

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.35.19 inet6_rth_add

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.35.20 inet6_rth_getaddr

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.35.21 inet6_rth_init

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.35.22 inet6_rth_reverse

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.35.23 *inet6_rth_segments*

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.35.24 *inet6_rth_space*

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.35.25 *setipv4sourcefilter*

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.35.26 *setsourcefilter*

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.36 Glibc `<obstack.h>`

13.36.1 *obstack_alloc_failed_handler*

Documentation:

Gnulib module: —
Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This variable is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.36.2 `obstack_exit_failure`

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This variable is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.36.3 `obstack_free`

Documentation:

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.36.4 `obstack_printf`

Documentation:

GnuLib module: `obstack_printf` or `obstack_printf-posix` or `obstack_printf-gnu`

Portability problems fixed by either GnuLib module `obstack_printf` or `obstack_printf-posix` or `obstack_printf-gnu`:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems fixed by either GnuLib module `obstack_printf-posix` or `obstack_printf-gnu`:

- This function does not support size specifiers as in C99 (hh, ll, j, t, z) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, mingw, MSVC 14.

- `printf` of `'long double'` numbers is unsupported on some platforms: mingw, MSVC 14.

- `printf "%f", "%e", "%g"` of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.0, mingw, MSVC 14.
This function does not support the ‘a’ and ‘A’ directives on some platforms: glibc-2.3.6, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.

This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.

This function does not support the ‘F’ directive on some platforms: NetBSD 3.0, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14.

This function does not support the ‘n’ directive on some platforms: MSVC 14.

This function does not support the ‘ls’ directive on some platforms: OpenBSD 4.0, IRIX 6.5, Cygwin 1.5.x, Haiku.

This function does not support precisions in the ‘ls’ directive correctly on some platforms: Solaris 11.4.

This function does not support format directives that access arguments in an arbitrary order, such as "%2$s", on some platforms: NetBSD 3.0, mingw, MSVC 14.

This function doesn’t support the ‘f’ flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.

This function does not round the argument of the ‘a’ directive correctly on some platforms: Mac OS X 10.12, FreeBSD 6.1.

printf "%010f" of NaN and Infinity yields an incorrect result (padded with zeroes) on some platforms: Mac OS X 10.5, FreeBSD 13.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.0, Cygwin 1.5.x, mingw, MSVC/clang.

This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: Solaris 10/x86, mingw, MSVC/clang.

This function produces wrong output for the ‘lc’ directive with a NUL wide character argument on some platforms: glibc 2.35, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

This function can crash in out-of-memory conditions on some platforms: FreeBSD 13.0, NetBSD 5.0.

This function does not fully support the ‘n’ directive on some platforms: HP-UX 11, mingw, MSVC 14.

Portability problems fixed by GnuLib module obstack-printf-gnu:

This function does not support the ‘B’ directive on some platforms: glibc 2.34, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems not fixed by GnuLib:

The %m directive is not portable, use %s mapped to an argument of strerror(errno) (or a version of strerror_r) instead.

13.36.5 obstack_vprintf

Documentation:
Gnulib module: obstack-printf or obstack-printf-posix or obstack-printf-gnu

Portability problems fixed by either Gnulib module obstack-printf or obstack-printf-posix or obstack-printf-gnu:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems fixed by either Gnulib module obstack-printf-posix or obstack-printf-gnu:

- This function does not support size specifiers as in C99 (hh, 11, j, t, z) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, mingw, MSVC 14.
- printf of ‘long double’ numbers is unsupported on some platforms: mingw, MSVC 14.
- printf "%f", "%e", "%g" of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.0, mingw, MSVC 14.
- This function does not support the ‘a’ and ‘A’ directives on some platforms: glibc-2.3.6, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the ‘F’ directive on some platforms: NetBSD 3.0, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘n’ directive on some platforms: MSVC 14.
- This function does not support the ‘ls’ directive on some platforms: OpenBSD 4.0, IRIX 6.5, Cygwin 1.5.x, Haiku.
- This function does not support precisions in the ‘ls’ directive correctly on some platforms: Solaris 11.4.
- This function does not support format directives that access arguments in an arbitrary order, such as "%2$s", on some platforms: NetBSD 3.0, mingw, MSVC 14.
- This function doesn’t support the ‘’ flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not round the argument of the ‘a’ directive correctly on some platforms: Mac OS X 10.12, FreeBSD 6.1.
- printf "%010f" of NaN and Infinity yields an incorrect result (padded with zeroes) on some platforms: Mac OS X 10.5, FreeBSD 13.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.0, Cygwin 1.5.x, mingw, MSVC/clang.
- This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: Solaris 10/x86, mingw, MSVC/clang.
- This function produces wrong output for the ‘le’ directive with a NUL wide character argument on some platforms: glibc 2.35, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.
- This function can crash in out-of-memory conditions on some platforms: FreeBSD 13.0, NetBSD 5.0.
• This function does not fully support the ‘n’ directive on some platforms: HP-UX 11, mingw, MSVC 14.

Portability problems fixed by Gnulib module obstack-printf-gnu:

• This function does not support the ‘B’ directive on some platforms: glibc 2.34, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems not fixed by Gnulib:

• The %a directive is not portable, use %s mapped to an argument of strerror(errno) (or a version of strerror_r) instead.

13.37 Glibc Extensions to <poll.h>

13.37.1 ppoll

Documentation:
man ppoll

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 10, Cygwin 1.7.x, mingw, MSVC 14, Android 4.3.

13.38 Glibc <printf.h>

13.38.1 parse_printf_format

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.38.2 printf_size

Documentation:

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.38.3 printf_size_info

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.38.4 register_printf_function

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.38.5 register_printf_modifier

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.38.6 register_printf_specifier

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.38.7 register_printf_type

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.39 Glibc Extensions to <pthread.h>

13.39.1 pthread_attr_getaffinity_np

Documentation:
man pthread_attr_getaffinity_np
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on many non-glibc platforms: glibc 2.3.2, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
• This function has a different signature on some platforms: glibc 2.3.3.

13.39.2 pthread_attr_setaffinity_np

Documentation:
man pthread_attr_setaffinity_np
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on many non-glibc platforms: glibc 2.3.2, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
• This function has a different signature on some platforms: glibc 2.3.3.

13.39.3 pthread_attr_getsigmask_np

Documentation:
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: glibc 2.31, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.39.4 pthread_attr_setsigmask_np

Documentation:


Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on all non-glibc platforms: glibc 2.31, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.39.5 pthread_clockjoin_np

Documentation:

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.39.6 pthread_cond_clockwait

Documentation:

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.39.7 pthread_getaffinity_np

Documentation:
man pthread_getaffinity_np

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on many non-glibc platforms: glibc 2.3.2, macOS 11.1, FreeBSD 6.4, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
• This function has a different signature on some platforms: glibc 2.3.3.
• The third parameter has a different type on some platforms: FreeBSD 13.0, NetBSD 9.0.

### 13.39.8 pthread_getattr_default_np

**Documentation:**
- `man pthread_getattr_default_np`

**Gnulib module:** —

**Portability problems fixed by Gnulib:**

**Portability problems not fixed by Gnulib:**

• This function is missing on all non-glibc platforms: glibc 2.17, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.39.9 pthread_getattr_np

**LSB specification:**
[https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pthread-getattr-np-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pthread-getattr-np-1.html)

**Documentation:**
`man pthread_getattr_np`

**Gnulib module:** —

**Portability problems fixed by Gnulib:**

**Portability problems not fixed by Gnulib:**

• This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.9, mingw, MSVC 14.

### 13.39.10 pthread_getname_np

**Documentation:**
`man pthread_getname_np`

**Gnulib module:** —

**Portability problems fixed by Gnulib:**

**Portability problems not fixed by Gnulib:**

• This function is missing on many non-glibc platforms: glibc 2.11, Mac OS X 10.5, FreeBSD 12.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.0, Cygwin 1.7.x, mingw, MSVC 14, Android 7.1.
13.39.11  pthread_kill_other_threads_np

Documentation:

man pthread_kill_other_threads_np

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.39.12  pthread_mutex_clocklock

Documentation: —

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.39.13  pthread_rwlock_clockrdlock

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Non-POSIX-Extensions.html,

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.39.14  pthread_rwlock_clockwrlock

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Non-POSIX-Extensions.html,

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.39.15 pthread_rwlockattr_getkind_np

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pthread_rwlockattr-getkind-np-1.html

Documentation:
man pthread_rwlockattr_getkind_np

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 5.1.

13.39.16 pthread_rwlockattr_setkind_np

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pthread_rwlockattr-getkind-np-1.html

Documentation:
man pthread_rwlockattr_setkind_np

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 5.1.

13.39.17 pthread_setaffinity_np

Documentation:
man pthread_setaffinity_np

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.3.2, macOS 11.1, FreeBSD 6.4, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function has a different signature on some platforms: glibc 2.3.3.
- The third parameter has a different type on some platforms: FreeBSD 13.0, NetBSD 9.0.
13.39.18 **pthread_setattr_default_np**

Documentation:

- man pthread_setattr_default_np.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.17, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.39.19 **pthread_setname_np**

Documentation:

man pthread_setname_np

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.11, Mac OS X 10.5, FreeBSD 12.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.0, Cygwin 1.7.x, mingw, MSVC 14.
- This function has a different signature on some platforms: NetBSD 9.0. On NetBSD the second argument is interpreted as a `printf` format string, with the third argument as parameter.

13.39.20 **pthread_sigqueue**

Documentation:

man pthread_sigqueue

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.10, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.0, Cygwin 1.7.9, mingw, MSVC 14, Android 9.0.

13.39.21 **pthread_timedjoin_np**

Documentation:

man pthread_timedjoin_np

Gnulib module: —
Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on many non-glibc platforms: glibc 2.3.2, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- FreeBSD 6.4 has a function of this name in libthr but not in libpthread, and it also is missing a declaration.

13.39.22 pthread_tryjoin_np

Documentation:
man pthread_tryjoin_np

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on all non-glibc platforms: glibc 2.3.2, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.40 Glibc <pty.h>

13.40.1 forkpty

Documentation:
- man forkpty.

GnuLib module: forkpty

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Android 5.1.
- One some systems (at least including Cygwin and Mac OS X) linking with -lutil is not required.
- On glibc, OpenBSD, NetBSD and FreeBSD linking with -lutil is required.
- The function is declared in pty.h on glibc and Cygwin. It is declared in util.h on Mac OS X, OpenBSD, and NetBSD. It is declared in libutil.h on FreeBSD. It is declared in termios.h on Solaris.
- Some platforms declare the function without marking the last two parameters const. FreeBSD 13.0, Solaris 11.4, Cygwin 1.7.1.

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: mingw, MSVC 14.
13.40.2 openpty

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Pseudo_002dTerminal-Pairs.html,
- man openpty.

Gnulib module: openpty

Portability problems fixed by Gnulib:
- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Android 5.1.
- One some systems (at least including Cygwin and Mac OS X) linking with -lutil is not required.
- On glibc, OpenBSD, NetBSD and FreeBSD linking with -lutil is required.
- The function is declared in pty.h on glibc and Cygwin. It is declared in util.h on Mac OS X, OpenBSD, and NetBSD. It is declared in libutil.h on FreeBSD. It is declared in termios.h on Solaris.
- Some platforms declare the function without marking the last two parameters const. FreeBSD 13.0, Solaris 11.4, Cygwin 1.7.1.

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.

13.41 Glibc Extensions to <pwd.h>

13.41.1 fgetpwent

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Scanning-All-Users.html,
- man fgetpwent.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.41.2 fgetpwent_r

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Scanning-All-Users.html,
- man fgetpwent_r.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.41.3 getpw

Documentation:
man getpw

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.41.4 getpwent_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getpwent-r-1.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Scanning-All-Users.html,
- man getpwent_r.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.41.5 putpwent

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Writing-a-User-Entry.html,
- man putpwent.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.42 Glibc Extensions to `<regex.h>`

13.42.1 `re_comp`

Documentation:
man `re_comp`

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.42.2 `re_compile_fastmap`

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.42.3 `re_compile_pattern`

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.42.4 `re_exec`

Documentation:
man `re_exec`

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.42.5 `re_match`

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.42.6 re_match_2
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.42.7 re_search
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.42.8 re_search_2
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.42.9 re_set_registers
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.42.10 re_set_syntax
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.42.11 re_syntax_options

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.43 Glibc <regexp.h>

13.43.1 advance

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.43.2 loc1

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.43.3 loc2

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.43.4 locs

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.43.5 step

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.44 Glibc <resolv.h>

13.44.1 dn_comp

Documentation:
man dn_comp

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.3.0, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

13.44.2 dn_expand

Documentation:
man dn_expand

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Cygwin 1.5.x, mingw, MSVC 14.

13.44.3 dn_skipname

Documentation:
man dn_skipname

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

13.44.4 res_dnok

Documentation:
man res_dnok

Gnulib module: —
Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, HP-UX 11.11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.44.5 res_hnok

Documentation:
man res_hnok

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, HP-UX 11.11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.44.6 res_init

Documentation:
man res_init

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Cygwin 1.5.x, mingw, MSVC 14.

### 13.44.7 res_mailok

Documentation:
man res_mailok

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, HP-UX 11.11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.44.8 res_mkquery

Documentation:
man res_mkquery

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: macOS 11.1, Cygwin 1.5.x, mingw, MSVC 14.
13.44.9 res_nmkquery

Documentation:
man res_nmkquery

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, HP-UX 11.31, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

13.44.10 res_nquery

Documentation:
man res_nquery

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, HP-UX 11.31, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

13.44.11 res_nquerydomain

Documentation:
man res_nquerydomain

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, HP-UX 11.31, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

13.44.12 res_nsearch

Documentation:
man res_nsearch

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, HP-UX 11.31, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.
13.44.13 res_nsend

Documentation:
man res_nsend

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, HP-UX 11.31, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

13.44.14 res_ownok

Documentation:
man res_ownok

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, HP-UX 11.11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.44.15 res_query

Documentation:
man res_query

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Cygwin 1.5.x, mingw, MSVC 14.

13.44.16 res_querydomain

Documentation:
man res_querydomain

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, Minix 3.3.0, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

13.44.17 res_search

Documentation:
man res_search

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Cygwin 1.5.x, mingw, MSVC 14.

### 13.44.18 res_send

Documentation:
man res_send

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.3.0, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 13.45 Glibc <rpc/auth.h>

#### 13.45.1 authdes_create

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.45.2 authdes_pk_create

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.45.3 authnone_create

Documentation:
man authnone_create

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.45.4 authunix_create

Documentation:
man authunix_create

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.45.5 authunix_create_default

Documentation:
man authunix_create_default

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.45.6 getnetname

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.45.7 host2netname

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.45.8 key_decryptsession

Documentation:
man key_decryptsession

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.45.9 key_decryptsession_pk
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.45.10 key_encryptsession
Documentation:
man key_encryptsession
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.45.11 key_encryptsession_pk
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.45.12 key_gendes
Documentation:
man key_gendes
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.45.13 key_get_conv
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.45.14 key_secretkey_is_set

Documentation:
man key_secretkey_is_set

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.45.15 key_setsecret

Documentation:
man key_setsecret

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.45.16 netname2host

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.45.17 netname2user

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.45.18 user2netname

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.45.19 xdr_des_block

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.45.20 xdr_opaque_auth

Documentation:
man xdr_opaque_auth

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.46 Glibc <rpc/auth_des.h>

13.46.1 authdes_getucred

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.46.2 getpublickey

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.46.3 getsecretkey

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.46.4 `rtime`

Documentation:
`man rtime`

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.47 Glibc `<rpc/auth_unix.h>`

13.47.1 `xdr_authunix_parms`

Documentation:
`man xdr_authunix_parms`

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.48 Glibc `<rpc/clnt.h>`

13.48.1 `callrpc`

Documentation:
`man callrpc`

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.48.2 `clnt_create`

Documentation:
`man clnt_create`

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.48.3 clnt_pcreateerror

Documentation:
man clnt_pcreateerror

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.48.4 clnt_perrno

Documentation:
man clnt_perrno

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.48.5 clnt_perror

Documentation:
man clnt_perror

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.48.6 clnt_spcreateerror

Documentation:
man clnt_spcreateerror

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.48.7 clnt_sperrno

Documentation:
man clnt_sperrno

Gnulib module: —
Portability problems fixed by GnuClib:

Portability problems not fixed by GnuClib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.48.8 clnt_serror

Documentation:
man clnt_serror
GnuClib module: —

Portability problems fixed by GnuClib:

Portability problems not fixed by GnuClib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.48.9 clntraw_create

Documentation:
man clntraw_create
GnuClib module: —

Portability problems fixed by GnuClib:

Portability problems not fixed by GnuClib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.48.10 clnttcp_create

Documentation:
man clnttcp_create
GnuClib module: —

Portability problems fixed by GnuClib:

Portability problems not fixed by GnuClib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.48.11 clntudp_bufcreate

Documentation:
man clntudp_bufcreate
GnuClib module: —

Portability problems fixed by GnuClib:

Portability problems not fixed by GnuClib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.48.12 clntudp_create

Documentation:
man clntudp_create

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.48.13 clntunix_create

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.48.14 get_myaddress

Documentation:
man get_myaddress

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.48.15 getrpcport

Documentation:
man getrpcport

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.48.16 rpc_createerr

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This variable is missing on some platforms: Minix 3.1.8, AIX 5.1, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.49 Glibc <rpc/key_prot.h>

13.49.1 xdr_cryptkeyarg

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.49.2 xdr_cryptkeyarg2

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.49.3 xdr_cryptkeyres

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.49.4 xdr_getcredres

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.49.5 xdr_key_netstarg

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.49.6 `xdr_key_netstres`
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.49.7 `xdr_keybuf`
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.49.8 `xdr_keystatus`
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.49.9 `xdr_netnamestr`
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.49.10 `xdr_unixcred`
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.50 Glibc `<rpc/netdb.h>`
13.50.1 endrpcent
Documentation:
man endrpcent
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.50.2 getrpcbyname
Documentation:
man getrpcbyname
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.50.3 getrpcbyname_r
Documentation:
man getrpcbyname_r
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.50.4 getrpcbynumber
Documentation:
man getrpcbynumber
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.50.5 getrpcbynumber_r
Documentation:
man getrpcbynumber_r
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.50.6 getrpcent

Documentation:
man getrpcent
Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.50.7 getrpcent_r

Documentation:
man getrpcent_r
Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.50.8 setrpcent

Documentation:
man setrpcent
Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.51 Glibc <rpc/pmap_clnt.h>

13.51.1 clnt_broadcast

Documentation:
man clnt_broadcast
Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.51.2 pmap_getmaps

Documentation:
man pmap_getmaps

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.51.3 pmap_getport

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pmap-getport-3.html

Documentation:
man pmap_getport

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.51.4 pmap_rmtcall

Documentation:
man pmap_rmtcall

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.51.5 pmap_set

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pmap-set-3.html

Documentation:
man pmap_set

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.51.6 pmap_unset

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pmap-unset-3.html

Documentation:
man pmap_unset

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.52 Glibc <rpc/pmap_prot.h>

13.52.1 xdr_pmap

Documentation:
man xdr_pmap

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.52.2 xdr_pmaplist

Documentation:
man xdr_pmaplist

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.53 Glibc <rpc/pmap_rmt.h>

13.53.1 xdr_rmtcall_args

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.53.2 xdr_rmtcallres

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.54 Glibc <rpc/rpc_msg.h>

13.54.1 xdr_callhdr

Documentation:
man xdr_callhdr

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.54.2 xdr_callmsg

Documentation:
man xdr_callmsg

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.54.3 xdr_replymsg

Documentation:
man xdr_replymsg

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.55 Glibc <rpc/svc.h>

13.55.1 svc_exit

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.55.2 svc_fdset

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This variable is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.55.3 svc_getreq

Documentation:
man svc_getreq

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.55.4 svc_getreq_common

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.55.5 svc_getreq_poll

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.55.6 svc_getreqset

Documentation:
man svc_getreqset

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.55.7 svc_max_pollfd

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This variable is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.55.8 svc_pollfd

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This variable is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.55.9 svc_register

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-svc-register-3.html

Documentation:
man svc_register

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.55.10 svc_run

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-svc-run-3.html

Documentation:
man svc_run

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.55.11 svc_sendreply

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-svc-sendreply-3.html

Documentation:
man svc_sendreply

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.55.12 svc_unregister

Documentation:
man svc_unregister

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.55.13 svcerr_auth

Documentation:
man svcerr_auth

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.55.14 svcerr_decode

Documentation:
man svcerr_decode

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.55.15 svcerr_noproc

Documentation:
man svcerr_noproc

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.55.16 svcerr_noprogs

Documentation:
man svcerr_noprog

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.55.17 svcerr_progvers

Documentation:
man svcerr_progvers

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.55.18 svcerr_systemerr

Documentation:
man svcerr_systemerr

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.19 svcerr_weakauth

Documentation:

man svcerr_weakauth

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.20 svcraw_create

Documentation:

man svcraw_create

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.21 svctcp_create

LSB specification:

https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-svctcp-create-3.html

Documentation:

man svctcp_create

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.22 svcudp_bufcreate

Documentation:

man svcudp_bufcreate

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.55.23 svcudp_create

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-svcudp-create-3.html

Documentation:
man svcudp_create

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.55.24 svcunix_create

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.55.25 xprt_register

Documentation:
man xprt_register

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.55.26 xprt_unregister

Documentation:
man xprt_unregister

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.56 Glibc <rpc/xdr.h>

13.56.1 xdr_array

Documentation:
man xdr_array

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.2 xdr_bool

Documentation:
man xdr_bool

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.3 xdr_bytes

Documentation:
man xdr_bytes

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.4 xdr_char

Documentation:
man xdr_char

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.
13.56.5  xdr_double

Documentation:
man xdr_double
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.6  xdr_enum

Documentation:
man xdr_enum
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.7  xdr_float

Documentation:
man xdr_float
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.8  xdr_free

Documentation:
man xdr_free
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.9  xdr_hyper

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.
13.56.10 xdr_int

Documentation:
man xdr_int

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.11 xdr_int16_t

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.12 xdr_int32_t

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.13 xdr_int64_t

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.14 xdr_int8_t

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.
13.56.15  xdr_long
    
    Documentation:
    man xdr_long
    
    Gnulib module: —
    Portability problems fixed by Gnulib:
    Portability problems not fixed by Gnulib:
    • This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.16  xdr_longlong_t
    
    Gnulib module: —
    Portability problems fixed by Gnulib:
    Portability problems not fixed by Gnulib:
    • This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.17  xdr_netobj
    
    Gnulib module: —
    Portability problems fixed by Gnulib:
    Portability problems not fixed by Gnulib:
    • This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.18  xdrOpaque
    
    Documentation:
    man xdr_opaque
    
    Gnulib module: —
    Portability problems fixed by Gnulib:
    Portability problems not fixed by Gnulib:
    • This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.19  xdr_pointer
    
    Documentation:
    man xdr_pointer
    
    Gnulib module: —
    Portability problems fixed by Gnulib:
    Portability problems not fixed by Gnulib:
    • This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.
13.56.20 xdr_quad_t

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.56.21 xdr_reference

Documentation:
man xdr_reference

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.22 xdr_short

Documentation:
man xdr_short

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.23 xdr_sizeof

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.24 xdr_string

Documentation:
man xdr_string

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.
13.56.25 xdr_u_char

Documentation:
man xdr_u_char

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.26 xdr_u_hyper

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.27 xdr_u_int

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-xdr-u-int-3.html

Documentation:
man xdr_u_int

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.28 xdr_u_long

Documentation:
man xdr_u_long

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.
13.56.29 xdr_u_longlong_t
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.30 xdr_u_quad_t
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.56.31 xdr_u_short
Documentation:
man xdr_u_short
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.32 xdr_uint16_t
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.
• This function is not declared in the header on some platforms: Cygwin 1.7.5.

13.56.33 xdr_uint32_t
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
• This function is not declared in the header on some platforms: Cygwin 1.7.5.
13.56.34 **xdr_uint64_t**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function is not declared in the header on some platforms: Cygwin 1.7.5.

13.56.35 **xdr_uint8_t**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function is not declared in the header on some platforms: Cygwin 1.7.5.

13.56.36 **xdr_union**

Documentation:

man xdr_union

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.37 **xdr_vector**

Documentation:

man xdr_vector

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.38 **xdr_void**

Documentation:

man xdr_void

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.39 xdr_wrapstring

Documentation:
man xdr_wrapstring
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.40 xdrmem_create

Documentation:
man xdrmem_create
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.41 xdrrec_create

Documentation:
man xdrrec_create
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.42 xdrrec_endofrecord

Documentation:
man xdrrec_endofrecord
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.
13.56.43 xdrrec_eof

Documentation:
man xdrrec_eof

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.44 xdrrec_skiprecord

Documentation:
man xdrrec_skiprecord

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.56.45 xdrstdio_create

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-xdrstdio-create-3.html

Documentation:
man xdrstdio_create

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

13.57 Glibc <rpcsvc/nislib.h>

13.57.1 nis_add

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.57.2 nis_add_entry

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.3 nis_addmember

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.4 nis_checkpoint

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.5 nis_clone_object

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.6 nis_creategroup

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.57.7 nis_destroy_object

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.8 nis_destroygroup

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.9 nis_dir_cmp

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.10 nis_domain_of

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.11 nis_domain_of_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.57.12 nis_first_entry

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.13 nis_freenames

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.14 nis_freeresult

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.15 nis_freeservlist

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.16 nis_freetags

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.57.17 nis_getnames

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.18 nis_getservlist

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.19 nis_ismember

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.20 nis_leaf_of

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.21 nis_leaf_of_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.57.22 nis_lerror

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.23 nis_list

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.24 nis_local_directory

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.25 nis_local_group

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.26 nis_local_host

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.57.27 **nis_local_principal**  
Gnulib module: —  
Portability problems fixed by Gnulib:  
Portability problems not fixed by Gnulib:  
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.28 **nis_lookup**  
Gnulib module: —  
Portability problems fixed by Gnulib:  
Portability problems not fixed by Gnulib:  
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.29 **nis_mkdir**  
Gnulib module: —  
Portability problems fixed by Gnulib:  
Portability problems not fixed by Gnulib:  
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.30 **nis_modify**  
Gnulib module: —  
Portability problems fixed by Gnulib:  
Portability problems not fixed by Gnulib:  
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.31 **nis_modify_entry**  
Gnulib module: —  
Portability problems fixed by Gnulib:  
Portability problems not fixed by Gnulib:  
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.57.32 \texttt{nis\_name\_of}

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.33 \texttt{nis\_name\_of\_r}

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.34 \texttt{nis\_next\_entry}

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.35 \texttt{nis\_perror}

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.36 \texttt{nis\_ping}

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.57.37 nis_print_directory
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.38 nis_print_entry
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.39 nis_print_group
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.40 nis_print_group_entry
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.41 nis_print_link
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.57.42 nis_print_object
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.43 nis_print_result
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.44 nis_print_rights
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.45 nis_print_table
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.46 nis_remove
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.57.47 nis_remove_entry

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.48 nis_removemember

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.49 nis_rmdir

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.50 nis_servstate

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.51 nis_sperrno

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.57.52 nis_sperror

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.53 nis_sperror_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.54 nis_stats

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.57.55 nis_verifygroup

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.58 Glibc <rpcsvc/nis_callback.h>

13.58.1 xdr_cback_data

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.58.2 xdr_obj_p

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.59 Glibc <rpcsvc/yp.h>

13.59.1 xdr_domainname

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.59.2 xdr_keydat

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 5.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.59.3 xdr_valdat

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 5.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.59.4 xdr_ypbind_resptype

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 5.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.59.5 xdr_ypmap_parms
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, OpenBSD 3.8, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.59.6 xdr_ypmaplist
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.59.7 xdr_yppushresp_xfr
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, OpenBSD 3.8, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.59.8 xdr_ypreq_key
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.59.9 xdr_ypreq_nokey
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.59.10 xdr_ypreq_xfr
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, OpenBSD 3.8, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.59.11  xdr_ypresp_all

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: NetBSD 5.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.59.12  xdr_ypresp_key_val

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.59.13  xdr_ypresp_maplist

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.59.14  xdr_ypresp_master

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.59.15  xdr_ypresp_order

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.59.16  xdr_ypresp_val

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.59.17 xdr_ypresp_xfr  
Gnulib module: —  
Portability problems fixed by Gnulib:  
Portability problems not fixed by Gnulib:  
- This function is missing on some platforms: macOS 11.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.59.18 xdr_ypstat  
Gnulib module: —  
Portability problems fixed by Gnulib:  
Portability problems not fixed by Gnulib:  
- This function is missing on some platforms: NetBSD 5.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.59.19 xdr_ypxfrstat  
Gnulib module: —  
Portability problems fixed by Gnulib:  
Portability problems not fixed by Gnulib:  
- This function is missing on some platforms: macOS 11.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.60 Glibc <rpcsvc/ypclnt.h>  

13.60.1 yp_all  
Gnulib module: —  
Portability problems fixed by Gnulib:  
Portability problems not fixed by Gnulib:  
- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.60.2 yp_bind  
Gnulib module: —  
Portability problems fixed by Gnulib:  
Portability problems not fixed by Gnulib:  
- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.60.3 yp_first
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.60.4 yp_get_default_domain
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.60.5 yp_master
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.60.6 yp_match
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.60.7 yp_next
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.60.8 yp_order
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.60.9 yp_unbind

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.60.10 ypbinderr_string

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.60.11 yperr_string

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.60.12 ypprot_err

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.61 Glibc Extensions to <sched.h>

13.61.1 clone

Documentation: man clone

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.
13.61.2 getcpu

Documentation:
- man getcpu.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.28, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.61.3 sched_getaffinity

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sched-getaffinity.html

Documentation:
- man sched_getaffinity.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 3.0.

13.61.4 sched_getcpu

Documentation:
man sched_getcpu

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function exists only on Linux and is therefore missing on most non-glibc platforms: glibc 2.5, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.61.5 sched_setaffinity

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sched-setaffinity.html

Documentation:
• man sched_setaffinity.
  GnuLib module: —
  Portability problems fixed by GnuLib:
  Portability problems not fixed by GnuLib:
• This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 3.0.

13.61.6 setns
  Documentation:
man setns
  GnuLib module: —
  Portability problems fixed by GnuLib:
  Portability problems not fixed by GnuLib:
• This function exists only on Linux and is therefore missing on many non-glibc platforms: glibc 2.13, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.4.

13.62 Glibc Extensions to <search.h>

13.62.1 hcreate_r
  LSB specification:
  https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-hcreate-r.html
  Documentation:
  • https://www.gnu.org/software/libc/manual/html_node/Hash-Search-Function.html,
  • man hcreate_r.
  GnuLib module: —
  Portability problems fixed by GnuLib:
  Portability problems not fixed by GnuLib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 8.1.

13.62.2 hdestroy_r
  LSB specification:
  https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-hdestroy-r.html
  Documentation:
  • https://www.gnu.org/software/libc/manual/html_node/Hash-Search-Function.html,
• man hdestroy_r.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 8.1.

13.62.3 hsearch_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/ baselib-hsearch-r.html

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Hash-Search-Function.html,
• man hsearch_r.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 8.1.

13.62.4 tdestroy

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Tree-Search-Function.html,
• man tdestroy.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.0, mingw, MSVC 14, Android 4.0.4.

13.62.5 twalk_r

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Tree-Search-Function.html,
• man twalk_r.
Chapter 13: Glibc Function Substitutes

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.63 Glibc Extensions to <selinux/selinux.h>

13.63.1 fgetfilecon

Documentation:
man fgetfilecon

Gnulib module: selinux-h

Portability problems fixed by Gnulib:

• This function exists only on Linux and is therefore missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0. On those platforms, this module provides a stub that always sets errno to ENOTSUP and returns -1.

• On systems with SELinux support, this module provides a wrapper for the fgetfilecon function that insulates the caller from API-nonconforming behavior. Without this wrapper, fgetfilecon can return '0' and set the context pointer to NULL, and in another scenario can return '10' and set the context pointer to 'unlabeled'. This wrapper returns '-1' in each case and sets errno to ENOTSUP and ENODATA respectively. While the conditions that can provoke such behavior are rare, the average caller does not handle them because the possibility of such behavior is not documented.

Portability problems not fixed by Gnulib:

13.63.2 getfilecon

Documentation:
man getfilecon

Gnulib module: selinux-h

Portability problems fixed by Gnulib:

• This function exists only on Linux and is therefore missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0. On those platforms, this module provides a stub that always sets errno to ENOTSUP and returns -1.

• On systems with SELinux support, this module provides a wrapper for the getfilecon function that insulates the caller from API-nonconforming behavior. Without this wrapper, getfilecon can return '0' and set the context pointer to NULL, and in another scenario can return '10' and set the context pointer to 'unlabeled'. This
wrapper returns ‘-1’ in each case and sets **errno** to **ENOTSUP** and **ENODATA** respectively. While the conditions that can provoke such behavior are rare, the average caller does not handle them because the possibility of such behavior is not documented.

Portability problems not fixed by Gnulib:

### 13.63.3 lgetfilecon

Documentation:

man lgetfilecon

Gnulib module: selinux-h

Portability problems fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0. On those platforms, this module provides a stub that always sets **errno** to **ENOTSUP** and returns ‘-1’.

- On systems with SELinux support, this module provides a wrapper for the *lgetfilecon* function that insulates the caller from API-nonconforming behavior. Without this wrapper, *lgetfilecon* can return ‘0’ and set the **context** pointer to NULL, and in another scenario can return ‘10’ and set the **context** pointer to ‘unlabeled’. This wrapper returns ‘-1’ in each case and sets **errno** to **ENOTSUP** and **ENODATA** respectively. While the conditions that can provoke such behavior are rare, the average caller does not handle them because the possibility of such behavior is not documented.

Portability problems not fixed by Gnulib:

### 13.64 Glibc Extensions to *<semaphore.h>*

#### 13.64.1 sem_clockwait

Documentation:


Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.65 Glibc *<shadow.h>*
13.65.1 endspent

Documentation:
man endspent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.65.2 fgetspent

Documentation:
man fgetspent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.65.3 fgetspent_r

Documentation:
man fgetspent_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.65.4 getspent

Documentation:
man getspent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.65.5 getspent_r

Documentation:
man getspent_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.65.6 getspnam

Documentation:
man getspnam

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.65.7 getspnam_r

Documentation:
man getspnam_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.65.8 lckpwdf

Documentation:
man lckpwdf

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.65.9 putspent

Documentation:
man putspent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.65.10 setspent

Documentation:
man setspent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.65.11 sgetspent

Documentation:
man sgetspent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.65.12 sgetspent_r

Documentation:
man sgetspent_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.65.13 ulckpuf

Documentation:
man ulckpuf

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.66 Glibc Extensions to <signal.h>

13.66.1 gsignal

Documentation:
- man gsignal.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.66.2 sigandset

LSB specification:
https://refsspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sigandset.html

Documentation:
man sigandset

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.66.3 sigblock

Documentation:
- man sigblock.
Chapter 13: Glibc Function Substitutes

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.66.4 siggetmask
Documentation:
man siggetmask
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.66.5 sigisemptyset
LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sigisemptyset.html
Documentation:
man sigisemptyset
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.66.6 sigorset
LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sigorset.html
Documentation:
man sigorset
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.66.7 sigreturn

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-sigreturn-2.html

Documentation:
man sigreturn
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7,
  AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.66.8 sigsetmask

Documentation:
  html,
• man sigsetmask.
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, Solaris 11.4, Cygwin 2.9,
  mingw, MSVC 14.

13.66.9 sigstack

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Signal-Stack.html,
• man sigstack.
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0,
  OpenBSD 6.7, Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.66.10 sigvec

Documentation:
man sigvec
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Solaris 11.4,
  Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.66.11 ssignal

Documentation:

- man ssignal.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.66.12 sys_siglist

Documentation:


Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This constant is missing on some platforms: macOS 10.13, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14.

13.66.13 sysv_signal

Documentation:

- man sysv.signal.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.66.14 tgkill

Documentation:

- man tgkill.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on most non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.67 Glibc Extensions to <spawn.h>

13.67.1 posix_spawn_file_actions_addchdir_np

Future POSIX specification: https://www.austingroupbugs.net/view.php?id=1208

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.28, macOS 10.13, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.0, Cygwin 3.4.6, mingw, MSVC 14, Android 9.0.

Note: Gnulib has a module posix_spawn_file_actions_addchdir that provides equivalent functionality, just without the suffix _np.

13.67.2 posix_spawn_file_actions_addclosefrom_np

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.33, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.67.3 posix_spawn_file_actions_addfchdir_np

Future POSIX specification: https://www.austingroupbugs.net/view.php?id=1208

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.28, macOS 10.13, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 3.4.6, mingw, MSVC 14, Android 9.0.

Note: Gnulib has a module posix_spawn_file_actions_addfchdir that provides equivalent functionality, just without the suffix _np.
13.68 Glibc Extensions to <stdio.h>

13.68.1 asprintf

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-asprintf.html

Documentation:
- man asprintf.

Gnulib module: vasprintf or vasprintf-posix or vasprintf-gnu

Portability problems fixed by either Gnulib module vasprintf or vasprintf-posix or
vasprintf-gnu:
- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10,
  mingw, MSVC 14.

Portability problems fixed by either Gnulib module vasprintf-posix or vasprintf-gnu:
- This function does not support size specifiers as in C99 (hh, ll, j, t, z) on some
  platforms: Cygwin 1.5.24.
- printf "%f", "%e", "%g" of Infinity and NaN yields an incorrect result on some platforms:
  Solaris 11.0.
- This function does not support the ‘a’ and ‘A’ directives on some platforms: glibc-2.3.6,
  Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, Solaris 11.4, Cygwin 1.5.x.
- This function does not support the ‘b’ directive, required by ISO C23, on some plat-
  forms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2,
  AIX 7.2, Solaris 11.4, Cygwin 2.9.0.
- This function does not support the ‘F’ directive on some platforms: NetBSD 3.0, Cyg-
  win 1.5.x.
- This function does not support the ‘ls’ directive on some platforms: OpenBSD 4.0,
  Cygwin 1.5.x, Haiku.
- This function does not support precisions in the ‘ls’ directive correctly on some plat-
  forms: Solaris 11.4.
- This function does not support format directives that access arguments in an arbitrary
  order, such as "%2$s", on some platforms: NetBSD 3.0.
- This function doesn’t support the ‘l’ flag on some platforms: NetBSD 3.0, Cygwin
  1.5.24.
- This function does not round the argument of the ‘a’ directive correctly on some plat-
  forms: Mac OS X 10.12, FreeBSD 13.0.
- printf "%010f" of NaN and Infinity yields an incorrect result (padded with zeroes) on
  some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, Solaris 11.0, Cygwin 1.5.x.
- This function produces wrong output for the ‘lc’ directive with a NUL wide character
  argument on some platforms: glibc 2.35, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2,
  macOS 12.5, AIX 7.2, Solaris 11.4, and others.
• This function can crash in out-of-memory conditions on some platforms: FreeBSD 13.0, NetBSD 5.0.

Portability problems fixed by Gnulib module \texttt{vasprintf-gnu}:
• This function does not support the ‘B’ directive on some platforms: glibc 2.34, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems not fixed by Gnulib:
• The \texttt{%m} directive is not portable, use \texttt{%s} mapped to an argument of \texttt{strerror(errno)} (or a version of \texttt{strerror_r}) instead.

\subsection*{13.68.2 cuserid}

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Who-Logged-In.html,
• man cuserid.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, mingw, MSVC 14, Android 9.0.

\subsection*{13.68.3 clearerr_unlocked}

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/ baselib-clearerr-unlocked-1.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Error-Recovery.html,
• man clearerr_unlocked.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1.

\subsection*{13.68.4 fcloseall}

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Closing-Streams.html,
• man fcloseall.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, Android 9.0.
• This function returns `void` instead of `int` on some platforms: FreeBSD 13.0.

13.68.5 `feof_unlocked`

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-feof-unlocked-1.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/EOF-and-Errors.html,
• man `feof_unlocked`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1.

13.68.6 `ferror_unlocked`

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ferror-unlocked-1.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/EOF-and-Errors.html,
• man `ferror_unlocked`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1.

13.68.7 `fflush_unlocked`

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fflush-unlocked-1.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Flushing-Buffers.html,
• man `fflush_unlocked`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
13.68.8 fgetc_unlocked

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-fgetc-unlocked-1.html

Documentation:
- man fgetc_unlocked.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0,
  NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4,
  Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

13.68.9 fgets_unlocked

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-fgets-unlocked-1.html

Documentation:
- man fgets_unlocked.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0,
  OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x,
  mingw, MSVC 14, Android 8.1.

13.68.10 fileno_unlocked

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-fileno-unlocked-1.html

Documentation:
  html,
- man fileno_unlocked.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8,
  AIX 5.1, HP-UX 11, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 6.0.
13.68.11 fopencookie

Documentation:

- man fopencookie.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

13.68.12 fputc_unlocked

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fputc-unlocked-1.html

Documentation:

- man fputc_unlocked.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

13.68.13 fgets_unlocked

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fputs-unlocked-1.html

Documentation:

- man fgets_unlocked.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
13.68.14 fread_unlocked

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-fread-unlocked-1.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Block-Input_002fOutput.html,
• man fread_unlocked.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 12.0, NetBSD 9.0,
  OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x,
  mingw, MSVC 14, Android 8.1.

13.68.15 fwrite_unlocked

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-fwrite-unlocked-1.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Block-Input_002fOutput.html,
• man fwrite_unlocked.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 12.0, NetBSD 9.0,
  OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x,
  mingw, MSVC 14, Android 8.1.

13.68.16 getw

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Character-Input.html,
• man getw.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Android 9.0.
13.68.17 putw

Documentation:
- man putw.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is not declared on some platforms: Android 9.0.

13.68.18 renameat2

Documentation:
man renameat2

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

13.68.19 setbuffer

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/ baselib-setbuffer-3.html

Documentation:
- man setbuffer.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, mingw, MSVC 14.

13.68.20 setlinebuf

Documentation:
- man setlinebuf.
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, HP-UX 11.23, mingw, MSVC 14.

13.68.21 sys_errlist
Documentation:
man sys_errlist
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This variable is missing on some platforms: Minix 3.1.8, macOS 10.13, IRIX 6.5, Cygwin 2.9, mingw, Android 9.0.

13.68.22 sys_nerr
Documentation:
man sys_nerr
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This variable is missing on some platforms: macOS 10.13, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, Android 9.0.

13.68.23 tmpnam_r
Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Temporary-Files.html,
  man tmpnam_r.
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.68.24 vasprintf
LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vasprintf.html
Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Variable-Arguments-Output.html,
• man vasprintf.

Gnulib module: vasprintf or vasprintf-posix or vasprintf-gnu

Portability problems fixed by either Gnulib module vasprintf or vasprintf-posix or vasprintf-gnu:

• This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

Portability problems fixed by either Gnulib module vasprintf-posix or vasprintf-gnu:

• This function does not support size specifiers as in C99 (hh, ll, j, t, z) on some platforms: Cygwin 1.5.24.
• printf "%-f", "%e", "%g" of Infinity and NaN yields an incorrect result on some platforms: Solaris 11.0.
• This function does not support the ‘a’ and ‘A’ directives on some platforms: glibc-2.3.6, Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, Solaris 11.4, Cygwin 1.5.x.
• This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, Solaris 11.4, Cygwin 2.9.0.
• This function does not support the ‘F’ directive on some platforms: NetBSD 3.0, Cygwin 1.5.x.
• This function does not support the ‘ls’ directive on some platforms: OpenBSD 4.0, Cygwin 1.5.x, Haiku.
• This function does not support precisions in the ‘ls’ directive correctly on some platforms: Solaris 11.4.
• This function does not support format directives that access arguments in an arbitrary order, such as "%2$s", on some platforms: NetBSD 3.0.
• This function doesn’t support the ‘f’ flag on some platforms: NetBSD 3.0, Cygwin 1.5.24.
• This function does not round the argument of the ‘a’ directive correctly on some platforms: Mac OS X 10.12, FreeBSD 13.0.
• printf "%010f" of NaN and Infinity yields an incorrect result (padded with zeroes) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, Solaris 11.0, Cygwin 1.5.x.
• This function produces wrong output for the ‘lc’ directive with a NUL wide character argument on some platforms: glibc 2.35, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.
• This function can crash in out-of-memory conditions on some platforms: FreeBSD 13.0, NetBSD 5.0.

Portability problems fixed by Gnulib module vasprintf-gnu:

• This function does not support the ‘B’ directive on some platforms: glibc 2.34, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems not fixed by Gnulib:

• The %m directive is not portable, use %s mapped to an argument of strerror(errno) (or a version of strerror_r) instead.
13.69 Glibc Extensions to <stdlib.h>

13.69.1 canonicalize_file_name

Documentation:
- man canonicalize_file_name.

Gnulib module: canonicalize-lgpl

Portability problems fixed by Gnulib:
- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.
- This function fails to detect trailing slashes on non-directories on some platforms: glibc 2.3.5.

Portability problems not fixed by Gnulib:

13.69.2 cfree

Documentation:
man cfree

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.69.3 clearenv

Documentation:
- man clearenv.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14.

13.69.4 drand48_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-drand48-r-1.html

Documentation:
• man drand48_r.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.69.5 ecvt_r

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/System-V-Number-Conversion.html,

• man ecvt_r.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.69.6 erand48_r

LSB specification:

https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-erand48-r-1.html

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/SVID-Random.html,

• man erand48_r.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.69.7 fcvt_r

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/System-V-Number-Conversion.html,

• man fcvt_r.
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.69.8 getloadavg

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getloadavg-3.html

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/Processor-Resources.html,
- man getloadavg.

Gnulib module: getloadavg
Portability problems fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- This function is declared in <sys/loadavg.h>, not <stdlib.h>, on some platforms: Solaris 11.4.

Portability problems not fixed by Gnulib:

13.69.9 getpt

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/Allocation.html,
- man getpt.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14.

13.69.10 initstate_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-initstate-r-1.html

Documentation:

- man initstate_r.
Gnulib module: random_r

Portability problems fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function has an incompatible declaration on some platforms: AIX 7.1.

Portability problems not fixed by Gnulib:
- This function crashes if the state buffer is unaligned on some platforms: glibc 2.36/sparc.
- This function has a slightly different (but compatible) declaration on some platforms: Haiku 2017.

13.69.11 jrand48_r
LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-jrand48-r-1.html
Documentation:
- man jrand48_r.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.69.12 lcong48_r
LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-lcong48-r-1.html
Documentation:
- man lcong48_r.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.69.13 lrand48_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-lrand48-r-1.html

Documentation:
- man lrand48_r.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.69.14 mkostemp

Documentation:
man mkostemp

Gnulib module: mkostemp

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many non-glibc platforms: glibc 2.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.5, mingw, MSVC 14, Android 5.1.
- This function is declared in <unistd.h> instead of <stdlib.h> on some platforms: macOS 11.1.
- On platforms where off_t is a 32-bit type, mkostemp may not work correctly to create files larger than 2 GB. (Cf. AC_SYS_LARGEFILE.)

Portability problems not fixed by Gnulib:

The gnulib module clean-temp can create temporary files that will not be left behind after signals such as SIGINT.

13.69.15 mkostemps

Documentation:
man mkostemps

Gnulib module: mkostemps

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many non-glibc platforms: glibc 2.10, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.5, mingw, MSVC 14, Android 5.1.
- This function is declared in <unistd.h> instead of <stdlib.h> on some platforms: macOS 11.1.
• On platforms where `off_t` is a 32-bit type, `mkostemps` may not work correctly to create files larger than 2 GB. (Cf. `AC_SYS_LARGEFILE`.)

Portability problems not fixed by Gnulib:

The gnuilb module `clean-temp` can create temporary files that will not be left behind after signals such as SIGINT.

### 13.69.16 `mkstemps`

**Documentation:**

`man mkstemps`

Gnulib module: `mkstemps`

Portability problems fixed by Gnulib:

• This function is missing on many non-glibc platforms: glibc 2.10, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14.
• This function is declared in `<unistd.h>` instead of `<stdlib.h>` on some platforms: macOS 11.1.
• On platforms where `off_t` is a 32-bit type, `mkstemps` may not work correctly to create files larger than 2 GB. (Cf. `AC_SYS_LARGEFILE`.)

Portability problems not fixed by Gnulib:

The gnuilb module `clean-temp` can create temporary files that will not be left behind after signals such as SIGINT.

### 13.69.17 `mrand48_r`

**LSB specification:**

https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-mrand48-r-1.html

**Documentation:**

• https://www.gnu.org/software/libc/manual/html_node/SVID-Random.html,
• `man mrand48_r`.

Gnulib module: ❌

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.69.18 `nrand48_r`

**LSB specification:**

https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-nrand48-r-1.html

**Documentation:**

• https://www.gnu.org/software/libc/manual/html_node/SVID-Random.html,
- man nrand48_r.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.69.19 on_exit

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Cleanups-on-Exit.html,
- man on_exit.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

13.69.20 ptsname_r

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Allocation.html,
- man ptsname_r.

Gnulib module: ptsname_r

Portability problems fixed by Gnulib:
- This function is missing on some platforms: Mac OS X 10.12, FreeBSD 12.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14.
- When this function fails, it returns -1 instead of the error code on some platforms: macOS 11.1, FreeBSD 13.0, Android 4.3.

Portability problems not fixed by Gnulib:
- When this function fails, it returns 0 and stores an empty string as result on some platforms: Cygwin 2.9.

Note: Portable programs should expect to find the error code as the return value of this function, not as the value of errno. This is needed for compatibility with musl libc and with the forthcoming POSIX Issue 8.
13.69.21 qecvt

Documentation:

- `man qecvt`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.69.22 qecvt_r

Documentation:

- `man qecvt_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.69.23 qfcvt

Documentation:

- `man qfcvt`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.69.24 qfcvt_r

Documentation:
- man qfcvt_r.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.69.25 qgcvt

Documentation:
- man qgcvt.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.69.26 qsort_r

Documentation:
man qsort_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: glibc 2.7, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- This function has an incompatible API on some platforms: FreeBSD 13.0.

Portability problems not fixed by Gnulib:

13.69.27 random_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-random-r-1.html

Documentation:
• man random_r.

Gnulib module: random_r

Portability problems fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
• This function has an incompatible declaration on some platforms: AIX 7.1.

Portability problems not fixed by Gnulib:
• This function has a slightly different (but compatible) declaration on some platforms: Haiku 2017.

13.69.28 rpmatch

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Yes_002dor_002dNo-Questions.html,
• man rpmatch.

Gnulib module: rpmatch

Portability problems fixed by Gnulib:
• This function is missing on some platforms: macOS 10.13, FreeBSD 5.2.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

13.69.29 secure_getenv

Documentation:
• man secure_getenv.

Gnulib module: secure_getenv

Portability problems fixed by Gnulib:
• This function is missing on many non-glibc platforms: glibc 2.16, OS X 10.8, FreeBSD 13.0, NetBSD 9.0, OpenBSD 5.2, Minix 3.2.0, AIX 7.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

13.69.30 seed48_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-seed48-r-1.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/SVID-Random.html,
- man seed48_r.

  Gnulib module: —

  Portability problems fixed by Gnulib:

  Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.69.31 setstate_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-setstate-r-1.html

Documentation:
- man setstate_r.

  Gnulib module: random_r

  Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

  This function has an incompatible declaration on some platforms: AIX 7.1.

  Portability problems not fixed by Gnulib:

- This function has a slightly different (but compatible) declaration on some platforms: Haiku 2017.

### 13.69.32 srand48_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-srand48-r-1.html

Documentation:
- man srand48_r.

  Gnulib module: —

  Portability problems fixed by Gnulib:

  Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.69.33  srandom_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-srandom-r-1.html

Documentation:
•  https://www.gnu.org/software/libc/manual/html_node/BSD-Random.html,
•  man srandom_r.

Gnulib module: random_r

Portability problems fixed by Gnulib:
•  This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

13.69.34  strtod_l

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
•  This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 7.1.

13.69.35  strtof_l

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
•  This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 7.1.

13.69.36  strtol_l

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
•  This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 7.1.
13.69.37 **strtol_l**
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

13.69.38 **strtoll_l**
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

13.69.39 **strtoq**
LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-strtoq-3.html

Documentation:

- man strtoq.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

- This function is not declared on some platforms: Android 9.0.

13.69.40 **strtoul_l**
Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 7.1.
13.69.41  **strtoull_l**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

13.69.42  **strtouq**

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-strtouq-3.html

Documentation:

- man strtouq.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.
- This function is not declared on some platforms: Android 9.0.

13.69.43  **valloc**

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/Aligned-Memory-Blocks.html,
- man valloc.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

13.70  **Glibc Extensions to <string.h>**

13.70.1  **explicit_bzero**

Documentation:

- man explicit_bzero.
Gnulib module: explicit_bzero

The explicit_bzero function is an approximation to what is needed, and does not suffice in general to erase information. Although calling explicit_bzero should clear the memory in question, the information that was in memory may still be available elsewhere on the machine. Proper implementation of information erasure requires support from levels below C code.

C23 specifies the function memset_explicit, which should be preferred to explicit_bzero in new code. See Section 10.606 [memset_explicit], page 269.

Portability problems fixed by Gnulib:
- This function is missing on some platforms: glibc 2.24, FreeBSD 10, NetBSD 7.1, OpenBSD 5.4, macOS 10.12, Solaris 11.4, Android 9.0, and many other systems.

Portability problems not fixed by Gnulib:
- Although the module’s implementation should clear the memory on platforms compatible with GCC and on platforms using traditional linkers, it may not clear the memory on non-GCC platforms that use whole-program optimization.

13.70.2 ffsl

Documentation:
man ffsl

Gnulib module: ffsl

Portability problems fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- This function is declared in <strings.h> instead of <string.h> on some platforms: AIX 7.2, Android 13.

Portability problems not fixed by Gnulib:
- This function is only defined as an inline function on some platforms: Android 13.

13.70.3 ffsll

Documentation:
man ffsll

Gnulib module: ffsll

Portability problems fixed by Gnulib:
- This function is missing on many non-glibc platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- This function is declared in <strings.h> instead of <string.h> on some platforms: AIX 7.2, Android 13.
- This function returns completely wrong values on some platforms: AIX 7.2 in 32-bit mode.

Portability problems not fixed by Gnulib:
- This function is only defined as an inline function on some platforms: Android 13.
13.70.4 memfrob

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Obfuscating-Data.html,
- man memfrob.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.70.5 memmem

LSB specification: https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-memmem-3.html

Documentation:
- man memmem.

Gnulib module: memmem or memmem-simple

Both modules implement the same replacement for the memmem function with the memmem module providing a replacement on more platforms where the existing memmem function has a quadratic worst-case complexity.

Portability problems fixed by either Gnulib module memmem-simple or memmem:
- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 5.2.1, OpenBSD 4.0, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.
- This function has reversed arguments on some older platforms: Linux libc 5.0.9
- This function can trigger false positives for long periodic needles on some platforms: glibc 2.12, Cygwin 1.7.7.
- This function returns incorrect values in some cases, such as when given an empty needle: glibc <= 2.0, macOS 12.5, AIX 7.2, Solaris 11.3, Cygwin 1.5.x.

Performance problems fixed by Gnulib module memmem:
- This function has quadratic instead of linear worst-case complexity on some platforms: glibc 2.8, macOS 12.5, FreeBSD 11.4, NetBSD 8.2, OpenBSD 6.6, AIX 7.2, Solaris 11.4, Cygwin 1.5.x. Note for small needles the replacement may be slower.

Portability problems not fixed by Gnulib:
13.70.6 mempcpy

Documentation:
- man mempcpy.

Gnulib module: mempcpy

Portability problems fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 5.1.

Portability problems not fixed by Gnulib:

13.70.7 memrchr

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-memrchr.html

Documentation:
- man memrchr.

Gnulib module: memrchr

Portability problems fixed by Gnulib:
- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

13.70.8 rawmemchr

Documentation:
- man rawmemchr.

Gnulib module: rawmemchr

Portability problems fixed by Gnulib:
- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:
13.70.9 sigabbrev_np

Documentation:

Gnulib module: sigabbrev_np

Portability problems fixed by Gnulib:
- This function is missing on all non-glibc platforms: glibc 2.31, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

Note: Gnulib has a module sig2str that contains an equivalent function and also one that does the opposite conversion, from an abbreviated signal name to a signal number.

13.70.10 sigdescr_np

Documentation:

Gnulib module: sigdescr_np

Portability problems fixed by Gnulib:
- This function is missing on all non-glibc platforms: glibc 2.31, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:
- The description of SIGCHLD is wrong on some platforms: glibc.
- The description of SIGEMT is completely unintelligible on some platforms: glibc.

Note: This function is hardly useful, because it returns English strings, not internationalized strings. Better use the function strsignal, which returns internationalized strings.

13.70.11 strcasestr

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-strcasestr.html

Documentation:
- man strcasestr.

Gnulib module: strcasestr or strcasestr-simple

Portability problems fixed by either Gnulib module strcasestr-simple or strcasestr:
- This function is missing on some platforms: AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14.
- This function can trigger memchr bugs on some platforms: glibc 2.10.
- This function can trigger false positives for long periodic needles on some platforms: glibc 2.12, Cygwin 1.7.7.
• This function may fail to find matches on some platforms: glibc 2.28.

Portability problems fixed by GnuLib module `strcasestr`:

• This function has quadratic instead of linear worst-case complexity on some platforms:
glibc 2.8, musl libc 1.2.3, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2,
Solaris 11.4.

Portability problems not fixed by GnuLib:

### 13.70.12 `strchrnul`

Documentation:

- `man strchrnul`

GnuLib module: `strchrnul`

Portability problems fixed by GnuLib:

• This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 6.0, NetBSD 7.1, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.7.8, mingw, MSVC 14, Android 6.0.

• This function crashes when no occurrence is found on some platforms: Cygwin 1.7.9.

Portability problems not fixed by GnuLib:

### 13.70.13 `strerrordesc_np`

Documentation:


GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

• This function is missing on all non-glibc platforms: glibc 2.31, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.70.14 `strerrorname_np`

Documentation:


GnuLib module: `strerrorname_np`

Portability problems fixed by GnuLib:

• This function is missing on all non-glibc platforms: glibc 2.31, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

• This function returns wrong values on some platforms: glibc 2.36.

Portability problems not fixed by GnuLib:
13.70.15 strfry

Documentation:
- man strfry.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.70.16 strsep

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-strsep-3.html

Documentation:
- man strsep.

Gnulib module: strsep

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

13.70.17 strverscmp

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/String\_Array-Comparison.html,
- man strverscmp.

Gnulib module: strverscmp

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:
- On older glibc platforms, this function does not always properly treat digit strings with leading zeros as fractions (for example, strverscmp ("B0075022800016.gb.corp.com", "B007502357019.GBP.CORP.COM") does not yield a negative number as it should): glibc 2.9
13.71 Glibc <sys/auxv.h>

13.71.1 getauxval

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/Auxiliary-Vector.html,
- man getauxval.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.15, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.72 Glibc <sys/capability.h>

13.72.1 capget

Documentation:

man capget

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.72.2 capset

Documentation:

man capset

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.73 Glibc <sys/epoll.h>
13.73.1 epoll_create

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-epoll-create-1.html

Documentation:
man epoll_create

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function exists only on Linux and illumos and is therefore missing on many non-
glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8,
AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.73.2 epoll_create1

Documentation:
man epoll_create1

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function exists only on Linux and illumos and is therefore missing on many non-
glibc platforms: glibc 2.8, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7,
Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC
14, Android 4.3.

13.73.3 epoll_ctl

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-epoll-ctl-1.html

Documentation:
man epoll_ctl

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function exists only on Linux and illumos and is therefore missing on many non-
glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8,
AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.73.4 epoll_pwait

Documentation:
man epoll_pwait

Gnulib module: —
Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function exists only on Linux and illumos and is therefore missing on many non-glibc platforms: glibc 2.5, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.3.

13.73.5 epoll_wait

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-epoll-wait-1.html

Documentation:
man epoll_wait

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function exists only on Linux and illumos and is therefore missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.74 Glibc <sys/eventfd.h>

13.74.1 eventfd

Documentation:
man eventfd

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function exists only on Linux, FreeBSD, and illumos and is therefore missing on many non-glibc platforms: glibc 2.6, macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.74.2 eventfd_read

Documentation:
man eventfd_read

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function exists only on Linux, FreeBSD, and illumos and is therefore missing on many non-glibc platforms: glibc 2.6, macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.
13.74.3 eventfd_write

Documentation:

man eventfd_write

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux, FreeBSD, and illumos and is therefore missing on many non-glibc platforms: glibc 2.6, macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.75 Glibc <sys/fanotify.h>

13.75.1 fanotify_init

Documentation:

man fanotify_init

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.12, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.75.2 fanotify_mark

Documentation:

man fanotify_mark

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.12, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.76 Glibc <sys/file.h>

13.76.1 flock

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-flock-2.html

Documentation:

man flock
Gnulib module: flock

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14
- This function is missing on some platforms: AIX 7.1, HP-UX 11.23, Solaris 11.4. But the replacement function does not really work; it exhibits test failures.

Portability problems not fixed by Gnulib:

13.77 Glibc <sys/fsuid.h>

13.77.1 setfsgid

Documentation:
man setfsgid

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.4.

13.77.2 setfsuid

Documentation:
man setfsuid

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.4.

13.78 Glibc <sys/gmon.h>

13.78.1 monstartup

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.79 Glibc <sys/inotify.h>

13.79.1 inotify_add_watch

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-inotify-add-watch.html

Documentation:
man inotify_add_watch

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on most non-glibc platforms: glibc 2.3.6, macOS 11.1, FreeBSD
  13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris
  11.4, Cygwin 2.9, mingw, MSVC 14.

13.79.2 inotify_init

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-inotify-init.html

Documentation:
man inotify_init

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on most non-glibc platforms: glibc 2.3.6, macOS 11.1, FreeBSD
  13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris
  11.4, Cygwin 2.9, mingw, MSVC 14.

13.79.3 inotify_init1

Documentation:
man inotify_init1

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on most non-glibc platforms: glibc 2.3.6, macOS 11.1, FreeBSD
  13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris
  11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.3.

13.79.4 inotify_rm_watch

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-inotify-rm-watch.html
Chapter 13: Glibc Function Substitutes

13.80 Glibc <sys/io.h>, <sys/perm.h>

13.80.1 ioperm

Documentation:
man ioperm

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.80.2 iopl

Documentation:
man iopl

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.81 Glibc <sys/kdaemon.h>

13.81.1 bdflush

Documentation:
man bdflush

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.82 Glibc <sys/klog.h>

13.82.1 klogctl

Documentation:
man klogctl

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms:
  macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.83 Glibc Extensions to <sys/mman.h>

13.83.1 madvise

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/Memory_002dmapped-I_002fO.html,
- man madvise.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Cygwin 1.7.7, mingw, MSVC 14.

13.83.2 memfd_create

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/Memory_002dmapped-I_002fO.html,
- man memfd_create.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and FreeBSD and is therefore missing on many non-glibc platforms: glibc 2.26, macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.83.3 mincore

Documentation:
man mincore

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14.

13.83.4 mlock2

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Page-Lock-Functions.html,
• man mlock2.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.26, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.83.5 mremap

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-mremap.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Memory_002dmapped-I_002fO.html,
• man mremap.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on many platforms: macOS 11.1, FreeBSD 13.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.83.6 pkey_alloc

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Memory-Protection.html,
• man pkey_alloc.
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.26, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.83.7 pkey_free
Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Memory-Protection.html,
- man pkey_free.
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.26, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.83.8 pkey_get
Documentation:
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.26, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.83.9 pkey_mprotect
Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Memory-Protection.html,
- man pkey_mprotect.
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.26, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.83.10 pkey_set

Documentation:

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function exists only on Linux and is therefore missing on all non-glibc platforms:

13.83.11 remap_file_pages

Documentation:
man remap_file_pages

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function exists only on Linux and is therefore missing on all non-glibc platforms:
macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.84 Glibc <sys/mount.h>

13.84.1 mount

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Mount_002dUnmount_002dRemount.html,
• man mount.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.

13.84.2 umount

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Mount_002dUnmount_002dRemount.html,
• man umount.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, mingw, MSVC 14.
13.84.3 umount2

Documentation:

- man umount2.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14.

13.85 Glibc <sys/personality.h>

13.85.1 personality

Documentation:
man personality
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function exists only on Linux and is therefore missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.0.2.

13.86 Glibc <sys/prctl.h>

13.86.1 prctl

Documentation:
man prctl
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.87 Glibc <sys/profil.h>
Chapter 13: Glibc Function Substitutes

13.87.1 srofif
  Gnulib module: —
  Portability problems fixed by Gnulib:
  Portability problems not fixed by Gnulib:
  • This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.88 Glibc <sys/ptrace.h>

13.88.1 ptrace
  LSB specification:
  https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ptrace-1.html
  Documentation:
  man ptrace
  Gnulib module: —
  Portability problems fixed by Gnulib:
  Portability problems not fixed by Gnulib:
  • This function is missing on some platforms: AIX 5.1, Cygwin 2.9, mingw, MSVC 14.

13.89 Glibc <sys/quotactl.h>

13.89.1 quotactl
  Documentation:
  man quotactl
  Gnulib module: —
  Portability problems fixed by Gnulib:
  Portability problems not fixed by Gnulib:
  • This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 7.1.

13.90 Glibc <sys/random.h>

13.90.1 getentropy
  Future POSIX specification:
  https://www.austingroupbugs.net/view.php?id=1134
  Documentation:
  • https://www.gnu.org/software/libc/manual/html_node/Unpredictable-Bytes.html,
  • man getentropy.
Chapter 13: Glibc Function Substitutes

Gnulib module: getentropy

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.24, Mac OS X 10.11, FreeBSD 11.0, NetBSD 9.0, OpenBSD 5.5, Minix 3.3, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.0, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
- This function is declared in `<sys/random.h>`, not in `<unistd.h>`, on some platforms: macOS 11.1, Solaris 11.4, Android 9.0.

Portability problems not fixed by Gnulib:

Although this function is intended to produce random data, the data’s security properties may not be appropriate for your application. For example, identical “random” data streams might be produced by rebooted virtual machines. If this is of concern you may need to use additional techniques such as hedging.\(^1\)

Related modules include `getrandom`, which has a more-flexible but more-complex API, and `crypto/gc-random`, which is likely a better match for code already using the other crypto APIs.

13.90.2 getrandom

Documentation:

- `man getrandom`.

Gnulib module: getrandom

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.24, macOS 11.1, FreeBSD 11.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.0, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
- This function has a different return type on some platforms: Solaris 11.4.

Portability problems not fixed by Gnulib:

- The `GRND_INSECURE` flag is missing on some platforms: glibc 2.34, macOS 10.15, GNU/kFreeBSD, FreeBSD 12.0, OpenBSD 6.7, Minix 3.3, Haiku.
- The `GRND_RANDOM` flag has different effects on different platforms. Some platforms ignore the flag, or yield data that can fail to be random in some cases.

Although this function is intended to produce random data, the data’s security properties may not be appropriate for your application. For example, identical “random” data streams might be produced by rebooted virtual machines. If this is of concern you may need to use additional techniques such as hedging.\(^2\)

Related modules include `getentropy`, which has a simpler but more-limited API, and `crypto/gc-random`, which is likely a better match for code already using the other crypto APIs.


## Chapter 13: Glibc Function Substitutes

### 13.91 Glibc \(<\text{sys/reboot.h}>\)

#### 13.91.1 reboot

Documentation:

- man reboot

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, Cygwin 2.9, mingw, MSVC 14.

### 13.92 Glibc Extensions to \(<\text{sys/resource.h}>\)

#### 13.92.1 prlimit

Documentation:

- man prlimit

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: glibc 2.12, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 6.0.

### 13.93 Glibc Extensions to \(<\text{sys/sem.h}>\)

#### 13.93.1 semtimedop

Documentation:

- man semtimedop.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 7.1.

### 13.94 Glibc \(<\text{sys/sendfile.h}>\)
13.94.1 sendfile

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/ baselib-sendfile.html

Documentation:
man sendfile

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11 2010-11, Cygwin 2.9, mingw, MSVC 14, Android 4.4.

• On platforms where off_t is a 32-bit type, this function may not work correctly on files larger than 2 GB. The fix is to use the AC_SYS_LARGEFILE macro.

13.95 Glibc <sys/signalfd.h>

13.95.1 signalfd

Documentation:
man signalfd

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function exists only on Linux and illumos and is therefore missing on many non-glibc platforms: glibc 2.6, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.96 Glibc <sys/single_threaded.h>

13.96.1 __libc_single_threaded

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This variable is missing on all non-glibc platforms: glibc 2.31, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.97 Glibc Extensions to <sys/socket.h>

13.97.1 accept4

Documentation:
man accept4

Gnulib module: accept4

Portability problems fixed by Gnulib:
• This function is missing on many non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 6.0, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.1, mingw, MSVC 14, Android 4.4. But the replacement function is not atomic; this matters in multi-threaded programs that spawn child processes.

Portability problems not fixed by Gnulib:
• SOCK_CLOEXEC and SOCK_NONBLOCK may not be defined as they’re also significant to the socket() function.

13.97.2 isfdtype

Documentation:
man isfdtype

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.97.3 recvmsg

Documentation:
man recvmsg

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on many non-glibc platforms: glibc 2.11, macOS 11.1, FreeBSD 6.4, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 4.4.

13.97.4 sendmsg

Documentation:
man sendmsg

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on many non-glibc platforms: glibc 2.13, macOS 11.1, FreeBSD 6.4, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 4.4.

13.98 Glibc Extensions to <sys/stat.h>

13.98.1 getumask

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Setting-Permissions.html,
• man getumask.

Gnulib module: getumask

Portability problems fixed by Gnulib:
• This function exists only on Hurd and is therefore missing on all non-glibc platforms: glibc/Linux, glibc/kFreeBSD, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

13.98.2 lchmod

Gnulib module: lchmod

Portability problems fixed by Gnulib:
• This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
• This function is not declared on some platforms: HP-UX 11.31.
• This function always fails with errno set to ENOSYS, even when the file is not a symbolic link: GNU/Linux with glibc 2.31.
• This function does not fail when the file name argument ends in a slash and (without the slash) names a non-directory, on some platforms: AIX 7.2.

Portability problems not fixed by Gnulib:
• Some platforms do not allow changing the access bits on symbolic links.
• This function can fail with errno set to EMFILE or ENFILE, and it fails with errno set to EOPNOTSUPP if the /proc file system is not mounted: GNU/Linux with glibc 2.34.

13.98.3 statx

Documentation:

man statx

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
• There is an incompatible function of the same name on some platforms: AIX 5.2 or newer.

13.99 Glibc <sys/statfs.h>

13.99.1 fstatfs

LSB specification:  
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fstatfs-2.html

Documentation:
man fstatfs

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: AIX 5.1, mingw, MSVC 14.
• On platforms where f_blocks in 'struct statfs' is a 32-bit value, this function may not work correctly on files systems larger than 4 TiB. The fix is to use the AC_SYS_LARGEFILE macro. This affects Mac OS X.

13.99.2 statfs

LSB specification:  
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-statfs-2.html

Documentation:
man statfs

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, mingw, MSVC 14.
• On platforms where f_blocks in 'struct statfs' is a 32-bit value, this function may not work correctly on files systems larger than 4 TiB. The fix is to use the AC_SYS_LARGEFILE macro. This affects Mac OS X.

13.100 Glibc <sys/swap.h>

13.100.1 swapoff

Documentation:  
man swapoff

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.3.

13.100.2 swapon

Documentation:
man swapon

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:

• This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.3.

13.101 Glibc <sys/sysctl.h>

13.101.1 sysctl

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/System-Parameters.html,
• man sysctl.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.34, Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.102 Glibc <sys/sysinfo.h>

13.102.1 get_avphys_pages

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Query-Memory-Parameters.html,
• man get_avphys_pages.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:

• This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.1, mingw, MSVC 14, Android 5.1.
13.102.2 get_nprocs

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Processor-Resources.html,
- man get_nprocs.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.7.1, mingw, MSVC 14, Android 5.1.

Gnulib provides the module nproc that performs a similar function but is portable to more systems.

13.102.3 get_nprocs_conf

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Processor-Resources.html,
- man get_nprocs_conf.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.7.1, mingw, MSVC 14, Android 5.1.

13.102.4 get_phys_pages

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Query-Memory-Parameters.html,
- man get_phys_pages.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.1, mingw, MSVC 14, Android 5.1.
13.102.5 sysinfo

LSB specification: https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sysinfo-1.html

Documentation:
man sysinfo

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, Cygwin 1.7.9, mingw, MSVC 14.

13.103 Glibc <sys/syslog.h>

13.103.1 vsyslog

LSB specification: https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vsyslog-3.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/syslog_003b-vsyslog.html,
• man vsyslog.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, mingw, MSVC 14.

13.104 Glibc <sys/sysmacros.h>

13.104.1 gnu_dev_major

Documentation:
man gnu_dev_major

Gnulib module: —

Portability problems fixed by Gnulib:
• The AC_HEADER_MAJOR macro in Autoconf 2.69 and earlier fails to set MAJOR_IN_SYSMACROS when it detects namespace pollution in sys/types.h; which in turn provokes deprecation warnings in glibc 2.25.

Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.104.2  gnu_dev_makedev

Documentation:
man gnu_dev_makedev

Gnulib module: —

Portability problems fixed by Gnulib:
• The AC_HEADER_MAJOR macro in Autoconf 2.69 and earlier fails to set MAJOR_IN_SYSMACROS when it detects namespace pollution in sys/types.h; which in turn provokes deprecation warnings in glibc 2.25.

Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.104.3  gnu_dev_minor

Documentation:
man gnu_dev_minor

Gnulib module: —

Portability problems fixed by Gnulib:
• The AC_HEADER_MAJOR macro in Autoconf 2.69 and earlier fails to set MAJOR_IN_SYSMACROS when it detects namespace pollution in sys/types.h; which in turn provokes deprecation warnings in glibc 2.25.

Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.105  Glibc Extensions to <sys/time.h>

13.105.1  adjtime

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-adjtime-2.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/High_002dResolution-Calendar.html,

• man adjtime.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.105.2 futimes

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-futimes.html

Documentation:
- man futimes.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 7.1.
- This function cannot set full timestamp resolution. Use futimens(fd,times) instead.

13.105.3 futimesat

Documentation:
man futimesat

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 7.1.
- On some platforms, this function mis-handles a trailing slash: Solaris 9.
- This function cannot set full timestamp resolution. Use
  
  ```c
  file ? utimensat(fd, file, times, 0)
  : futimens(fd, times)
  ```

  or the gnulib module fdutimensat, instead.

13.105.4 lutimes

Documentation:

- man lutimes.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 7.1.
- This function cannot set full timestamp resolution. Use utimensat(AT_FDCWD,file,times,AT_SYMLINK_NOFOLLOW), or the gnulib module utimens, instead.
• The mere act of using `lstat` modifies the access time of symlinks on some platforms, so `lutimes` can only effectively change modification time: Cygwin.

13.105.5 `settimeofday`

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/High_002dResolution-Calendar.html,
- `man settimeofday`.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14.

13.106 Glibc `<sys/timerfd.h>`

13.106.1 `timerfd_create`

Documentation:
`man timerfd_create`
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function exists only on Linux and illumos and is therefore missing on many non-glibc platforms: glibc 2.7, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.3.

13.106.2 `timerfd_gettime`

Documentation:
`man timerfd_gettime`
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function exists only on Linux and illumos and is therefore missing on many non-glibc platforms: glibc 2.7, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.3.

13.106.3 `timerfd_settime`

Documentation:
`man timerfd_settime`
Gnulib module: —
Chapter 13: Glibc Function Substitutes

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function exists only on Linux and illumos and is therefore missing on many non-glibc platforms: glibc 2.7, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.3.

13.107 Glibc <sys/timex.h>

13.107.1 adjtimex

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/High-Resolution-Calendar.html,
• man adjtimex.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function exists only on Linux and is therefore missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 6.0.

13.107.2 ntp_adjtime

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/High-Accuracy-Clock.html,
• man ntp_adjtime.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Mac OS X 10.5, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.107.3 ntp_gettime

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/High-Accuracy-Clock.html,
• man ntp_gettime.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Mac OS X 10.5, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.107.4 ntp_gettimex

Documentation:
man ntp_gettimex

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: glibc 2.11, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.108 Glibc Extensions to <sys/uio.h>

13.108.1 preadv

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Scatter_002dGather.html,
• man preadv.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: glibc 2.9, macOS 10.13, FreeBSD 5.2.1, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 6.0.
• On platforms where off_t is a 32-bit type, this function may not work correctly on files larger than 2 GB. The fix is to use the AC_SYS_LARGEFILE macro.

13.108.2 preadv2

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Scatter_002dGather.html,
• man preadv2.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function exists only on Linux and is therefore missing on many non-glibc platforms: glibc 2.25, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.108.3 process_vm_readv

Documentation:
man process_vm_readv

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: glibc 2.14, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 5.1.

13.108.4 process_vm_writev

Documentation:
man process_vm_writev

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: glibc 2.14, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 5.1.

13.108.5 pwritev

Documentation:

- man pwritev.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.9, macOS 10.13, FreeBSD 5.2.1, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 6.0.
- On platforms where off_t is a 32-bit type, this function may not work correctly on files larger than 2 GB. The fix is to use the AC_SYS_LARGEFILE macro.

13.108.6 pwritev2

Documentation:

- man pwritev2.
Chapter 13: Glibc Function Substitutes

Glibc module: —
Portability problems fixed by Glibc:

Portability problems not fixed by Glibc:

• This function exists only on Linux and is therefore missing on many non-glibc platforms: glibc 2.25, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.109 Glibc <sys/ustat.h>

13.109.1 ustat

Documentation:
man ustat

Glibc module: —
Portability problems fixed by Glibc:

Portability problems not fixed by Glibc:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.110 Glibc <sys/vlimit.h>

13.110.1 vlimit

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Limits-on-Resources.html,
• man vlimit.

Glibc module: —
Portability problems fixed by Gnuilb:

Portability problems not fixed by Gnuilb:

• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.111 Glibc Extensions to <sys/wait.h>

13.111.1 wait3

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/BSD-Wait-Functions.html,
• man wait3.
Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 9.0.
- This function is not declared on some platforms: Android 13.

### 13.111.2 wait4

**LSB specification:**
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-wait4-2.html

**Documentation:**
- https://www.gnu.org/software/libc/manual/html_node/Process-Completion.html,
- man wait4.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.11, IRIX 6.5, mingw, MSVC 14, Android 4.2.

### 13.112 Glibc <sys/xattr.h>

#### 13.112.1 fgetxattr

**Documentation:**
man fgetxattr

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.
- This function has extra offset and options parameters: macOS 11.1.

#### 13.112.2 flistxattr

**Documentation:**
man flistxattr

Gnulib module: —
Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on many non-glibc platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

13.112.3 fremovexattr

Documentation:
man fremovexattr

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on many non-glibc platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

13.112.4 fsetxattr

Documentation:
man fsetxattr

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on many non-glibc platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

13.112.5 getxattr

Documentation:
man getxattr

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on many non-glibc platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.
- This function has extra offset and options parameters: macOS 11.1.

13.112.6 lgetxattr

Documentation:
man lgetxattr

GnuLib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

13.112.7 listxattr

Documentation:
man listxattr

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

13.112.8 llistxattr

Documentation:
man llistxattr

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

13.112.9 lremovexattr

Documentation:
man lremovexattr

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

13.112.10 lsetxattr

Documentation:
man lsetxattr

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

13.112.11 removexattr

Documentation:

man removexattr

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many non-glibc platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

13.112.12 setxattr

Documentation:

man setxattr

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on many non-glibc platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

13.113 Glibc Extensions to <termios.h>

13.113.1 cfmakeraw

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-cfmakeraw-3.html

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Noncanonical-Input.html,
• man cfmakeraw.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4.
13.113.2 cfsetspeed

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-cfsetspeed-3.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Line-Speed.html,
• man cfsetspeed.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

13.114 Glibc Extensions to <time.h>

13.114.1 clock_adjtime

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function exists only on Linux and is therefore missing on many non-glibc platforms: glibc 2.13, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 6.0.

13.114.2 dysize

Documentation:
man dysize

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.114.3 getdate_r

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/General-Time-String-Parsing.html,
• man getdate_r.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.114.4 stime

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/ baselib-stime-2.html

Documentation:
- man stime.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

13.114.5 strftime_l

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

13.114.6 timelocal

Documentation:
- man timelocal.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, mingw, MSVC 14, Android 3.0.
13.114.7 timespec_get

Gnulib module: timespec_get

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.15, macOS 10.13, FreeBSD 11.0, NetBSD 7.1, OpenBSD 6.0, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

13.115 Glibc <ttyent.h>

13.115.1 endttyent

Documentation:

man endttyent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.115.2 getttyent

Documentation:

man getttyent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.115.3 getttynam

Documentation:

man getttynam

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.115.4 `setttyent`

Documentation:

man `setttyent`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.116 Glibc Extensions to `<unistd.h>`

13.116.1 `_Fork`

Documentation:


Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.33, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.116.2 `acct`

LSB specification:

https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-acct-3.html

Documentation:

man `acct`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14.

13.116.3 `brk`

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/Resizing-the-Data-Segment.html,
- man `brk`.

Gnulib module: —
Chapter 13: Glibc Function Substitutes

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: FreeBSD 12.2/arm64, AIX 5.1, Cygwin 2.9, mingw, MSVC 14.

13.116.4 chroot

Documentation:
man chroot

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: AIX 5.1, mingw, MSVC 14.

13.116.5 closefrom

Documentation:


Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: glibc 2.33, macOS 11.1, FreeBSD 7.2, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Note (quoted from man close): “The [POSIX] standard developers rejected a proposal to add closefrom() to the [POSIX] standard. Because the standard permits implementations to use inherited file descriptors as a means of providing a conforming environment for the child process, it is not possible to standardize an interface that closes arbitrary file descriptors above a certain value while still guaranteeing a conforming environment.”

13.116.6 copy_file_range

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Copying-File-Data.html,

• man copy_file_range.

Gnulib module: copy-file-range

Portability problems fixed by Gnulib:

• This function exists only on Linux and FreeBSD and is therefore missing on many non-glibc platforms: glibc 2.26, macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0. But the replacement function is only a stub: It always fails with error ENOSYS.
• This function has many problems on Linux kernel versions before 5.3. On these kernel versions, the replacement function always fails with error ENOSYS.

Portability problems not fixed by Gnilib:

13.116.7 daemon

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-daemon-3.html

Documentation:
man daemon

Gnilib module: —

Portability problems fixed by Gnilib:

Portability problems not fixed by Gnilib:

• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

13.116.8 dup3

Documentation:
man dup3

Gnilib module: dup3

Portability problems fixed by Gnilib:

• This function is missing on many non-glibc platforms: glibc 2.8, macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.1, mingw, MSVC 14, Android 4.4.

• This function can crash on some platforms: Cygwin 1.7.25.

Portability problems not fixed by Gnilib:

13.116.9 eaccess

Documentation:
man eaccess

This function is an alias of euidaccess. See Section 13.116.11 [euidaccess], page 732.

13.116.10 endusershell

Documentation:
man endusershell

Gnilib module: getusershell

Portability problems fixed by Gnilib:

• This function is missing on some platforms: Minix 3.1.8, IRIX 6.5, mingw, MSVC 14, Android 9.0.

• This function is missing a declaration on some platforms: Solaris 9.

Portability problems not fixed by Gnilib:
13.116.11 euidaccess

Documentation:
man euidaccess

Gnulib module: euidaccess

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

Other problems of this function:

- There is an inherent race between calling this function and performing some action based on the results; you should think twice before trusting this function, especially in a set-uid or set-gid program.
- This function does not have an option for not following symbolic links (like stat versus lstat). If you need this option, use the Gnulib module faccessat with the AT_EACCESS flag.

13.116.12 execveat

Documentation: man execveat.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.33/Linux, glibc 2.34/Hurd, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.116.13 execvpe

Documentation:
man execvpe

Gnulib module: execvpe

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.10, macOS 11.1, FreeBSD 13.0, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.5.x, mingw, Android 4.4.
- This function is not declared on some platforms: AIX 7.1.
- On Windows platforms (excluding Cygwin), this function does not pass command-line arguments correctly if they contain space, tab, backslash, or double-quote characters.
- On Windows platforms (excluding Cygwin), this function spawns an asynchronous child process and then exits the current process immediately. As a consequence, the parent of the current process 1. may incorrectly proceed as if its child had exited, and 2. will never see the child’s exit status.
On Windows platforms (excluding Cygwin), the return type of this function is `intptr_t`, not `int`.

Portability problems not fixed by GnuLib:

### 13.116.14 `get_current_dir_name`

Documentation:
- `man get_current_dir_name`

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14, Android 9.0.

### 13.116.15 `getdomainname`

LSB specification: [https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getdomainname.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getdomainname.html)

Documentation:
- `man getdomainname`

GnuLib module: `getdomainname`

Portability problems fixed by GnuLib:
- This function is missing on some platforms: Solaris 11.3, mingw, MSVC 14, Android 7.1.
- This function is declared in `netdb.h`, not in `unistd.h`, on some platforms: AIX 7.1.
- The second argument is of type `int`, not `size_t`, on some platforms: macOS 11.1, FreeBSD 13.0, AIX 7.1, IRIX 6.5.

Portability problems not fixed by GnuLib:

### 13.116.16 `getdtablesize`

SUSv2 specification: [https://pubs.opengroup.org/onlinepubs/7908799/xsh/getdtablesize.html](https://pubs.opengroup.org/onlinepubs/7908799/xsh/getdtablesize.html)

LSB specification: [https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getdtablesize.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getdtablesize.html)

Documentation:
- `man getdtablesize`
Gnulib module: getdtablesize
Portability problems fixed by Gnulib:
• This function is missing on some platforms: Android LP64, mingw, MSVC 14, Android 9.0.
• This function is not declared on some platforms: Android 13 (LP32?).
• This function does not represent the true RLIMIT_NOFILE soft limit on some platforms: Android 13 (LP32?), Cygwin 1.7.25.

Portability problems not fixed by Gnulib:
• On OpenVMS, this function returns the maximum number of open file descriptors in a process. The possible values of file descriptors are not constrained by this function.

13.116.17 getpagesize

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getpagesize.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Query-Memory-Parameters.html,
• man getpagesize.

Gnulib module: getpagesize
Portability problems fixed by Gnulib:
• This function is missing on some platforms: MSVC 14, Android 4.4.
• This function is not declared on some platforms: HP-UX 11 with compiler option -D_XOPEN_SOURCE=600.
• This function is broken on some platforms: mingw.

Portability problems not fixed by Gnulib:

13.116.18 getpass

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/getpass.html,
• man getpass.

Gnulib module: getpass or getpass-gnu
Portability problems fixed by either Gnulib module getpass or getpass-gnu:
• This function is missing on some platforms: mingw, MSVC 14, Android 9.0.
• This function cannot be called from plain inline or extern inline functions on some platforms: Android 13.

Portability problems fixed by Gnulib module getpass-gnu:
• The returned password is truncated to PASS_MAX characters on some platforms: uClibc (256), musl (128), macOS 11.1 (128), FreeBSD 13.0 (128), NetBSD 3.0 (128), OpenBSD 4.0 (128), AIX 5.1 (32), HP-UX 11 (8), IRIX 6.5 (32), Solaris 11 2010-11 (8, even less than PASS_MAX), Cygwin (128). The gnulib implementation returns the password untruncated.
Portability problems not fixed by Gnulib:

13.116.19 getresgid

Future POSIX specification:
https://www.austingroupbugs.net/view.php?id=1344
Documentation:
man getresgid
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, Minix 3.1.8, AIX 5.1, HP-UX 11.00, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.116.20 getresuid

Future POSIX specification:
https://www.austingroupbugs.net/view.php?id=1344
Documentation:
man getresuid
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, Minix 3.1.8, AIX 5.1, HP-UX 11.00, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.116.21 gettid

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Process-Identification.html,
• man gettid.
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function exists only on Linux and is therefore missing on most non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.116.22 getusershell

Documentation:
man getusershell
Gnulib module: getusershell
Portability problems fixed by Gnulib:
• This function is missing on some platforms: Minix 3.1.8, IRIX 6.5, mingw, MSVC 14, Android 9.0.
• This function is missing a declaration on some platforms: Solaris 9.

Portability problems not fixed by Gnulib:

13.116.23 group_member

Documentation:
man group_member

Gnulib module: group-member

Portability problems fixed by Gnulib:
• This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

13.116.24 pipe2

Documentation:
man pipe2

Gnulib module: pipe2

Portability problems fixed by Gnulib:
• This function is missing on many non-glibc platforms: glibc 2.8, macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.1, mingw, MSVC 14, Android 2.2. But the replacement function is not atomic; this matters in multi-threaded programs that spawn child processes.

Portability problems not fixed by Gnulib:
• This function crashes rather than failing with **EMFILE** if no resources are left on some platforms: Cygwin 1.7.9.

Note: This function portably supports the **O_NONBLOCK** flag only if the gnuib module **nonblocking** is also used.

13.116.25 profil

Documentation:
man profil

Gnuib module: —

Portability problems fixed by Gnuib:

Portability problems not fixed by Gnuib:
• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.116.26 revoke

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

13.116.27 sbrk

Documentation:

man sbrk

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 12.2/arm64, AIX 5.1, mingw, MSVC 14.

13.116.28 setlogin

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.116.29 setdomainname

Documentation:

- man setdomainname.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 7.1.

13.116.30 sethostid

Documentation:

- man sethostid.
Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.116.31 sethostname

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sethostname-2.html

Documentation:

- man sethostname.

Gnulib module: sethostname

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1. Note that the Gnulib replacement may fail with ENOSYS on some platforms.
- This function is not declared on some platforms: AIX 7.1, Solaris 10.

Portability problems not fixed by Gnulib:

- The first parameter is char * instead of const char * on some platforms: Solaris 11 2010-11.
- The second parameter is int instead of size_t on some platforms: macOS 11.1, MidnightBSD 2.0, Solaris 11 2010-11.

13.116.32 setresgid

Future POSIX specification:
https://www.austingroupbugs.net/view.php?id=1344

Documentation:
man setresgid

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.
13.116.33 setresuid

Future POSIX specification:
https://www.austingroupbugs.net/view.php?id=1344

Documentation:
man setresuid

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: macOS 11.1, NetBSD 9.0, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

13.116.34 setusershell

Documentation:
man setusershell

Gnulib module: getusershell

Portability problems fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, IRIX 6.5, mingw, MSVC 14, Android 9.0.

• This function is missing a declaration on some platforms: Solaris 9.

Portability problems not fixed by Gnulib:

13.116.35 syncfs

Documentation:
man syncfs

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on all non-glibc platforms: glibc 2.13, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 8.1.

13.116.36 syscall

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/System-Calls.html,
• man syscall.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14.
13.116.37 ttyslot

Documentation:
man ttyslot

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: mingw, MSVC 14, Android 9.0.

13.116.38 vhangup

Documentation:
man vhangup

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, mingw, MSVC 14, Android 9.0.

13.117 Glibc <utmp.h>

13.117.1 endutent

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-endutent-3.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html,
• man endutent.

Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

13.117.2 getutent

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getutent-3.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html,
• man getutent.
Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

### 13.117.3 getutent_r

**LSB specification:**
[https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getutent-r-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getutent-r-3.html)

**Documentation:**

- man getutent_r.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.117.4 getutid

**Documentation:**

- man getutid.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 13.117.5 getutid_r

**Documentation:**

- man getutid_r.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.117.6 getutline

Documentation:

- `man getutline`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 13.117.7 getutline_r

Documentation:

- `man getutline_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.117.8 pututline

Documentation:

- `man pututline`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.
13.117.9 setutent

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-setutent-3.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html,
- man setutent.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

13.117.10 updwtmp

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html,
- man updwtmp.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, mingw, MSVC 14, Android 9.0.

13.117.11 utmpname

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-utmpname-3.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html,
- man utmpname.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.
13.117.12 login

Documentation:
- man login.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on many non-glibc platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

13.117.13 login_tty

Documentation:
- man login_tty.

Gnulib module: login_tty
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Android 5.1.
- This function is declared in <utmp.h> on glibc, Cygwin, Android, in <util.h> on macOS 11.1, NetBSD 5.0, OpenBSD 3.8, in <libutil.h> on FreeBSD 13.0, Haiku, and in <termios.h> on Solaris 11.4.
- This function requires linking with -lutil on some platforms: glibc 2.3.6, FreeBSD 13.0, NetBSD 5.0, OpenBSD 3.8. It is available without link options on other platforms: macOS 11.1, Cygwin.

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.

13.118 Glibc Extensions to <utmpx.h>

13.118.1 getutmp

Documentation:
- man getutmp.

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
13.118.2 **getutmpx**

Documentation:
- man getutmpx.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

13.118.3 **updwtmpx**

Documentation:
man updwtmpx

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

13.118.4 **utmpxname**

Documentation:
- man utmpxname.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
- This function is missing on some platforms: FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, mingw, MSVC 14, Android 9.0.

13.119 **Glibc Extensions to `<wchar.h>`**

13.119.1 **fgetwc_unlocked**

LSB specification:
- [https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fgetwc-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fgetwc-unlocked-1.html)

Documentation:
- man fgetwc_unlocked.
Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

**13.119.2 fgets_unlocked**

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fgetws-unlocked-1.html

Documentation:
- man `fgetws_unlocked`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

**13.119.3 fputwc_unlocked**

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fputwc-unlocked-1.html

Documentation:
- man `fputwc_unlocked`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.
13.119.4 fputws_unlocked

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fputws-unlocked-1.html

Documentation:
- man fputws_unlocked.

Gnulib module: —

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

13.119.5 getwc_unlocked

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getwc-unlocked-1.html

Documentation:
- man getwc_unlocked.

Gnulib module: —

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

13.119.6 getwchar_unlocked

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getwchar-unlocked-1.html

Documentation:
- man getwchar_unlocked.
Chapter 13: Glibc Function Substitutes

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

13.119.7 putwc_unlocked

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-putwc-unlocked-1.html

Documentation:
- man putwc_unlocked.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

13.119.8 putwchar_unlocked

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-putwchar-unlocked-1.html

Documentation:
- man putwchar_unlocked.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.
13.119.9 wcschrnul

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

13.119.10 wcsftime_l

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

13.119.11 wcstod_l

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 7.1, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

13.119.12 wcstof_l

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 7.1, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.
13.119.13 wcstol_l

Gnulib module: —

Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:

• This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

13.119.14 wcstold_l

Gnulib module: —

Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:

• This function is missing on many platforms: FreeBSD 6.0, NetBSD 7.1, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

13.119.15 wcstoll_l

Gnulib module: —

Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:

• This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

13.119.16 wcstoq

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/ baselib-wcstoq.html

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:

• This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
• On Windows and 32-bit AIX platforms, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

13.119.17 \texttt{wcstoul\_l}

Gnulib module: —

Portability problems fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

- On Windows and 32-bit AIX platforms, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

13.119.18 \texttt{wcstoull\_l}

Gnulib module: —

Portability problems fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

- On Windows and 32-bit AIX platforms, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

13.119.19 \texttt{wcstouq}

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-wcstouq.html

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

- On Windows and 32-bit AIX platforms, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

13.119.20 \texttt{wmempcpy}

Documentation:

• man wmempcpy.

Gnulib module: wmempcpy

Portability problems fixed by Gnulib:
• This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 5.1.

Portability problems not fixed by Gnulib:
• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.
14 Native Windows Support

There are three ways to create binaries that run on Microsoft Windows:

- Native binaries, built using the MinGW tool chain.
- Native binaries, built using the MSVC (MS Visual C/C++) tool chain.
- Binaries for the Cygwin environment.

This chapter deals with the MinGW and MSVC platforms, commonly called “native Windows” platforms. Cygwin, on the other hand, is close enough to POSIX that it can be treated like any other Unix-like platform.

14.1 Libtool and Windows

If you want it to be possible to compile your program for a native Windows platform and you use Libtool, you need to use the win32-dll option of LT_INIT. In other words, put:

```bash
LT_INIT([win32-dll])
```

in your configure.ac. This sets the correct names for the OBJDUMP, DLLTOOL, and AS tools for the build.

If you are building a library, you will also need to pass -no-undefined to make sure Libtool produces a DLL for your library. From a Makefile.am:

```makefile
libgsasl_la_LDFLAGS += -no-undefined
```

14.2 Large File Support

This module provides support for files 2 GiB and larger, or with device or inode numbers exceeding 32 bits. To this effect, it attempts to ensure that types like off_t and ino_t are 64-bit, at least on the following platforms: glibc, Mac OS X, FreeBSD, NetBSD, OpenBSD, AIX, HP-UX, IRIX, Solaris, Cygwin, mingw, MSVC.

If the types cannot be made 64-bit, configure issues a warning and proceeds.

This module gives configure an option '--disable-largefile' that suppresses support for large files. This may be useful if the package links to other libraries whose user-facing ABIs still require off_t or most other file-related types to be 32-bit on your platform.

This module also adds to configure an option --enable-year2038, needed on some platforms to access files with timestamps past the year 2038. See Section 14.5 [Avoiding the year 2038 problem], page 754.

14.3 Inode numbers on Windows

The module 'windows-stat-inodes' ensures that, on native Windows platforms, struct stat contains st_dev, st_ino fields that are able to distinguish different inodes.

Note: Such values can only be provided for most files on the file system. For a few files (such as inaccessible files), st_dev and st_ino are set to 0. Therefore, you should test whether st_dev != 0 && st_ino != 0, before going to make inferences based on the file identity based on st_dev and st_ino.
14.4 Precise file timestamps on Windows

The module ‘windows-stat-timespec’ ensures that, on native Windows platforms, \texttt{struct stat} contains \texttt{st_atim}, \texttt{st_mtim}, \texttt{st_ctim} fields of type \texttt{struct timespec}, providing 100 ns resolution for the timestamps of files.

Note: On some types of file systems, the timestamp resolution is limited by the file system. For example, on FAT file systems, \texttt{st_mtim} only has a resolution of 2 seconds. For more details, see https://docs.microsoft.com/en-us/windows/desktop/SysInfo/file-times.

14.5 Avoiding the year 2038 problem

The year 2038 problem denotes unpredictable behaviour that will likely occur in the year 2038, for programs that use a 32-bit signed integer ‘\texttt{time_t}’ type that cannot represent timestamps on or after 2038-01-19 03:14:08 UTC. See Year 2038 problem (https://en.wikipedia.org/wiki/Year_2038_problem) for details.

The Gnulib module ‘year2038’ fixes this problem on some platforms, by making \texttt{time_t} wide enough to represent timestamps after 2038. This has no effect on most current platforms, which have timestamps that are already wide enough. However, ‘year2038’ by default arranges for builds on legacy 32-bit Linux kernels running glibc 2.34 and later to compile with ‘\_TIME\_BITS=64’ to get wider timestamps. On older platforms that do not support timestamps after the year 2038, ‘year2038’ causes \texttt{configure} to issue a warning but still proceed. On platforms that appear to support post-2038 timestamps but where something prevents this from working, \texttt{configure} fails.

The default behavior of ‘year2038’ can be overridden by using the \texttt{configure} option --disable-year2038, which suppresses support for post-2038 timestamps. This may be useful if the package links to other libraries whose user-facing ABIs still require \texttt{time_t} to be 32-bit on your platform.

The Gnulib module ‘year2038-recommended’ is like ‘year2038’, except it by default rejects platforms where \texttt{time_t} cannot represent timestamps after 2038. If this module is used and a 32-platform cannot support 64-bit \texttt{time_t}, one can still fix the year-2038 problem by using a 64-bit instead of a 32-bit build, as noted in the architecture list below. If all else fails one can configure with --disable-year2038; however, the resulting programs will mishandle timestamps after 2038.

The Gnulib module ‘year2038-recommended’ is designed for packages intended for use on 32-bit platforms after the year 2038. If your package is commonly built on 32-bit platforms that will not be used after the year 2038, you can use the ‘year2038’ module instead, to save builders the trouble of configuring with --disable-year2038.

If the Gnulib module ‘largefile’ is used but neither ‘year2038’ nor ‘year2038-recommended’ is used, \texttt{configure} will have an option --enable-year2038 that causes \texttt{configure} to behave as if ‘year2038’ was used. This is for packages that have long used ‘largefile’ but have not gotten around to upgrading their Gnulib module list to include ‘year2038’ or ‘year2038-recommended’. See Section 14.2 [Large File Support], page 753.

With the ‘year2038-recommended’ module, \texttt{configure} by default should work on the following 32-bit platforms (or 32-bit ABIs in bi-arch systems):
Chapter 14: Native Windows Support

- Linux kernel 5.1 (2019) and later with glibc 2.34 (2021) and later on x86, arm, mips (o32 or n32 ABI), powerpc32, sparc32, s390, hppa, m68k, sh, csky, microblaze, nios2,
- Linux kernel 5.1 (2019) and later with musl libc 1.2 (2020) and later on x86,
- Linux on arc, loong32, ork1, riscv32 and x86_64-x32,
- NetBSD 6.0 (2012) and later on x86 and sparc,
- OpenBSD 5.5 (2014) and later on x86,
- FreeBSD/arm,
- Minix 3.3 (2014).

Whereas with `year2038-recommended`, configure should by default fail on earlier versions of the abovementioned platforms if a version is listed, and it should also by default fail on all versions of the following older 32-bit platforms or ABIs:

- Android on ARMv7 or x86,
- Mac OS X 10.6 (2009) and earlier on x86 and powerpc,
- GNU/Hurd/x86,
- GNU/kFreeBSD/x86,
- FreeBSD/x86 (this port demoted to Tier 2 in FreeBSD 13 [2021] and planned to never have 64-bit time_t),
- MidnightBSD/x86,
- AIX/powerpc (to fix, configure with ‘CC=\'gcc -maix64\' AR=\'ar -X64\’),
- Solaris 11.4 (2018) and earlier on x86 and sparc (to fix, configure with ‘CC=\'gcc -m64\’),
- Cygwin 3.3.6 (2022) and earlier on x86,
- Haiku/x86.

14.6 Windows sockets

One of the portability problems for native Windows are sockets and networking functions.

14.6.1 Getaddrinfo and WINVER

This was written for the getaddrinfo module, but may be applicable to other functions too.

The getaddrinfo function exists in ws2tcpip.h and -lws2_32 on Windows XP. The function declaration is present if WINVER >= 0x0501. Windows 2000 does not have getaddrinfo in its WS2_32.DLL.

Thus, if you want to assume Windows XP or later, you can add AC_DEFINE([WINVER], [0x0501]) to avoid compiling the (partial) getaddrinfo implementation.

If you want to support Windows 2000, don’t do anything. The replacement function will open WS2_32.DLL during run-time to see if there is a getaddrinfo function available, and use it when available.
14.7 Native Windows Support without MSVC Support

If your package does not desire to have MSVC support, that is, if MinGW shall be the only native Windows platform that you wish to get support for from Gnulib, and you wish to minimize the number of files imported from Gnulib accordingly, you can do so by passing the options ‘--avoid=msvc-inval --avoid=msvc-nothrow’ to gnulib-tool.

14.8 Visual Studio Compatibility

The lib-msvc-compat module detects whether the linker supports --output-def when building a library. That parameter is used to generate a DEF file for a shared library (DLL). DEF files are useful for developers that use Visual Studio to develop programs that links to your library. See the GNU LD manual for more information.

There are other ways to create a DEF file, but we believe they are all sub-optimal to using --output-def during the build process. The variants we have considered include:

- Use DUMPBIN /EXPORTS. This is explained in https://docs.microsoft.com/en-us/cpp/build/reference/dash-exports. The tool does not generate DEF files directly, so its output needs to be post processed manually:

  ```
  $ { echo EXPORTS; \ 
    dumpbin /EXPORTS libfoo-0.dll | tail -n+20 | awk '{ print $4 }'; \ 
  } > libfoo-0.def
  $ lib /def:libfoo-0.def
  ```

- Use IMPDEF. There is a tool called IMPDEF that can generate DEF files. However, it is not part of a standard Visual Studio installation. Further, it is documented as being an unreliable process.

- Use DLLTOOL. The dlltool is part of the MinGW suite, and thus not part of a standard Visual Studio installation. The documentation for the IMPDEF tool claims that DLLTOOL is the wrong tool for this job. Finally, DLLTOOL does not generate DEF files directly, so it requires post-processing of the output.

If you are using libtool to build your shared library, here is how to use this module. Import lib-msvc-compat to your project, and then add the following lines to the Makefile.am that builds the library:

```
if HAVE_LD_OUTPUT_DEF
libfoo_la_LDFLAGS += -Wl,--output-def,libfoo-$\{(DLL_VERSION)\}.def
libfoo-$\{(DLL_VERSION)\}.def: libfoo.la

defexecdir = $(libexecdir)
defexec_DATA = libfoo-$\{(DLL_VERSION)\}.def
DISTCLEANFILES += $(defexec_DATA)
endif
```

The DLL_VERSION variable needs to be defined. It should be the shared library version number used in the DLL filename. For Windows targets you compute this value from the values you pass to Libtool’s --version-info. Assuming you have variables LT_CURRENT and LT_AGE defined for the CURRENT and AGE libtool version integers, you compute DLL_VERSION as follows:

```
DLL_VERSION=`expr $\{LT_CURRENT\} - $\{LT_AGE\}`
AC_SUBST(DLL_VERSION)
```
15 Multithreading

Multithreading is a programming paradigm. In a multithreaded program, multiple threads execute concurrently (or quasi concurrently) at different places in the program.

There are three motivations for using multithreading in a program:

- Exploiting CPU hardware with multiple execution units. Nowadays, many CPUs have 2 to 8 execution cores in a single chip. Additionally, often multiple CPU chips are combined in a single package. Thus, some CPU packages support 64 or 96 simultaneous threads of execution.
- Simplifying program architecture. When a program has to read from different file descriptors, network sockets, or event channels at the same time, the classical single-threaded architecture is to have a main loop which uses `select` or `poll` on all the descriptors and then dispatches according to from which descriptor input arrived. In a multi-threaded program, you allocate one thread for each descriptor, and these threads can be programmed and managed independently.
- Offloading work from signal handlers. A signal handler is not allowed to call `malloc`; therefore you are very limited in what you can do in a signal handler. But a signal handler can notify a thread, and the thread can then do the appropriate processing, as complex as it needs to be.

A multithreading API offers

- Primitives for creating threads, for waiting until threads are terminated, and for reaping their results.
- Primitives through which different threads can operate on the same data or use some data structures for communicating between the threads. These are called “mutexes” or “locks”.
- Primitives for executing a certain (initialization) code at most once.
- Primitives for notifying one or more other threads. These are called wait queues or “condition variables”.
- Primitives for allowing different threads to have different values for a variable. Such a variable is said to reside in “thread-local storage” or “thread-specific storage”.
- Primitives for relinquishing control for some time and letting other threads go.

Note: Programs that achieve multithreading through OpenMP (cf. the gnulib module ‘openmp’) don’t create and manage their threads themselves. Nevertheless, they need to use mutexes/locks in many cases.

15.1 The three multithreading APIs

Three multithreading APIs are available to Gnulib users:

- POSIX multithreading,
- ISO C multithreading,
- Gnulib multithreading.

They are supported on all platforms that have multithreading in one form or the other. Currently, these are all platforms supported by Gnulib, except for Minix.
The main differences are:

- The exit code of a thread is a pointer in the POSIX and Gnulib APIs, but only an `int` in the ISO C API.
- The POSIX API has additional facilities for detaching threads, setting the priority of a thread, assigning a thread to a certain set of processors, and much more.
- In the POSIX and ISO C APIs, most functions have a return code, and you are supposed to check the return code; even locking and unlocking a lock can fail. In the Gnulib API, many functions don't have a return code; if they cannot complete, the program aborts. This sounds harsh, but such aborts have not been reported in 12 years.
- In the ISO C API, the initialization of a statically allocated lock is clumsy: You have to initialize it through a once-only function.

### 15.2 Choosing the right multithreading API

Here are guidelines for determining which multithreading API is best for your code.

In programs that use advanced POSIX APIs, such as spin locks, detached threads (`pthread_detach`), signal blocking (`pthread_sigmask`), priorities (`pthread_setschedparam`), processor affinity (`pthread_setaffinity_np`), it is best to use the POSIX API. This is because you cannot convert an ISO C `thrd_t` or a Gnulib `gl_thread_t` to a POSIX `pthread_t`.

In code that is shared with glibc, it is best to use the POSIX API as well.

In libraries, it is best to use the Gnulib API. This is because it gives the person who builds the library an option `--enable-threads={isoc,posix,windows}`, that determines on which native multithreading API of the platform to rely. In other words, with this choice, you can minimize the amount of glue code that your library needs to contain.

In the other cases, the POSIX API and the Gnulib API are equally well suited.

The ISO C API is never the best choice, as of this writing (2020).

### 15.3 The POSIX multithreading API

The POSIX multithreading API is documented in POSIX [https://pubs.opengroup.org/onlinepubs/9699919799/](https://pubs.opengroup.org/onlinepubs/9699919799/).

To make use of POSIX multithreading, even on platforms that don’t support it natively (most prominently, native Windows), use the following Gnulib modules:

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>For thread creation and management:</td>
<td><code>pthread-thread</code></td>
</tr>
<tr>
<td>For simple and recursive locks:</td>
<td><code>pthread-mutex</code></td>
</tr>
<tr>
<td>For read-write locks:</td>
<td><code>pthread-rwlock</code></td>
</tr>
<tr>
<td>For once-only execution:</td>
<td><code>pthread-once</code></td>
</tr>
<tr>
<td>For “condition variables” (wait queues):</td>
<td><code>pthread-cond</code></td>
</tr>
<tr>
<td>For thread-local storage:</td>
<td><code>pthread-tss</code></td>
</tr>
<tr>
<td>For relinquishing control:</td>
<td><code>sched_yield</code></td>
</tr>
<tr>
<td>For spin locks:</td>
<td><code>pthread-spin</code></td>
</tr>
</tbody>
</table>

There is also a convenience module named `pthread` which depends on all of these (except `sched_yield`); so you don’t need to enumerate these modules one by one.
15.4 The ISO C multithreading API


To make use of ISO C multithreading, even on platforms that don’t support it or have severe bugs, use the following GnuLib modules:

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>For thread creation and management:</td>
<td>thrd</td>
</tr>
<tr>
<td>For simple locks, recursive locks, and read-write locks:</td>
<td>mtx</td>
</tr>
<tr>
<td>For once-only execution:</td>
<td>mtx</td>
</tr>
<tr>
<td>For “condition variables” (wait queues):</td>
<td>cnd</td>
</tr>
<tr>
<td>For thread-local storage:</td>
<td>tss</td>
</tr>
</tbody>
</table>

There is also a convenience module named threads which depends on all of these; so you don’t need to enumerate these modules one by one.

15.5 The GnuLib multithreading API

The GnuLib multithreading API is documented in the respective include files:

- `<glthread/thread.h>`
- `<glthread/lock.h>`
- `<glthread/cond.h>`
- `<glthread/tls.h>`
- `<glthread/yield.h>`

To make use of GnuLib multithreading, use the following GnuLib modules:

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>For thread creation and management:</td>
<td>thread</td>
</tr>
<tr>
<td>For simple locks, recursive locks, and read-write locks:</td>
<td>lock</td>
</tr>
<tr>
<td>For once-only execution:</td>
<td>lock</td>
</tr>
<tr>
<td>For “condition variables” (wait queues):</td>
<td>cond</td>
</tr>
<tr>
<td>For thread-local storage:</td>
<td>tls</td>
</tr>
<tr>
<td>For relinquishing control:</td>
<td>yield</td>
</tr>
</tbody>
</table>

The GnuLib multithreading supports a configure option ‘--enable-threads={isoc,posix,windows}’, that chooses the underlying thread implementation. Currently (2020):

- `--enable-threads=posix` is supported and is the best choice on all platforms except for native Windows. It may also work, to a limited extent, on mingw with the winpthreads library, but is not recommended there.
- `--enable-threads=windows` is supported and is the best choice on native Windows platforms (mingw and MSVC).
- `--enable-threads=isoc` is supported on all platforms that have the ISO C multithreading API. However, `--enable-threads=posix` is always a better choice.

15.6 Optimizations of multithreaded code

Despite all the optimizations of multithreading primitives that have been implemented over the years – from atomic operations in hardware (https://en.wikipedia.

Gnulib defines four facilities that help optimizing for the single-threaded case.

- The Gnulib multithreading API, when used on glibc ≤ 2.32 and *BSD systems, uses weak symbols to detect whether the program is linked with *libpthread*. If not, the program has no way to create additional threads and must therefore be single-threaded. This optimization applies to all the Gnulib multithreading API (locks, thread-local storage, and more).

- The thread-optim module, on glibc ≥ 2.32 systems, allows your code to skip locking between threads (regardless which of the three multithreading APIs you use). You need extra code for this: include the "thread-optim.h" header file, and use the macro `gl_multithreaded` like this:

  ```
  bool mt = gl_multithreaded ();
  if (mt) gl_lock_lock (some_lock);
  ...
  if (mt) gl_lock_unlock (some_lock);
  ```

- You may use the unlocked-io module if you want the FILE stream functions `getc`, `putc`, etc. to use unlocked I/O if available, throughout the package. Unlocked I/O can improve performance, sometimes dramatically. But unlocked I/O is safe only in single-threaded programs, as well as in multithreaded programs for which you can guarantee that every FILE stream, including `stdin`, `stdout`, `stderr`, is used only in a single thread.

  You need extra code for this optimization to be effective: include the "unlocked-io.h" header file. Some Gnulib modules that do operations on FILE streams have these preparations already included.

- You may define the C macro `GNULIB_REGEX_SINGLE_THREAD`, if all the programs in your package invoke the functions of the regex module only from a single thread.

- You may define the C macro `GNULIB_MBRTOCW_SINGLE_THREAD`, if all the programs in your package invoke the functions `mbrtocw`, `mbrtoc32`, and the functions of the regex module only from a single thread. (The regex module uses `mbrtocw` under the hood.)

- You may define the C macro `GNULIB_WCHAR_SINGLE_LOCALE`, if all the programs in your package set the locale early and

  - don’t change the locale after it has been initialized, and
  - don’t call locale sensitive functions (`mbrtocw`, `wcwidth`, etc.) before the locale has been initialized.

  This macro optimizes the functions `mbrtocw`, `mbrtoc32`, and `wcwidth`.

- You may define the C macro `GNULIB_GETUSERSHELL_SINGLE_THREAD`, if all the programs in your package invoke the functions `setusershell`, `getusershell`, `endusershell` only from a single thread.

- You may define the C macro `GNULIB_EXCLUDE_SINGLE_THREAD`, if all the programs in your package invoke the functions of the `exclude` module only from a single thread.
16 Strings and Characters

This chapter describes the APIs for strings and characters, provided by GnuLib.

16.1 Strings

Several possible representations exist for the representation of strings in memory of a running C program.

16.1.1 The C string representation

The classical representation of a string in C is a sequence of characters, where each character takes up one or more bytes, followed by a terminating NUL byte. This representation is used for strings that are passed by the operating system (in the `argv` argument of `main`, for example) and for strings that are passed to the operating system (in system calls such as `open`). The C type to hold such strings is `char *` or, in places where the string shall not be modified, `const char *`. There are many C library functions, standardized by ISO C and POSIX, that assume this representation of strings.

A character encoding, or encoding for short, describes how the elements of a character set are represented as a sequence of bytes. For example, in the ASCII encoding, the UNDERSCORE character is represented by a single byte, with value 0x5F. As another example, the COPYRIGHT SIGN character is represented:

- in the ISO-8859-1 encoding, by the single byte 0xA9,
- in the UTF-8 encoding, by the two bytes 0xC2 0xA9,
- in the GB18030 encoding, by the four bytes 0x81 0x30 0x84 0x38.

Note: The `char` type may be signed or unsigned, depending on the platform. When we talk about the "byte 0xA9" we actually mean the char object whose value is (char) 0xA9; we omit the cast to char in this documentation, for brevity.

In POSIX, the character encoding is determined by the locale. The locale is some environmental attribute that the user can choose.

Depending on the encoding, in general, every character is represented by one or more bytes (up to 4 bytes in practice – but use `MB_LEN_MAX` instead of the number 4 in the code). When every character is represented by only 1 byte, we speak of an “unibyte locale”, otherwise of a “multibyte locale”.

It is important to realize that the majority of Unix installations nowadays use UTF-8 as locale encoding; therefore, the majority of users are using multibyte locales.

Three important facts to remember are:

A ‘char’ is a byte, not a character.

As a consequence:

- The `<ctype.h>` API, that was designed only with unibyte encodings in mind, is useless nowadays for general text processing; it does not work in multibyte locales.
- The `strlen` function does not return the number of characters in a string. Nor does it return the number of screen columns occupied by a string after it is output. It merely returns the number of bytes occupied by a string.
• Truncating a string, for example, with `strncpy`, can have the effect of truncating it in the middle of a multibyte character. Such a string will, when output, have a garbled character at its end, often represented by a hollow box.

**Multibyte does not imply UTF-8 encoding.**

While UTF-8 is the most common multibyte encoding, GB18030 is also a supported locale encoding on GNU systems (mostly because it is a Chinese government standard, last revised in 2022).

**Searching for a character in a string is not the same as searching for a byte in the string.**

Take the above example of COPYRIGHT SIGN in the GB18030 encoding: A byte search will find the bytes '0' and '8' in this string. But a search for the character "0" or "8" in the string "©" must, of course, report “not found”.

As a consequence:

• `strchr` and `strrchr` do not work with multibyte strings if the locale encoding is GB18030 and the character to be searched is a digit.
• `strstr` does not work with multibyte strings if the locale encoding is different from UTF-8.
• `strcspn`, `strpbrk`, `strspn` cannot work correctly in multibyte locales: they assume the second argument is a list of single-byte characters. Even in this simple case, they do not work with multibyte strings if the locale encoding is GB18030 and one of the characters to be searched is a digit.
• `strsep` and `strtok_r` do not work with multibyte strings unless all of the delimiter characters are ASCII characters < 0x30.
• The `strcasecmp`, `strncasecmp`, and `strcasestr` functions do not work with multibyte strings.

Workarounds can be found in GnuLib, in the form of `mbs*` API functions:

• GnuLib has functions `mbslen` and `mbswidth` that can be used instead of `strlen` when the number of characters or the number of screen columns of a string is requested.
• GnuLib has functions `mbschr` and `mbrrchr` that are like `strchr` and `strrchr`, but work in multibyte locales.
• GnuLib has a function `mbsstr` that is like `strstr`, but works in multibyte locales.
• GnuLib has functions `mbscspn`, `mbspbrk`, `mbssp` that are like `strcspn`, `strpbrk`, `strspn`, but work in multibyte locales.
• GnuLib has functions `mbssep` and `mbstok_r` that are like `strsep` and `strtok_r` but work in multibyte locales.
• GnuLib has functions `mbcasecmp`, `mbncasecmp`, `mbpcasecmp`, and `mbcasestr` that are like `strcasecmp`, `strncasecmp`, and `strcasestr`, but work in multibyte locales. Still, the function `ulc_casecmp` is preferable to these functions.

GnuLib also has additional API.
16.1.1.1 Iterating through strings

For complex string processing, the provided string functions may not be enough, and what you need is a way to iterate through a string while processing each (possibly multibyte) character in turn. Gnulib provides two modules for this purpose. Both iterate through the string in forward direction. Iteration in backward direction, that is, from the string’s end to start, is not provided, as it is too hairy in general.

- The `mbiter` module. It iterates through a C string whose length is already known.
- The `mbuiter` module. It iterates through a C string whose length is not a-priori known.

The `mbuiter` module is suitable when there is a high probability that only the first few multibyte characters need to be inspected. Whereas the `mbiter` module is better if usually the iteration runs through the entire string.

16.1.2 Strings with NUL characters


Utilities reading files should not drop NUL characters, or any other nonprinting characters.

When it is a requirement to store NUL characters in strings, a variant of the C strings is needed. Gnulib offers a “string descriptor” type for this purpose. See Section 17.11 [Handling strings with NUL characters], page 788.

All remarks regarding encodings and multibyte characters in the previous section apply to string descriptors as well.

16.1.3 Character and String Functions in C Locale

The functions in this section are similar to the generic string functions from the standard C library, except that

- They behave as if the locale was set to the "C" locale, even when the locale is different, and/or
- They are specially optimized for the case where all characters are plain ASCII characters.

The functions are provided by the following modules.

16.1.3.1 c-ctype

The `c-ctype` module contains functions operating on single-byte characters, like the functions in `<ctype.h>`, that operate as if the locale encoding was ASCII. (The "C" locale on many systems has the locale encoding "ASCII".)

The functions are:

```c
extern bool c_isascii (int c);
extern bool c_isalnum (int c);
extern bool c_isalpha (int c);
extern bool c_isblank (int c);
```
extern bool c_iscntrl (int c);
extern bool c_isdigit (int c);
extern bool c_islower (int c);
extern bool c_isgraph (int c);
extern bool c_isprint (int c);
extern bool c_ispunct (int c);
extern bool c_isspace (int c);
extern bool c_isupper (int c);
extern bool c_isxdigit (int c);

extern int c_tolower (int c);
extern int c_toupper (int c);

These functions assign properties only to ASCII characters.

The `c` argument can be a `char` or `unsigned char` value, whereas the corresponding functions in `<ctype.h>` take an argument that is actually an `unsigned char` value.

The `c_is*` functions return `bool`, where the corresponding functions in `<ctype.h>` return `int` for historical reasons.

Note: The `<ctype.h>` functions support only unibyte locales.

### 16.1.3.2 c-strcase

The `c-strcase` module contains case-insensitive string comparison functions operating on single-byte character strings, like the functions in `<strings.h>`, that operate as if the locale encoding was ASCII. (The "C" locale on many systems has the locale encoding "ASCII".)

The functions are:

```c
extern int c_strcasecmp (const char *s1, const char *s2);
extern int c_strncasecmp (const char *s1, const char *s2, size_t n);
```

For case conversion here, only ASCII characters are considered to be upper case or lower case.

Note: The functions `strcasecmp`, `strncasecmp` from `<strings.h>` support only unibyte locales; for multibyte locales, you need the functions `mbscasecmp`, `mbsncasecmp`, `mbspcasecmp`.

### 16.1.3.3 c-strcaseeq

The `c-strcaseeq` module contains an optimized case-insensitive string comparison function operating on single-byte character strings, that operate as if the locale encoding was ASCII. (The "C" locale on many systems has the locale encoding "ASCII".)

The functions is actually implemented as a macro:

```c
extern int STRCASEEQ (const char *s1, const char *s2, int s20, int s21, int s22, int s23, int s24, int s25, int s26, int s27, int s28);
```

`s2` should be a short literal ASCII string, and `s20`, `s21`, ... the individual characters of `s2`.

For case conversion here, only ASCII characters are considered to be upper case or lower case.
16.1.3.4 c-strcasestr

The c-strcasestr module contains a case-insensitive string search function operating on single-byte character strings, that operate as if the locale encoding was ASCII. (The "C" locale on many systems has the locale encoding "ASCII".)

The function is:

```c
extern char *c_strcasestr (const char *haystack, const char *needle);
```

For case conversion here, only ASCII characters are considered to be upper case or lower case.

Note: The function strcasestr from <string.h> supports only unibyte locales; for multibyte locales, you need the function mbscasestr.

16.1.3.5 c-strstr

The c-strstr module contains a substring search function operating on single-byte character strings, that operate as if the locale encoding was ASCII. (The "C" locale on many systems has the locale encoding "ASCII".)

The function is:

```c
extern char *c_strstr (const char *haystack, const char *needle);
```

Note: The function strstr from <string.h> supports only unibyte locales; for multibyte locales, you need the function mbstrstr.

16.1.3.6 c strtod

The c strtod module contains a string to number ('double') conversion function operating on single-byte character strings, that operates as if the locale encoding was ASCII. (The "C" locale on many systems has the locale encoding "ASCII".)

The function is:

```c
extern double c strtod (const char *string, char **endp);
```

In particular, only a period '.' is accepted as decimal point, even when the current locale's notion of decimal point is a comma ',', and no characters outside the basic character set are accepted.

On platforms without strtod_l, this function is not safe for use in multi-threaded applications since it calls setlocale.

16.1.3.7 c strtold

The c strtold module contains a string to number ('long double') conversion function operating on single-byte character strings, that operates as if the locale encoding was ASCII. (The "C" locale on many systems has the locale encoding "ASCII".)

The function is:

```c
extern long double c strtold (const char *string, char **endp);
```

In particular, only a period '.' is accepted as decimal point, even when the current locale's notion of decimal point is a comma ','.
### 16.1.4 Comparison of string APIs

This table summarizes the API functions available for strings, in POSIX and in Gnulib.

<table>
<thead>
<tr>
<th>Function</th>
<th>POSIX</th>
<th>Gnulib</th>
<th>C locale</th>
<th>32-bit wide character strings</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>strlen</code></td>
<td><code>strlen</code></td>
<td><code>mbslen</code></td>
<td><code>string_desc_length</code></td>
<td><code>wcslen</code></td>
</tr>
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</tr>
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<td><code>strcmpl</code></td>
<td><code>strcmpl</code></td>
<td><code>string_desc_cmpl</code></td>
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<td><code>wcsncmpl</code></td>
</tr>
<tr>
<td><code>strcascmpl</code></td>
<td><code>strcascmpl</code></td>
<td><code>mbscascmpl, mbspcascmpl</code></td>
<td>–</td>
<td><code>wcsncascmpl</code></td>
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<td>–</td>
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<td><code>mbsrchr</code></td>
<td><code>string_desc_last_index</code></td>
<td><code>wcsrchr</code></td>
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<td><code>strstr</code></td>
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<td>strcspn</td>
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<td>wcpncpy</td>
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</table>
### 16.2 Characters

A character is the elementary unit that strings are made of.

What is a character? “A character is an element of a character set” is sort of a circular definition, but it highlights the fact that it is not merely a number. Although many characters are visually represented by a single glyph, there are characters that, for example, have a different glyph when used at the end of a word than when used inside a word. A character is also not the minimal rendered text processing unit; that is a grapheme cluster and in general consists of one or more characters. If you want to know more about the concept of character and various concepts associated with characters, refer to the Unicode standard.

For the representation in memory of a character, various types have been in use, and some of them were failures: `char` and `wchar_t` were invented for this purpose, but are not

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<tr>
<th>Function</th>
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</table>
the right types. \texttt{char32\_t} is the right type (successor of \texttt{wchar\_t}); and \texttt{mbchar\_t} (defined by Gnulib) is an alternative for specific kinds of processing.

16.2.1 The \texttt{char} type

The \texttt{char} type is in the C language since the beginning in the 1970ies, but – due to its limitation of 256 possible values – is no longer the adequate type for storing a character.

Technically, it is still adequate in unibyte locales. But since most locales nowadays are multibyte locales, it makes no sense to write a program that runs only in unibyte locales.

ISO C and POSIX standardized an API for characters of type \texttt{char}, in \texttt{<ctype.h>}. This API is nowadays useless and obsolete, when it comes to general text processing.

The important lessons to remember are:

\begin{itemize}
\item A ‘\texttt{char}’ is just the elementary storage unit for a string, not a character.
\item Never use \texttt{<ctype.h>}!
\end{itemize}

16.2.2 The \texttt{wchar\_t} type

The ISO C and POSIX standard creators made an attempt to overcome the dead end regarding the \texttt{char} type. They introduced

\begin{itemize}
\item a type ‘\texttt{wchar\_t}’, designed to encapsulate a character,
\item a “wide string” type ‘\texttt{wchar\_t *}’, with some API functions declared in \texttt{<wchar.h>}, and
\item functions declared in \texttt{<wctype.h>} that were meant to supplant the ones in \texttt{<ctype.h>}.
\end{itemize}

Unfortunately, this API and its implementation has numerous problems:

\begin{itemize}
\item On Windows platforms and on AIX in 32-bit mode, \texttt{wchar\_t} is a 16-bit type. This means that it can never accommodate an entire Unicode character. Either the \texttt{wchar\_t *} strings are limited to characters in UCS-2 (the “Basic Multilingual Plane” of Unicode), or – if \texttt{wchar\_t *} strings are encoded in UTF-16 – a \texttt{wchar\_t} represents only half of a character in the worst case, making the \texttt{<wctype.h>} functions pointless.
\item On Solaris and FreeBSD, the \texttt{wchar\_t} encoding is locale dependent and undocumented. This means, if you want to know any property of a \texttt{wchar\_t} character, other than the properties defined by \texttt{<wctype.h>} – such as whether it’s a dash, currency symbol, paragraph separator, or similar –, you have to convert it to \texttt{char *} encoding first, by use of the function \texttt{wctomb}.
\item When you read a stream of wide characters, through the functions \texttt{fgetwc} and \texttt{fgetws}, and when the input stream/file is not in the expected encoding, you have no way to determine the invalid byte sequence and do some corrective action. If you use these functions, your program becomes “garbage in - more garbage out” or “garbage in - abort”.
\end{itemize}

As a consequence, it is better to use multibyte strings. Such multibyte strings can bypass limitations of the \texttt{wchar\_t} type, if you use functions defined in Gnulib and GNU libunistring for text processing. They can also faithfully transport malformed characters that were present in the input, without requiring the program to produce garbage or abort.
16.2.3 The char32_t type

The ISO C and POSIX standard creators then introduced the char32_t type. In ISO C 11, it was conceptually a “32-bit wide character” type. In ISO C 23, its semantics has been further specified: A char32_t value is a Unicode code point.

Thus, the char32_t type is not affected the problems that plague the wchar_t type.

The char32_t type and its API are defined in the <uchar.h> header file.

ISO C and POSIX specify only the basic functions for the char32_t type, namely conversion of a single character (mbtocs32 and c32rtomb). For convenience, Gnulib adds API for classification and case conversion of characters.

GNU libunistring can also be used on char32_t values. Since char32_t is the same as uint32_t, all u32_* functions of GNU libunistring are applicable to arrays of char32_t values.

On glibc systems, use of the 32-bit wide strings (char32_t[]) is exactly as efficient as the use of the older wide strings (wchar_t[]). This is possible because on glibc, wchar_t values already always were 32-bit and Unicode code points. mbtocs32 is just an alias of mbtowc. The Gnulib *c32* functions are optimized so that on glibc systems they immediately redirect to the corresponding *wc* functions.

Gnulib implements the ISO C 23 semantics of char32_t when you import the ‘uchar-c23’ module. Without this module, it implements only the ISO C 11 semantics; the effect is that on some platforms (macOS, FreeBSD, NetBSD, Solaris) a char32_t value is the same as a wchar_t value, not a Unicode code point. Thus, when you want to pass char32_t values to GNU libunistring or to some Unicode centric Gnulib functions, you need the ‘uchar-c23’ module in order to do so without portability problems.

16.2.4 The mbchar_t type

Gnulib defines an alternate way to encode a multibyte character: mbchar_t. Its main feature is the ability to process a string or stream with some malformed characters without reporting an error.

The type mbchar_t, defined in "mbchar.h", holds a character in both the multibyte and the 32-bit wide character representation. In case of a malformed character only the multibyte representation is used.

16.2.4.1 Reading multibyte strings

If you want to process (possibly multibyte) characters while reading them from a FILE * stream, without reading them into a string first, the mbfile module is made for this purpose.

16.2.5 Comparison of character APIs

This table summarizes the API functions available for characters, in POSIX and in Gnulib.

<table>
<thead>
<tr>
<th>unibyte character</th>
<th>assume C locale</th>
<th>wide character</th>
<th>32-bit wide character mbchar_t character</th>
</tr>
</thead>
<tbody>
<tr>
<td>== '\0'</td>
<td>== '\0'</td>
<td>== L'\0'</td>
<td>== 0</td>
</tr>
<tr>
<td>Function</td>
<td>C Function</td>
<td>IS Function</td>
<td>C32 Function</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>isalnum</td>
<td>c_isalnum</td>
<td>iswalnum</td>
<td>c32isalnum</td>
</tr>
<tr>
<td>isalpha</td>
<td>c_isalpha</td>
<td>iswalpha</td>
<td>c32isalpha</td>
</tr>
<tr>
<td>isblank</td>
<td>c_isblank</td>
<td>iswblank</td>
<td>c32isblank</td>
</tr>
<tr>
<td>iscntrl</td>
<td>c_iscntrl</td>
<td>iswcntrl</td>
<td>c32iscntrl</td>
</tr>
<tr>
<td>isdigit</td>
<td>c_isdigit</td>
<td>iswdigit</td>
<td>c32isdigit</td>
</tr>
<tr>
<td>isgraph</td>
<td>c_isgraph</td>
<td>iswgraph</td>
<td>c32isgraph</td>
</tr>
<tr>
<td>islower</td>
<td>c_islower</td>
<td>iswlower</td>
<td>c32islower</td>
</tr>
<tr>
<td>isprint</td>
<td>c_isprint</td>
<td>iswprint</td>
<td>c32isprint</td>
</tr>
<tr>
<td>ispunct</td>
<td>c_ispunct</td>
<td>iswpunct</td>
<td>c32ispunct</td>
</tr>
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<td>isspace</td>
<td>c_isspace</td>
<td>iswspace</td>
<td>c32isspace</td>
</tr>
<tr>
<td>isupper</td>
<td>c_isupper</td>
<td>iswupper</td>
<td>c32isupper</td>
</tr>
<tr>
<td>isxdigit</td>
<td>c_isxdigit</td>
<td>iswxdigit</td>
<td>c32isxdigit</td>
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<tr>
<td>tolower</td>
<td>c_tolower</td>
<td>towlower</td>
<td>c32tolower</td>
</tr>
<tr>
<td>toupper</td>
<td>c_toupper</td>
<td>towupper</td>
<td>c32toupper</td>
</tr>
<tr>
<td>–</td>
<td>–</td>
<td>towctrans</td>
<td>–</td>
</tr>
<tr>
<td>–</td>
<td>–</td>
<td>wcwidth</td>
<td>c32width</td>
</tr>
</tbody>
</table>
17 Particular Modules

17.1 alloca

The alloca module provides for a function alloca which allocates memory on the stack, where the system allows it. A memory block allocated with alloca exists only until the function that calls alloca returns or exits abruptly.

There are a few systems where this is not possible: HP-UX systems, and some other platforms when the C++ compiler is used. On these platforms the alloca module provides a malloc based emulation. This emulation will not free a memory block immediately when the calling function returns, but rather will wait until the next alloca call from a function with the same or a shorter stack length. Thus, in some cases, a few memory blocks will be kept although they are not needed any more.

The user can #include <alloca.h> and use alloca on all platforms. Note that the #include <alloca.h> must be the first one after the autoconf-generated config.h, for AIX 3 compatibility. Thanks to IBM for this nice restriction!

Note that GCC 3.1 and 3.2 can inline functions that call alloca. When this happens, the memory blocks allocated with alloca will not be freed until the end of the calling function. If this calling function runs a loop calling the function that uses alloca, the program easily gets a stack overflow and crashes. To protect against this compiler behaviour, you can mark the function that uses alloca with the following attribute:

```c
#ifdef __GNUC__
__attribute__((__noinline__))
#endif
```

An alternative to this module is the ‘alloca-opt’ module.

17.2 alloca-opt

The alloca-opt module provides for a function alloca which allocates memory on the stack, where the system allows it. A memory block allocated with alloca exists only until the function that calls alloca returns or exits abruptly.

There are a few systems where this is not possible: HP-UX systems, and some other platforms when the C++ compiler is used. On these platforms the alloca-opt module provides no replacement, just a preprocessor macro HAVE_ALLOCA.

The user can #include <alloca.h> on all platforms, and use alloca on those platforms where the preprocessor macro HAVE_ALLOCA evaluates to true. If HAVE_ALLOCA is false, the code should use a heap-based memory allocation based on malloc or (in C++) new. Note that the #include <alloca.h> must be the first one after the autoconf-generated config.h, for AIX 3 compatibility. Thanks to IBM for this nice restriction!

Note that GCC 3.1 and 3.2 can inline functions that call alloca. When this happens, the memory blocks allocated with alloca will not be freed until the end of the calling function. If this calling function runs a loop calling the function that uses alloca, the program easily gets a stack overflow and crashes. To protect against this compiler behaviour, you can mark the function that uses alloca with the following attribute:

```c
#ifdef __GNUC__
__attribute__((__noinline__))
#endif
```
17.3 Safe Allocation Macros

The standard C library malloc/realloc/calloc/free APIs are prone to a number of common coding errors. The safe-alloc module provides macros that make it easier to avoid many of them. It still uses the standard C allocation functions behind the scenes.

Some of the memory allocation mistakes that are commonly made are

- passing the incorrect number of bytes to malloc, especially when allocating an array,
- unchecked integer overflow when calculating array sizes,
- fail to check the return value of malloc and realloc for errors,
- forget to fully initialize memory just allocated with malloc,
- duplicate calls to free by forgetting to set the pointer variable to NULL,
- leaking memory in calls to realloc when that call fails.

The safe-alloc module addresses these problems in the following way:

- It defines macros that wrap around the standard C allocation functions. That makes it possible to use the compiler’s knowledge of the size of objects for allocation; it also allows setting pointers passed in as arguments when appropriate.
- It uses return values only for a success/failure error condition flag, and annotates them with GCC’s __warn_unused_result__ attribute.
- When allocating a fresh array, it uses calloc instead of malloc so that the array’s contents are zeroed. However, memory added to an already-existing array is uninitialized.

**[Macro] int ALLOC (ptr)**

Allocate sizeof *ptr bytes of memory and store the address of allocated memory in ptr. Fill the newly allocated memory with zeros.

Returns −1 on failure, 0 on success.

**[Macro] int ALLOC_N (ptr, count)**

Allocate an array of count elements, each sizeof *ptr bytes long, and store the address of allocated memory in ptr. Fill the newly allocated memory with zeros.

Returns −1 on failure, 0 on success.

**[Macro] int ALLOC_N_UNINITIALIZED (ptr, count)**

Allocate an array of count elements, each sizeof *ptr bytes long, and store the address of allocated memory in ptr. The allocated memory is not initialized.

Returns −1 on failure, 0 on success.

**[Macro] int REALLOC_N (ptr, count)**

Reallocate the memory pointed to by ptr to be big enough to hold at least count elements, each sizeof *ptr bytes long, and store the address of allocated memory in ptr. If reallocation fails, the ptr variable is not modified. If the new array is smaller than the old one, discard excess contents; if larger, the newly added storage is not initialized.

Returns −1 on failure, 0 on success.

**[Macro] void FREE (ptr)**

Free the memory stored in ptr and set ptr to NULL.
17.4 Attributes

This module provides a header file `attribute.h` that defines macros related to C and C++ attributes and the GCC `__attribute__` keyword.

Here is an example of its use:

```c
#include <attribute.h>

NODISCARD
extern char *crypt (char const *, char const *)
ATTRIBUTE_NOTHRWATTRIBUTE_LEAFATTRIBUTE_NONNULL ((1, 2));
```

NODISCARD expands to `[[nodiscard]]` if the compiler supports this C23 syntax, otherwise to `__attribute__((warn_unused_result__))` if the compiler is a recent enough GCC or GCC-like compiler, or to nothing. `ATTRIBUTE_NOTHRW` expands to `__attribute__((nothrow))` if the compiler is recent enough GCC or GCC-like compiler, and to nothing otherwise. Similarly for `ATTRIBUTE_LEAF`, `ATTRIBUTE_NONNULL ((1, 2))` expands to `__attribute__((nonnull (1, 2)))` if the compiler is recent enough GCC, and to nothing otherwise.

Most of these attribute names begin with `ATTRIBUTE_`. A few do not, because they are part of C23 and their names are not likely to clash with other macro names. These macros are `DEPRECATED`, `FALLTHROUGH`, `MAYBE_UNUSED`, and `NODISCARD`, which can be defined to `[[deprecated]]` etc. on C23 platforms. Also, these exceptional macros should be placed at the start of function declarations, whereas the `ATTRIBUTE_*` macros can be placed at the end.

17.5 Compile-time Assertions

This module provides a header file `verify.h` that defines macros related to compile-time verification.

Two of these macros are `verify (V)` and `verify_expr (V, EXPR)`. Both accept an integer constant expression argument `V` and verify that it is nonzero. If not, a compile-time error results.

These two macros implement compile-time tests, as opposed to the standard `assert` macro which supports only runtime tests. Since the tests occur at compile-time, they are more reliable, and they require no runtime overhead.

`verify (V)` is a declaration; it can occur outside of functions. In contrast, `verify_expr (V, EXPR)` is an expression that returns the value of `EXPR`; it can be used in macros that expand to expressions. If `EXPR` is an integer constant expression, then `verify_expr (V, EXPR)` is also an integer constant expression. Although `EXPR` and `verify_expr (V, EXPR)` are guaranteed to have the same side effects and value and type (after integer promotion), they need not have the same type if `EXPR`'s type is an integer that is narrower than `int` or `unsigned int`.

`V` should be an integer constant expression in the sense of the C standard. Its leaf operands should be integer, enumeration, or character constants; or `sizeof` expressions that return constants; or floating constants that are the immediate operands of casts. Outside a `sizeof` subexpression, `V` should not contain any assignments, function calls, comma
operators, casts to non-integer types, or subexpressions whose values are outside the representable ranges for their types. If \( V \) is not an integer constant expression, then a compiler might reject a usage like ‘\( \text{verify} (V); \)’ even when \( V \) is nonzero.

Although the standard \texttt{assert} macro is a runtime test, C23 and C++17 specify a built-in \texttt{static\_assert \((V)\)}, which differs from \texttt{verify} in two major ways. First, it can also be used within a \texttt{struct} or \texttt{union} specifier, in place of an ordinary member declaration. Second, it allows the programmer to specify, as an optional second argument, a compile-time diagnostic as a string literal. If your program is not intended to be portable to compilers that lack C23 or C++17 \texttt{static\_assert}, the only advantage of \texttt{verify} is that its name is a bit shorter.

The \texttt{verify.h} header defines one more macro, \texttt{assume \((E)\)}, which expands to an expression of type \texttt{void} that causes the compiler to assume that \( E \) yields a nonzero value. \( E \) should be a scalar expression, and should not have side effects; it may or may not be evaluated. The behavior is undefined if \( E \) would yield zero. The main use of \texttt{assume} is optimization, as the compiler may be able to generate better code if it assumes \( E \). For best results, \( E \) should be simple enough that a compiler can determine that it has no side effects: if \( E \) calls an external function or accesses volatile storage the compiler may not be able to optimize \( E \) away and \texttt{assume \((E)\)} may therefore slow down the program.

Here are some example uses of these macros.

```c
#include <verify.h>
#include <limits.h>
#include <time.h>

/* Verify that time_t is an integer type. */
verify ((time_t) 1.5 == 1);

/* Verify that time_t is no smaller than int. */
verify (sizeof (int) <= sizeof (time_t));

/* Verify that time_t is signed. */
verify ((time_t) -1 < 0);

/* Verify that time_t uses two's complement representation. */
verify (~ (time_t) -1 == 0);

/* Return the maximum value of the integer type \( T \),
verifying that \( T \) is an unsigned integer type.
The cast to \((T)\) is outside the call to verify_expr
so that the result is of type \( T 
even when \( T \) is narrower than unsigned int. */
#define MAX_UNSIGNED_VAL(t) ((T) verify_expr (0 < (T) -1, -1))

/* Return \( T \) divided by CHAR_MAX + 1, where behavior is
undefined if \( T < 0 \). In the common case where CHAR_MAX
is 127 the compiler can therefore implement the division
```
by shifting T right 7 bits, an optimization that would not be valid if T were negative. */

time_t
time_index (time_t t)
{
  assume (0 <= t);
  return t / (CHAR_MAX + 1);
}

17.6 Non-returning Functions

A "non-returning" function is a function which cannot return normally. Instead of returning, it can loop forever, or it can transfer control via abort, execvp, exit, longjmp, throw (in C++), or similar mechanisms. Non-returning functions are declared with a void return type.

It helps the compiler's ability to emit sensible warnings, following data-flow analysis, to declare which functions are non-returning. It can also help generate more-efficient code, as there is no need to save a return address when calling a non-returning function.

Gnulib has multiple ways to support such a declaration:

• The _Noreturn keyword. No modules are needed, as Gnulib arranges for <config.h> to define _Noreturn to an appropriate replacement on platforms lacking it. Unfortunately, although this approach works for all current C versions, the _Noreturn keyword is obsolescent in C23.
• The 'noreturn' module. It provides a way to put this declaration at function declarations, at function definitions, and in function pointer types. The identifiers to use are:
  - __GL_NORETURN_FUNC for use in function declarations and function definitions.
  - __GL_NORETURN_FUNCPTR for use on function pointers.

The include file is <noreturn.h>.

Which of the approaches to use? If the non-returning functions you have to declare are unlikely to be accessed through function pointers, you should use _Noreturn; otherwise the module noreturn provides for better data-flow analysis and thus for better warnings.

There is also an obsolete stdnoreturn module, but its use is no longer recommended.

17.7 Integer Properties

The intprops module consists of an include file <intprops.h> that defines several macros useful for testing properties of integer types.

Integer overflow is a common source of problems in programs written in C and other languages. In some cases, such as signed integer arithmetic in C programs, the resulting behavior is undefined, and practical platforms do not always behave as if integers wrap around reliably. In other cases, such as unsigned integer arithmetic in C, the resulting behavior is well-defined, but programs may still misbehave badly after overflow occurs.
Many techniques have been proposed to attack these problems. These include precondition testing, wraparound behavior where signed integer arithmetic is guaranteed to be modular, saturation semantics where overflow reliably yields an extreme value, undefined behavior sanitizers where overflow is guaranteed to trap, and various static analysis techniques.

Gnulib supports wraparound arithmetic and precondition testing, as these are relatively easy to support portably and efficiently. There are two families of precondition tests: the first, for integer types, is easier to use, while the second, for integer ranges, has a simple and straightforward portable implementation.

Like other Gnulib modules, the implementation of the `intprops` module assumes that integers use a two’s complement representation, but it does not assume that signed integer arithmetic wraps around. See Section 1.5.4 [Other portability assumptions], page 6.

### 17.7.1 Arithmetic Type Properties

`TYPE_IS_INTEGER (t)` is an arithmetic constant expression that yields 1 if the arithmetic type `t` is an integer type, 0 otherwise. `bool` counts as an integer type.

`TYPE_SIGNED (t)` is an arithmetic constant expression that yields 1 if the real type `t` is a signed integer type or a floating type, 0 otherwise. If `t` is an integer type, `TYPE_SIGNED (t)` is an integer constant expression.

`EXPR_SIGNED (e)` yields 1 if the real expression `e` has a signed integer type or a floating type, 0 otherwise. If `e` is an integer constant expression or an arithmetic constant expression, `EXPR_SIGNED (e)` is likewise. The expression `e` is not evaluated, and `EXPR_SIGNED (e)` is typically optimized to a constant.

Example usage:

```c
#include <intprops.h>
#include <sys/types.h>

enum
{
    clock_t_is_integer = TYPE_IS_INTEGER (clock_t),
    uid_t_is_signed = TYPE_SIGNED (uid_t)
};

int
CLOCKS_PER_SEC_is_signed (void)
{
    return EXPR_SIGNED (CLOCKS_PER_SEC);
}
```

### 17.7.2 Integer Bounds

`INT_BUFSIZE_BOUND (t)` is an integer constant expression that is a bound on the size of the string representing an integer type or expression `t` in decimal notation, including the terminating null character and any leading - character. For example, if `INT_BUFSIZE_BOUND (int)` is 12, any value of type `int` can be represented in 12 bytes or less, including the terminating null. The bound is not necessarily tight.
Example usage:
```c
#include <intprops.h>
#include <stdio.h>
int
t
int_strlen (int i)
{
    char buf[INT_BUFSIZE_BOUND (int)];
    return sprintf (buf, "%d", i);
}
```

INT_STRLEN_BOUND (t) is an integer constant expression that is a bound on the length of the string representing an integer type or expression t in decimal notation, including any leading - character. This is one less than INT_BUFSIZE_BOUND (t).

TYPE_MINIMUM (t) and TYPE_MAXIMUM (t) are integer constant expressions equal to the minimum and maximum values of the integer type t. These expressions are of the type t.

Example usage:
```c
#include <sys/types.h>
#include <intprops.h>
bool
in_off_t_range (long long int a)
{
    return TYPE_MINIMUM (off_t) <= a && a <= TYPE_MAXIMUM (off_t);
}
```

17.7.3 Checking Integer Overflow

Signed integer arithmetic has undefined behavior on overflow in C. Although almost all modern computers use two’s complement signed arithmetic that is well-defined to wrap around, C compilers routinely optimize assuming that signed integer overflow cannot occur, which means that a C program cannot easily get at the underlying machine arithmetic. For example:
```c
if ((a + b < b) == (a < 0))
a += b;
else
    printf ("overflow\n");
```
might not work as expected if a and b are signed, because a compiler can assume that signed overflow cannot occur and treat the entire if expression as if it were true. And even if a is unsigned, the expression might not work as expected if b is negative or is wider than a.

The following macros work around this problem by yielding an overflow indication while computing the sum, difference, or product of two integers. For example, if i is of type int, INT_ADD_OK (INT_MAX - 1, 1, &i) sets i to INT_MAX and yields 1, whereas INT_ADD_OK (INT_MAX, 1, &i) yields 0.

Example usage:
```c
#include <intprops.h>
#include <stdio.h>
```
/* Compute A * B, reporting whether overflow occurred. */
void
print_product (long int a, long int b)
{
    long int r;
    if (INT_MULTIPLY_OK (a, b, &r))
        printf ("result is %ld\n", r);
    else
        printf ("overflow\n");
}

These macros work for both signed and unsigned integers, so they can be used with
type like time_t that may or may not be signed, depending on the platform.

These macros have the following restrictions:
- Their first two arguments must be integer expressions.
- Their last argument must be a non-null pointer to an integer.
- They may evaluate their arguments zero or multiple times, so the arguments should
  not have side effects.
- They are not necessarily constant expressions, even if all their arguments are constant
  expressions.

INT_ADD_OK (a, b, r)
Compute the sum of a and b. If it fits into *r, store it there and yield 1.
Otherwise yield 0, possibly modifying *r to an unspecified value. See above for
restrictions.

INT_SUBTRACT_OK (a, b, r)
Compute the difference between a and b. If it fits into *r, store it there and
yield 1. Otherwise yield 0, possibly modifying *r to an unspecified value. See
above for restrictions.

INT_MULTIPLY_OK (a, b, r)
Compute the product of a and b. If it fits into *r, store it there and yield 1.
Otherwise yield 0, possibly modifying *r to an unspecified value. See above for
restrictions.

Other macros are available if you need wrapped-around results when overflow occurs (see
Section 17.7.4 [Wraparound Arithmetic], page 779), or if you need to check for overflow in
operations other than addition, subtraction, and multiplication (see Section 17.7.5 [Integer
Type Overflow], page 781).

17.7.4 Wraparound Arithmetic with Integers

Signed integer arithmetic has undefined behavior on overflow in C. Although almost
all modern computers use two's complement signed arithmetic that is well-defined to wrap
around, C compilers routinely optimize assuming that signed integer overflow cannot occur,
which means that a C program cannot easily get at the underlying machine arithmetic. For
example, on a typical machine with 32-bit two's complement int the expression INT_MAX
+ 1 does not necessarily yield INT_MIN, because the compiler may do calculations with a
64-bit register, or may generate code that traps on signed integer overflow.
The following macros work around this problem by storing the wraparound value, i.e., the low-order bits of the correct answer, and by yielding an overflow indication. For example, if \( i \) is of type \texttt{int}, \texttt{INT_ADD_WRAPV} (INT\_MAX, 1, &\( i \)) sets \( i \) to INT\_MIN and yields 1 on a two's complement machine. See Section 17.7.5 [Integer Type Overflow], page 781.

Example usage:
```c
#include <intprops.h>
#include <stdio.h>

/* Print the low order bits of \( A \times B \), reporting whether overflow occurred. */
void
print_product (long int a, long int b)
{
    long int r;
    int overflow = INT_MULTIPLY_WRAPV (a, b, &r);
    printf ("result is %ld (%s)\n", r,
            (overflow
               ? "after overflow"
               : "no overflow"));
}
```

These macros work for both signed and unsigned integers, so they can be used with integer types like \texttt{time_t} that may or may not be signed, depending on the platform.

These macros have the following restrictions:
- Their first two arguments must be integer expressions.
- Their last argument must be a non-null pointer to an integer.
- They may evaluate their arguments zero or multiple times, so the arguments should not have side effects.
- They are not necessarily constant expressions, even if all their arguments are constant expressions.

\texttt{INT\_ADD\_WRAPV} (\( a, b, r \))

Store the low-order bits of the sum of \( a \) and \( b \) into \(*r\). Yield 1 if overflow occurred, 0 if the low-order bits are the mathematically-correct sum. See above for restrictions.

\texttt{INT\_SUBTRACT\_WRAPV} (\( a, b, r \))

Store the low-order bits of the difference between \( a \) and \( b \) into \(*r\). Yield 1 if overflow occurred, 0 if the low-order bits are the mathematically-correct difference. See above for restrictions.

\texttt{INT\_MULTIPLY\_WRAPV} (\( a, b, r \))

Store the low-order bits of the product of \( a \) and \( b \) into \(*r\). Yield 1 if overflow occurred, 0 if the low-order bits are the mathematically-correct product. See above for restrictions.

If your code includes \texttt{<intprops.h> only for these \_WRAPV macros, you may prefer to use GnuLib’s stdckdint module instead, as it supports similar macros that were standardized
in C23 and are therefore independent of Gnulib if your code can assume C23 or later. See Section 9.48 [stdckdint.h], page 68.

Other macros are available if you do not need wrapped-around results when overflow occurs (see Section 17.7.3 [Checking Integer Overflow], page 778), or if you need to check for overflow in operations other than addition, subtraction, and multiplication (see Section 17.7.5 [Integer Type Overflow], page 781).

### 17.7.5 Integer Type Overflow

Although unsigned integer arithmetic wraps around modulo a power of two, signed integer arithmetic has undefined behavior on overflow in C. Almost all modern computers use two’s complement signed arithmetic that is well-defined to wrap around, but C compilers routinely optimize based on the assumption that signed integer overflow cannot occur, which means that a C program cannot easily get at the underlying machine behavior. For example, the signed integer expression \((a + b < b) \neq (a < 0)\) is not a reliable test for whether \(a + b\) overflows, because a compiler can assume that signed overflow cannot occur and treat the entire expression as if it were false.

These macros yield 1 if the corresponding C operators overflow, 0 otherwise. They work correctly on all known practical hosts, and do not rely on undefined behavior due to signed arithmetic overflow. They are integer constant expressions if their arguments are. They are typically easier to use than the integer range overflow macros (see Section 17.7.6 [Integer Range Overflow], page 782), and they support more operations and evaluation contexts than the integer overflow checking macros (see Section 17.7.3 [Checking Integer Overflow], page 778) or the wraparound macros (see Section 17.7.4 [Wraparound Arithmetic], page 779).

These macros can be tricky to use with arguments narrower than int. For example, in the common case with 16-bit short int and 32-bit int, if \(a\) and \(b\) are of type short int then INT_MULTIPLY_OVERFLOW \((a, b)\) always yields 0, as \(a \times b\) cannot overflow due to C’s rule that \(a\) and \(b\) are widened to int before multiplying. For this reason, often it is better to use the integer overflow checking macros (see Section 17.7.3 [Checking Integer Overflow], page 778) or the wraparound macros (see Section 17.7.4 [Wraparound Arithmetic], page 779) when checking for overflow in addition, subtraction, or multiplication.

Example usage:

```c
#include <intprops.h>
#include <limits.h>
#include <stdio.h>

/* Print A * B if in range, an overflow indicator otherwise. */
void
print_product (long int a, long int b)
{
    if (INT_MULTIPLY_OVERFLOW (a, b))
        printf ("multiply would overflow");
    else
        printf ("product is %ld", a * b);
}
```
/* Does the product of two ints always fit in a long int? */
enum {
    INT_PRODUCTS_FIT_IN_LONG
    = ! (INT_MULTIPLY_OVERFLOW
         ((long int) INT_MIN, INT_MIN))
};

These macros have the following restrictions:

- Their arguments must be integer expressions.
- They may evaluate their arguments zero or multiple times, so the arguments should not have side effects.

These macros are tuned for their last argument being a constant.

INT_ADD_OVERFLOW (a, b)
   Yield 1 if \( a + b \) would overflow, 0 otherwise. See above for restrictions.

INT_SUBTRACT_OVERFLOW (a, b)
   Yield 1 if \( a - b \) would overflow, 0 otherwise. See above for restrictions.

INT_NEGATE_OVERFLOW (a)
   Yields 1 if \(-a\) would overflow, 0 otherwise. See above for restrictions.

INT_MULTIPLY_OVERFLOW (a, b)
   Yield 1 if \( a \times b \) would overflow, 0 otherwise. See above for restrictions.

INT_DIVIDE_OVERFLOW (a, b)
   Yield 1 if \( a / b \) would overflow, 0 otherwise. See above for restrictions. Division overflow can happen on two's complement hosts when dividing the most negative integer by \(-1\). This macro does not check for division by zero.

INT_REMAINDER_OVERFLOW (a, b)
   Yield 1 if \( a \% b \) would overflow, 0 otherwise. See above for restrictions. Remainder overflow can happen on two’s complement hosts when dividing the most negative integer by \(-1\); although the mathematical result is always 0, in practice some implementations trap, so this counts as an overflow. This macro does not check for division by zero.

INT_LEFT_SHIFT_OVERFLOW (a, b)
   Yield 1 if \( a \ll b \) would overflow, 0 otherwise. See above for restrictions. The C standard says that behavior is undefined for shifts unless \( 0 \leq b < w \) where \( w \) is \( a \)'s word width, and that when \( a \) is negative then \( a \ll b \) has undefined behavior, but this macro does not check these other restrictions.

### 17.7.6 Integer Range Overflow

These macros yield 1 if the corresponding C operators might not yield numerically correct answers due to arithmetic overflow, and 0 if the operators do not overflow. They do not rely on undefined or implementation-defined behavior. They are integer constant expressions if their arguments are. Their implementations are simple and straightforward, but
they are typically harder to use than the integer type overflow macros. See Section 17.7.5 [Integer Type Overflow], page 781.

Although the implementation of these macros is similar to that suggested in the SEI CERT C Secure Coding Standard, in its two sections “INT30-C. Ensure that unsigned integer operations do not wrap” (https://www.securecoding.cert.org/confluence/display/c/INT30-C.+Ensure+that+unsigned+integer+operations+do+not+wrap) and “INT32-C. Ensure that operations on signed integers do not result in overflow” (https://www.securecoding.cert.org/confluence/display/c/INT32-C.+Ensure+that+operations+on+signed+integers+do+not+result+in+overflow), GnuLib’s implementation was derived independently of CERT’s suggestions.

Example usage:

```c
#include <intprops.h>
#include <limits.h>
#include <stdio.h>

void print_product (long int a, long int b)
{
    if (INT_MULTIPLY_RANGE_OVERFLOW (a, b, LONG_MIN, LONG_MAX))
        printf ("multiply would overflow");
    else
        printf ("product is %ld", a * b);
}

/* Does the product of two ints always fit in a long int? */
enum {
    INT_PRODUCTS_FIT_IN_LONG
        = ! (INT_MULTIPLY_RANGE_OVERFLOW
            ((long int) INT_MIN, (long int) INT_MIN,
             LONG_MIN, LONG_MAX))
};
```

These macros have the following restrictions:

- Their arguments must be integer expressions.
- They may evaluate their arguments zero or multiple times, so the arguments should not have side effects.
- The arithmetic arguments (including the \texttt{min} and \texttt{max} arguments) must be of the same integer type after the usual arithmetic conversions, and the type must have minimum value \texttt{min} and maximum \texttt{max}. Unsigned values should use a zero \texttt{min} of the proper type, for example, \texttt{(unsigned int) 0}.

These macros are tuned for constant \texttt{min} and \texttt{max}. For commutative operations such as \texttt{a + b}, they are also tuned for constant \texttt{b}.

\texttt{INT_ADD_RANGE_OVERFLOW (a, b, min, max)}

Yield 1 if \texttt{a + b} would overflow in \texttt{[min,max]} integer arithmetic, 0 otherwise. See above for restrictions.
INT_SUBTRACT_RANGE_OVERFLOW (a, b, min, max)
Yield 1 if \(a - b\) would overflow in \([\text{min, max}]\) integer arithmetic, 0 otherwise.
See above for restrictions.

INT_NEGATE_RANGE_OVERFLOW (a, min, max)
Yield 1 if \(-a\) would overflow in \([\text{min, max}]\) integer arithmetic, 0 otherwise. See
above for restrictions.

INT_MULTIPLY_RANGE_OVERFLOW (a, b, min, max)
Yield 1 if \(a \times b\) would overflow in \([\text{min, max}]\) integer arithmetic, 0 otherwise.
See above for restrictions.

INT_DIVIDE_RANGE_OVERFLOW (a, b, min, max)
Yield 1 if \(a / b\) would overflow in \([\text{min, max}]\) integer arithmetic, 0 otherwise.
See above for restrictions. Division overflow can happen on two’s complement hosts when
dividing the most negative integer by \(-1\). This macro does not check for division by zero.

INT_REMAINDER_RANGE_OVERFLOW (a, b, min, max)
Yield 1 if \(a \% b\) would overflow in \([\text{min, max}]\) integer arithmetic, 0 otherwise. See
above for restrictions. Remainder overflow can happen on two’s complement hosts when
dividing the most negative integer by \(-1\); although the mathematical result is always 0, in practice
some implementations trap, so this counts as an overflow. This macro does not check for division by zero.

INT_LEFT_SHIFT_RANGE_OVERFLOW (a, b, min, max)
Yield 1 if \(a \ll b\) would overflow in \([\text{min, max}]\) integer arithmetic, 0 otherwise.
See above for restrictions. Here, \text{min} and \text{max} are for \text{a} only, and \text{b} need not be
of the same type as the other arguments. The C standard says that behavior is
undefined for shifts unless \(0 \leq b < w\) where \(w\) is \text{a}’s word width, and that when \text{a}
is negative then \(a \ll b\) has undefined behavior, but this macro does not check
these other restrictions.

17.8 Static inline functions
In order to mark functions as static inline, the only prerequisite you need is an \texttt{AC_REQUIRE(\[AC_C_INLINE\])}. No Gnulib module is needed.

17.9 Extern inline functions
The extern-inline module supports the use of C99-style extern inline functions so
that the code still runs on compilers that do not support this feature correctly.

C code ordinarily should not use inline. Typically it is better to let the compiler figure
out whether to inline, as compilers are pretty good about optimization nowadays. In this
sense, inline is like register, another keyword that is typically no longer needed.

Functions defined (not merely declared) in headers are an exception, as avoiding inline
would commonly cause problems for these functions. Suppose \texttt{aaa.h} defines the function
\texttt{aaa_fun}, and \texttt{aaa.c}, \texttt{bbb.c} and \texttt{ccc.c} all include \texttt{aaa.h}. If code is intended to portable
to non-C99 compilers, \texttt{aaa_fun} cannot be declared with the C99 inline keyword. This
problem cannot be worked around by making \texttt{aaa_fun} an ordinary function, as it would
Chapter 17: Particular Modules 785

be defined three times with external linkage and the definitions would clash. Although

aaa_fun could be a static function, with separate compilation if aaa_fun is not inlined its
code will appear in the executable three times.

To avoid this code bloat, aaa.h can do this:

```c
/* aaa.h */
/* #include any other headers here */
#ifndef _GL_INLINE_HEADER_BEGIN
#error "Please include config.h first."
#endif
_GL_INLINE_HEADER_BEGIN
#ifndef AAA_INLINE
#define AAA_INLINE _GL_INLINE
#endif
...
AAA_INLINE int
aaa_fun (int i)
{
    return i + 1;
}
...
_GL_INLINE_HEADER_END
```

and aaa.c can do this:

```c
/* aaa.c */
#include <config.h>
#define AAA_INLINE _GL_EXTERN_INLINE
#include <aaa.h>
```

whereas bbb.c and ccc.c can include aaa.h in the usual way. C99 compilers expand AAA_
INLINE to C99-style inline usage, where aaa_fun is declared extern inline in aaa.c and
plain inline in other modules. Non-C99 compilers that are compatible with GCC use
GCC-specific syntax to accomplish the same ends. Other non-C99 compilers use static
inline so they suffer from code bloat, but they are not mainline platforms and will die out
eventually.

_GL_INLINE is a portable alternative to C99 plain inline.
_GL_EXTERN_INLINE is a portable alternative to C99 extern inline.

Invoke _GL_INLINE_HEADER_BEGIN before all uses of _GL_INLINE in an include file. This
suppresses some bogus warnings in GCC versions before 5.1. If an include file includes other
files, it is better to invoke this macro after including the other files.

Invoke _GL_INLINE_HEADER_END after all uses of _GL_INLINE in an include file.

17.10 Handling closed standard file descriptors

Usually, when a program gets invoked, its file descriptors 0 (for standard input), 1 (for
standard output), and 2 (for standard error) are open. But there are situations when some
of these file descriptors are closed. These situations can arise when

- The invoking process invokes close() on the file descriptor before exec, or
The invoking process invokes `posix_spawn_file_actions_addclose()` for the file descriptor before `posix_spawn` or `posix_spawnp`, or

- The invoking process is a Bourne shell, and the shell script uses the POSIX syntax for closing the file descriptor: `<&-` for closing standard input, `>&-` for closing standard output, or `2>&-` for closing standard error.

When a closed file descriptor is accessed through a system call, such as `fcntl()`, `fstat()`, `read()`, or `write()`, the system call fails with error `EBADF` ("Bad file descriptor").

When a new file descriptor is allocated, the operating system chooses the smallest non-negative integer that does not yet correspond to an open file descriptor. So, when a given fd (0, 1, or 2) is closed, opening a new file descriptor may assign the new file descriptor to this fd. This can have unintended effects, because now standard input/output/error of your process is referring to a file that was not meant to be used in that role.

This situation is a security risk because the behaviour of the program in this situation was surely never tested, therefore anything can happen then – from overwriting precious files of the user to endless loops.

To deal with this situation, you first need to determine whether your program is affected by the problem.

- Does your program invoke functions that allocate new file descriptors? These are the system calls
  - `open()`, `openat()`, `creat()`
  - `dup()`
  - `fopen()`, `freopen()`
  - `pipe()`, `pipe2()`, `popen()`
  - `opendir()`
  - `tmpfile()`, `mkstemp()`, `mkstemps()`, `mkostemp()`, `mkostemps()`

Note that you also have to consider the libraries that your program uses.

- If your program may open two or more file descriptors or FILE streams for reading at the same time, and some of them may reference standard input, your program is affected.
- If your program may open two or more file descriptors or FILE streams for writing at the same time, and some of them may reference standard output or standard error, your program is affected.
- If your program does not open new file descriptors or FILE streams, it is not affected.
- If your program opens only one new file descriptor or FILE stream at a time, it is not affected. This is often the case for programs that are structured in simple phases: first a phase where input is read from a file into memory, then a phase of processing in memory, finally a phase where the result is written to a file.
- If your program opens only two new file descriptors or FILE streams at a time, out of which one is for reading and the one is for writing, it is not affected. This is because if the first file descriptor is allocated and the second file descriptor is picked as 0, 1, or 2, and both happen to be the same, writing to the one opened in `O_RDONLY` mode will produce an error `EBADF`, as desired.
If your program is affected, what is the mitigation?

Some operating systems install open file descriptors in place of the closed ones, either in the `exec` system call or during program startup. When such a file descriptor is accessed through a system call, it behaves like an open file descriptor opened for the “wrong” direction: the system calls `fcntl()` and `fstat()` succeed, whereas `read()` from fd 0 and `write()` to fd 1 or 2 fail with error `EBADF` (“Bad file descriptor”). The important point here is that when your program allocates a new file descriptor, it will have a value greater than 2.

This mitigation is enabled on HP-UX, for all programs, and on glibc, FreeBSD, NetBSD, OpenBSD, but only for setuid or setgid programs. Since it is operating system dependent, it is not a complete mitigation.

For a complete mitigation, Gnulib provides two alternative sets of modules:

- The `xstdopen` module.

The approach with the `xstdopen` module is simpler, but it adds three system calls to program startup. Whereas the approach with the `-safer` modules is more complex, but adds no overhead (no additional system calls) in the normal case.

To use the approach with the `xstdopen` module:

1. Import the module `xstdopen` from Gnulib.
2. In the compilation unit that contains the `main` function, include "xstdopen.h".
3. In the `main` function, near the beginning, namely right after the i18n related initializations (`setlocale`, `bindtextdomain`, `textdomain` invocations, if any) and the closeout initialization (if any), insert the invocation:
   ```c
   /* Ensure that stdin, stdout, stderr are open. */
   xstdopen();
   ```

To use the approach with the `-safer` modules:

1. Import the relevant modules from Gnulib.
2. In the compilation units that contain these function calls, include the replacement header file.

Do so according to this table:

<table>
<thead>
<tr>
<th>Function</th>
<th>Module</th>
<th>Header file</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>open()</code></td>
<td><code>fcntl-safer</code></td>
<td>&quot;fcntl--.h&quot;</td>
</tr>
<tr>
<td><code>openat()</code></td>
<td><code>openat-safer</code></td>
<td>&quot;fcntl--.h&quot;</td>
</tr>
<tr>
<td><code>creat()</code></td>
<td><code>fcntl-safer</code></td>
<td>&quot;fcntl--.h&quot;</td>
</tr>
<tr>
<td><code>dup()</code></td>
<td><code>unistd-safer</code></td>
<td>&quot;unistd--.h&quot;</td>
</tr>
<tr>
<td><code>fopen()</code></td>
<td><code>fopen-safer</code></td>
<td>&quot;stdio--.h&quot;</td>
</tr>
<tr>
<td><code>freopen()</code></td>
<td><code>freopen-safer</code></td>
<td>&quot;stdio--.h&quot;</td>
</tr>
<tr>
<td><code>pipe()</code></td>
<td><code>unistd-safer</code></td>
<td>&quot;unistd--.h&quot;</td>
</tr>
<tr>
<td><code>pipe2()</code></td>
<td><code>pipe2-safer</code></td>
<td>&quot;unistd--.h&quot;</td>
</tr>
<tr>
<td><code>popen()</code></td>
<td><code>popen-safer</code></td>
<td>&quot;stdio--.h&quot;</td>
</tr>
<tr>
<td><code>opendir()</code></td>
<td><code>dirent-safer</code></td>
<td>&quot;dirent--.h&quot;</td>
</tr>
</tbody>
</table>
17.11 Handling strings with NUL characters

Strings in C are usually represented by a character sequence with a terminating NUL character. A `char *`, pointer to the first byte of this character sequence, is what gets passed around as function argument or return value.

The major restriction of this string representation is that it cannot handle strings that contain NUL characters: such strings will appear shorter than they were meant to be. In most application areas, this is not a problem, and the `char *` type is well usable.

In areas where strings with embedded NUL characters need to be handled, the common approach is to use a `char *ptr` pointer variable together with a `size_t nbytes` variable (or an `idx_t nbytes` variable, if you want to avoid problems due to integer overflow). This works fine in code that constructs or manipulates strings with embedded NUL characters. But when it comes to storing them, for example in an array or as key or value of a hash table, one needs a type that combines these two fields.

The GnuLib modules `string-desc`, `xstring-desc`, and `string-desc-quotearg` provide such a type. We call it a “string descriptor” and name it `string_desc_t`.

The type `string_desc_t` is a struct that contains a pointer to the first byte and the number of bytes of the memory region that make up the string. An additional terminating NUL byte, that may be present in memory, is not included in this byte count. This type implements the same concept as `std::string_view` in C++, or the `String` type in Java.

A `string_desc_t` can be passed to a function as an argument, or can be the return value of a function. This is type-safe: If, by mistake, a programmer passes a `string_desc_t` to a function that expects a `char *` argument, or vice versa, or assigns a `string_desc_t` value to a variable of type `char *`, or vice versa, the compiler will report an error.

Functions related to string descriptors are provided:

- Side-effect-free operations in "string-desc.h",
- Memory-allocating operations in "string-desc.h",
- Memory-allocating operations with out-of-memory checking in "xstring-desc.h",
- Operations with side effects in "string-desc.h".

For outputting a string descriptor, the `*printf` family of functions cannot be used directly. A format string directive such as "%.s" would not work:

- it would stop the output at the first encountered NUL character,
- it would require to cast the number of bytes to `int`, and thus would not work for strings longer than `INT_MAX` bytes.

Therefore GnuLib offers

- a function `string_desc_fwrite` that outputs a string descriptor to a `FILE` stream,
- a function `string_desc_write` that outputs a string descriptor to a file descriptor,
and for those applications where the NUL characters should become visible as '\0', a family of \texttt{quotearg} based functions, that allow to specify the escaping rules in detail.

The functionality is thus split across three modules as follows:

- The module \texttt{string-desc}, under LGPL, defines the type and elementary functions.
- The module \texttt{xstring-desc}, under GPL, defines the memory-allocating functions with out-of-memory checking.
- The module \texttt{string-desc-quotearg}, under GPL, defines the \texttt{quotearg} based functions.

## 17.12 Container data types

Gnulib provides several generic container data types. They can be used to organize collections of application-defined objects.

### 17.12.1 Ordinary container data types

<table>
<thead>
<tr>
<th>Data type</th>
<th>Details</th>
<th>Module</th>
<th>Main</th>
<th>Include file for operations with out-of-memory checking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequential list</td>
<td>Can contain any number of objects in any given order. Duplicates are allowed, but can optionally be forbidden.</td>
<td>list</td>
<td>&quot;gl_&quot;</td>
<td>&quot;gl_list.h&quot; &quot;gl_xlist.h&quot;\</td>
</tr>
<tr>
<td>Set</td>
<td>Can contain any number of objects; the order does not matter. Duplicates (in the sense of the comparator) are forbidden.</td>
<td>set</td>
<td>&quot;gl_&quot;</td>
<td>&quot;gl_set.h&quot; &quot;gl_xset.h&quot;\</td>
</tr>
<tr>
<td>Ordered set</td>
<td>Can contain any number of objects in the order of a given comparator function. Duplicates (in the sense of the comparator) are forbidden.</td>
<td>oset</td>
<td>&quot;gl_&quot;</td>
<td>&quot;gl_oset.h&quot; &quot;gl_xoset.h&quot;\</td>
</tr>
<tr>
<td>Map</td>
<td>Can contain any number of (key, value) pairs, where keys and values are objects; there are no (key, value1) and (key, value2) pairs with the same key (in the sense of a given comparator function).</td>
<td>map</td>
<td>&quot;gl_&quot;</td>
<td>&quot;gl_map.h&quot; &quot;gl_xmap.h&quot;\</td>
</tr>
<tr>
<td>Ordered map</td>
<td>Can contain any number of (key, value) pairs, where keys and values are objects; the (key, value) pairs are ordered by the key, in the order of a given comparator function; there are no (key, value1) and (key, value2) pairs with the same key (in the sense of the comparator function).</td>
<td>omap</td>
<td>&quot;gl_&quot;</td>
<td>&quot;gl_omap.h&quot; &quot;gl_xomap.h&quot;\</td>
</tr>
</tbody>
</table>

Operations without out-of-memory checking (suitable for use in libraries) are declared in the “main include file”. Whereas operations with out-of-memory checking (suitable only in programs) are declared in the “include file for operations with out-of-memory checking”.  


For each of the data types, several implementations are available, with different performance profiles with respect to the available operations. This enables you to start with the simplest implementation (ARRAY) initially, and switch to a more suitable implementation after profiling your application. The implementation of each container instance is specified in a single place only: in the invocation of the function `gl_*_create_empty` that creates the instance.

The implementations and the guaranteed average performance for the operations for the "sequential list" data type are:

<table>
<thead>
<tr>
<th>Operation</th>
<th>ARRAY</th>
<th>CARRAY</th>
<th>LINKEDTREE</th>
<th>LINKEDHASH</th>
<th>WITH_duplicates</th>
<th>LINKEDHASH</th>
<th>HASH</th>
<th>ASHEE</th>
<th>HASH</th>
<th>HASH</th>
<th>ASHEE</th>
<th>HASH</th>
<th>ASHEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>gl_list_size</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
</tr>
<tr>
<td>gl_list_node_value</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
</tr>
<tr>
<td>gl_list_node_set_value</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
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<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
</tr>
<tr>
<td>gl_list_next_node</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(log n)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(log n)</td>
<td>O(log n)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gl_list_previous_node</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(log n)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(log n)</td>
<td>O(log n)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gl_list_first_node</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(log n)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(log n)</td>
<td>O(log n)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gl_list_last_node</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(log n)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(log n)</td>
<td>O(log n)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gl_list_get_at</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(n)</td>
<td>O(log n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(log n)</td>
<td>O(log n)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>gl_list_get_first</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(log n)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(log n)</td>
<td>O(log n)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gl_list_get_last</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(log n)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(log n)</td>
<td>O(log n)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gl_list_set_at</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(n)</td>
<td>O(log n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O((log n)O(1))</td>
<td>O(log n)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gl_list_set_first</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(log n)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O((log n)O(1))</td>
<td>O(log n)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gl_list_set_last</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O(log n)</td>
<td>O(1)</td>
<td>O(1)</td>
<td>O((log n)O(1))</td>
<td>O(log n)</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>gl_list_search</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O((log n)O(1))</td>
<td>O(log n)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gl_list_search_from</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O((log n)O(1))</td>
<td>O(log n)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gl_list_search_from_to</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O((log n)O(1))</td>
<td>O(log n)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gl_list_indexof</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O((log n)O(1))</td>
<td>O(log n)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gl_list_indexof_from</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O((log n)O(1))</td>
<td>O(log n)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gl_list_indexof_from_to</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O(n)</td>
<td>O((log n)O(1))</td>
<td>O(log n)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The implementations and the guaranteed average performance for the operations for the
“set” data type are:

<table>
<thead>
<tr>
<th>Operation</th>
<th>ARRAY</th>
<th>LINKEDHASH, HASH</th>
</tr>
</thead>
<tbody>
<tr>
<td>gl_set_size</td>
<td>$O(1)$</td>
<td>$O(1)$</td>
</tr>
<tr>
<td>gl_set_add</td>
<td>$O(n)$</td>
<td>$O(1)$</td>
</tr>
<tr>
<td>gl_set_remove</td>
<td>$O(n)$</td>
<td>$O(1)$</td>
</tr>
<tr>
<td>gl_set_search</td>
<td>$O(n)$</td>
<td>$O(1)$</td>
</tr>
<tr>
<td>gl_set_iterator</td>
<td>$O(1)$</td>
<td>$O(1)$</td>
</tr>
<tr>
<td>gl_set_iterator_next</td>
<td>$O(1)$</td>
<td>$O(1)$</td>
</tr>
<tr>
<td>gl_sortedlist_search</td>
<td>$O(1)$</td>
<td>$O(1)$</td>
</tr>
<tr>
<td>gl_sortedlist_search_from</td>
<td>$O(1)$</td>
<td>$O(1)$</td>
</tr>
<tr>
<td>gl_sortedlist_indexof</td>
<td>$O(1)$</td>
<td>$O(1)$</td>
</tr>
<tr>
<td>gl_sortedlist_indexof_from</td>
<td>$O(1)$</td>
<td>$O(1)$</td>
</tr>
<tr>
<td>gl_sortedlist_add</td>
<td>$O(1)$</td>
<td>$O(1)$</td>
</tr>
<tr>
<td>gl_sortedlist_remove</td>
<td>$O(1)$</td>
<td>$O(1)$</td>
</tr>
</tbody>
</table>
The implementations and the guaranteed average performance for the operations for the “ordered set” data type are:

**Operation** | **ARRAY** | **TREE**
--- | --- | ---
gl_oset_size | $O(1)$ | $O(1)$
gl_oset_add | $O(n)$ | $O(\log n)$
gl_oset_remove | $O(n)$ | $O(\log n)$
gl_oset_search | $O(\log n)$ | $O(\log n)$
gl_oset_search_atleast | $O(\log n)$ | $O(\log n)$
gl_oset_iterator | $O(1)$ | $O(\log n)$
gl_oset_iterator_next | $O(1)$ | $O(\log n)$

The implementations and the guaranteed average performance for the operations for the “map” data type are:

**Operation** | **ARRAY** | **LINKEDHASH, HASH**
--- | --- | ---
gl_map_size | $O(1)$ | $O(1)$
gl_map_get | $O(n)$ | $O(1)$
gl_map_put | $O(n)$ | $O(1)$
gl_map_remove | $O(n)$ | $O(1)$
gl_map_search | $O(n)$ | $O(1)$
gl_map_iterator | $O(1)$ | $O(1)$
gl_map_iterator_next | $O(1)$ | $O(1)$

The implementations and the guaranteed average performance for the operations for the “ordered map” data type are:

**Operation** | **ARRAY** | **TREE**
--- | --- | ---
gl_omap_size | $O(1)$ | $O(1)$
gl_omap_get | $O(\log n)$ | $O(\log n)$
gl_omap_put | $O(n)$ | $O(\log n)$
gl_omap_remove | $O(n)$ | $O(\log n)$
gl_omap_search | $O(\log n)$ | $O(\log n)$
gl_omap_search_atleast | $O(\log n)$ | $O(\log n)$
gl_omap_iterator | $O(1)$ | $O(\log n)$
gl_omap_iterator_next | $O(1)$ | $O(\log n)$

For C++, GnuLib provides a C++ template class for each of these container data types.

<table>
<thead>
<tr>
<th>Data type</th>
<th>C++ class</th>
<th>Module</th>
<th>Include file</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequential list</td>
<td>gl_List</td>
<td>list-c++</td>
<td>&quot;gl_list.hh&quot;</td>
</tr>
<tr>
<td>Set</td>
<td>gl_Set</td>
<td>set-c++</td>
<td>&quot;gl_set.hh&quot;</td>
</tr>
<tr>
<td>Ordered set</td>
<td>gl_OSet</td>
<td>oset-c++</td>
<td>&quot;gl_oset.hh&quot;</td>
</tr>
<tr>
<td>Map</td>
<td>gl_Map</td>
<td>map-c++</td>
<td>&quot;gl_map.hh&quot;</td>
</tr>
<tr>
<td>Ordered map</td>
<td>gl_OMap</td>
<td>omap-c++</td>
<td>&quot;gl_omap.hh&quot;</td>
</tr>
</tbody>
</table>

### 17.12.2 Specialized container data types

The **hamt** module implements the hash array mapped trie (HAMT) data structure. This is a data structure that contains (key, value) pairs. Lookup of a (key, value) pair given the key is on average an $O(1)$ operation, assuming a good hash function for the keys is employed.
The HAMT data structure is useful when you want modifications (additions of pairs, removal, value changes) to be visible only to some part of your program, whereas other parts of the program continue to use the unmodified HAMT. The HAMT makes this possible in a space-efficient manner: the modified and the unmodified HAMT share most of their allocated memory. It is also time-efficient: Every such modification is $O(1)$ on average, again assuming a good hash function for the keys.

A HAMT can be used whenever an ordinary hash table would be used. It does however, provide non-destructive updating operations without the need to copy the whole container. On the other hand, a hash table is simpler so that its performance may be better when non-destructive update operations are not needed.

For example, a HAMT can be used to model the dynamic environment in a LISP interpreter. Updating a value in the dynamic environment of one continuation frame would not modify values in earlier frames.

To use the module, include `hamt.h` in your code. The public interface is documented in that header file. You have to provide a hash function and an equivalence relation, which defines key equality. The module includes a test file `test-hamt.c`, which demonstrates how the API can be used.

In the current implementation, each inner node of the HAMT can store up to $32 = 2^5$ entries and subtries. Whenever a collision between the initial bits of the hash values of two entries would happen, the next 5 bits of the hash values are examined and the two entries pushed down one level in the trie.

HAMTs have the same average access times as hash tables but grow and shrink dynamically, so they use memory more economically and do not have to be periodically resized.

They were described and analyzed in Phil Bagwell (2000). Ideal Hash Trees (Report). Infoscience Department, École Polytechnique Fédérale de Lausanne.

The persistence aspect of the HAMT data structure, which means that each updating operation (like inserting, replacing, or removing an entry) returns a new HAMT while leaving the original one intact, is achieved through structure sharing, which is even safe in the presence of multiple threads when the used C compiler supports atomics.

### 17.13 Recognizing Option Arguments

The module `argmatch` provides a simple textual user interface to a finite choice. It is for example well suited to recognize arguments of options or values of environment variables that accept a fixed set of valid choices.

These choices may be denoted by synonyms, such as ‘none’ and ‘off’ below.

```
$ my_cp --backup=none foo bar
$ my_cp --backup=non foo bar
$ my_cp --backup=no foo bar
$ my_cp --backup=n foo bar
my_cp: ambiguous argument 'n' for 'backup type'
Valid arguments are:
   - 'no', 'none', 'off'
   - 'numbered', 't', 'newstyle'
   - 'existing', 'nil', 'numbered-existing'
   - 'simple', 'never', 'single'
Try 'my_cp --help' for more information.
$ my_cp --backup=num foo bar
```
To set up argmatch, first call `ARGMATCH_DEFINE_GROUP (name, type)` with the name of the argmatch group name, and the value type. For instance:

```c
enum backup_type
{
    no_backups,
    simple_backups,
    numbered_existing_backups,
    numbered_backups
};
ARGMATCH_DEFINE_GROUP (backup, enum backup_type);
```

This defines a few types and functions named `argmatch_name_*`. Introduce the array that defines the mapping from user-input to actual value, with a terminator:

```c
static const argmatch_backup_arg argmatch_backup_args[] =
{
    { "no", no_backups },
    { "none", no_backups },
    { "off", no_backups },
    { "simple", simple_backups },
    { "never", simple_backups },
    { "single", simple_backups },
    { "existing", numbered_existing_backups },
    { "nil", numbered_existing_backups },
    { "numbered-existing", numbered_existing_backups },
    { "numbered", numbered_backups },
    { "t", numbered_backups },
    { "newstyle", numbered_backups },
    { NULL, no_backups }
};
```

Then introduce the array that defines the values, also with a terminator. Document only once per group of synonyms:

```c
static const argmatch_backup_doc argmatch_backup_docs[] =
{
    { "no", N_("never make backups (even if --backup is given)") },
    { "numbered", N_("make numbered backups") },
    { "existing", N_("numbered if numbered backups exist, simple otherwise") },
    { "simple", N_("always make simple backups") },
    { NULL, NULL }
};
```

Finally, define the argmatch group:

```c
const argmatch_backup_group_type argmatch_backup_group =
```
The backup suffix is ‘~’ unless set with --suffix or SIMPLE_BACKUP_SUFFIX. The version control method may be selected via the --backup option or through the VERSION_CONTROL environment variable. Here are the values:

To use the argmatch group:

```c
ptrdiff_t i = argmatch_backup_choice ("--backup", "none");
// argmatch_backup_group.args[i].arg is "none", so its value
// is argmatch_backup_group.args[i].val.
// Return -1 on invalid argument, and -2 on ambiguity.

enum backup_type val = *argmatch_backup_value ("--backup", "none");
// Returns a pointer to the value, and exit on errors.
// So argmatch_backup_group.args[i].val == val.

const char *arg = argmatch_backup_argument (&no_backups);
// arg is "no".
```

// Print the documentation on stdout.
argmatch_backup_usage (stdout);
// Gives:
// 
// The backup suffix is ‘~’, unless set with --suffix or SIMPLE_BACKUP_SUFFIX.
// The version control method may be selected via the --backup option or through
// the VERSION_CONTROL environment variable. Here are the values:
// 
// no, none, off never make backups (even if --backup is given)
// numbered, t, newstyle
// make numbered backups
// existing, nil, numbered-existing
// numbered if numbered backups exist, simple otherwise
// simple, never, single
// always make simple backups

### 17.14 Quoting

Gnulib provides ‘quote’ and ‘quotearg’ modules to help with quoting text, such as file names, in messages to the user. Here’s an example of using ‘quote’:

```c
#include <quote.h>
...
error (0, errno, _("cannot change owner of %s"), quote (fname));
```

This differs from

```c
error (0, errno, _("cannot change owner of '%s'"), fname);
```

in that quote escapes unusual characters in `fname`, e.g., ‘’ and control characters like ‘\n’.

However, a caveat: quote reuses the storage that it returns. Hence if you need more than one thing quoted at the same time, you need to use `quote_n`. 
Also, the *quote* module is not suited for multithreaded applications. In that case, you have to use *quotearg_alloc*, defined in the ‘quotearg’ module, which is decidedly less convenient.

### 17.15 proname and getproname

Gnulib has two modules for retrieving the name of the currently executing program: *proname* and *getproname*.

The *proname* module defines a variable *program_name*. It contains the name of the currently executing program, on all platforms. But it cannot be used implicitly: It requires that every *main* function be modified to invoke *set_program_name (argv[0])* as one of its first actions.

The *getproname* module defines a function *getproname()* . It returns the name of the currently executing program, on most platforms. The advantage of this module is that it can be used without prior initializations. But it has limitations: In some rare situations, it cannot determine the name; then it returns "?" instead. And on some platforms, it returns a truncated program name.

The *error* function uses the *getproname* module.

### 17.16 gcd: greatest common divisor

The *gcd* function returns the greatest common divisor of two numbers *a > 0* and *b > 0*. It is the caller’s responsibility to ensure that the arguments are non-zero.

If you need a gcd function for an integer type larger than ‘*unsigned long*’, you can include the *gcd.c* implementation file with parametrization. The parameters are:

- **WORD_T** Define this to the unsigned integer type that you need this function for.
- **GCD** Define this to the name of the function to be created.

The created function has the prototype

\[
WORD_T \text{GCD} (WORD_T a, WORD_T b);
\]

If you need the least common multiple of two numbers, it can be computed like this:

\[
lcm(a,b) = (a / gcd(a,b)) \times b \quad \text{or} \quad lcm(a,b) = a \times (b / gcd(a,b)).
\]

Avoid the formula \[lcm(a,b) = (a + b) / gcd(a,b)\] because—although mathematically correct—it can yield a wrong result, due to integer overflow.

In some applications it is useful to have a function taking the gcd of two signed numbers. In this case, the gcd function result is usually normalized to be non-negative (so that two gcd results can be compared in magnitude or compared against 1, etc.). Note that in this case the prototype of the function has to be

\[
\text{unsigned long gcd (long a, long b)};
\]

and not

\[
\text{long gcd (long a, long b)};
\]

because \[gcd(LONG_MIN, LONG_MIN) = -LONG_MIN = LONG_MAX + 1\] does not fit into a signed ‘long’.
17.17 Profiling of program phases

The module ‘timevar’ provides a simple self-profiling facility, based on timers.

<table>
<thead>
<tr>
<th>Execution times (seconds)</th>
<th>read</th>
<th>read: scan</th>
<th>read: parse</th>
<th>work</th>
<th>work: phase 1</th>
<th>work: phase 2</th>
<th>output</th>
<th>total time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.09 (19%)</td>
<td>0.08 (80%)</td>
<td>0.09 (18%)</td>
<td>0.33 (70%)</td>
<td>0.30 (64%)</td>
<td>0.33 (28%)</td>
<td>0.04 (9%)</td>
<td>0.47</td>
</tr>
</tbody>
</table>

To set up timevar, copy the stub file `gnulib/lib/timevar.def` next to where `timevar.h` and `timevar.c` were imported in your project, and define your timers there. For instance:

```c
/* The total execution time. Mandatory. */
DEFTIMEVAR (tv_total, "total time")

/* Examples. */
DEFTIMEVAR (tv_read, "read")
DEFTIMEVAR (tv_work, "work")
DEFTIMEVAR (tv_work_1, "work: phase 1")
DEFTIMEVAR (tv_work_2, "work: phase 2")
DEFTIMEVAR (tv_output, "output")
```

Do not remove `tv_total`, it is mandatory. You may change its associated string.

Use `timevar_push/timevar_pop` to start/stop timers, as in the following example.

```c
#include <config.h>
#include "timevar.h"

#include <stdio.h>
#include "read.h"
#include "work.h"
#include "output.h"

int main (void)
{
    timevar_enabled = true;
    timevar_init ();
    timevar_start (tv_total);

    timevar_push (tv_read);
    reader ();
    timevar_pop (tv_read);

    timevar_push (tv_work);
    work ();
    timevar_pop (tv_work);

    timevar_push (tv_output);
    output ();
    timevar_pop (tv_output);

    timevar_stop (tv_total);
    timevar_print (stderr);
```
with, for instance, in work.c

```c
#include <config.h>
#include "work.h"

void
work (void)
{
    timevar_push (tv_work_phase1);
    work1 ();
    timevar_pop (tv_work_phase1);

    timevar_push (tv_work_phase2);
    work2 ();
    timevar_pop (tv_work_phase2);
}
```

### 17.18 Library version handling

The module 'check-version' can be useful when your gnulib application is a system library. You will typically wrap the call to the `check_version` function through a library API, your library header file may contain:

```c
#define STRINGPREP_VERSION "0.5.18"
...
extern const char *stringprep_check_version (const char *req_version);
```

To avoid ELF symbol collisions with other libraries that use the 'check-version' module, add to `config.h` through a AC_DEFINE something like:

```
AC_DEFINE(check_version, stringprep_check_version,
    [Rename check_version.])
```

The `stringprep_check_version` function will thus be implemented by the `check_version` module.

There are two uses of the interface. The first is a way to provide for applications to find out the version number of the library it uses. The application may contain diagnostic code such as:

```c
printf ("Stringprep version: header %s library %s",
    STRINGPREP_VERSION,
    stringprep_check_version (NULL));
```

Separating the library and header file version can be useful when searching for version mismatch related problems.

The second uses is as a rudimentary test of proper library version, by making sure the application get a library version that is the same, or newer, than the header file used when building the application. This doesn’t catch all problems, libraries may change backwards incompatibly in later versions, but enable applications to require a certain minimum version before it may proceed.

Typical uses look like:

```c
/* Check version of libgcrypt. */
if (!gcry_check_version (GCRYPT_VERSION))
    die ("version mismatch\n");
```
17.19 Supporting Relocation

It has been a pain for many users of GNU packages for a long time that packages are not relocatable. It means a user cannot copy a program, installed by another user on the same machine, to his home directory, and have it work correctly (including i18n). So many users need to go through configure; make; make install with all its dependencies, options, and hurdles.

Red Hat, Debian, and other binary distributions solve the “ease of installation” problem, but they hardwire path names, usually to /usr or /usr/local. This means that users need root privileges to install a binary package, and prevents installing two different versions of the same binary package.

A relocatable program can be moved or copied to a different location on the file system. It is possible to make symlinks to the installed and moved programs, and invoke them through the symlink. It is possible to do the same thing with a hard link only if the hard link file is in the same directory as the real program.

The relocatable-prog module aims to ease the process of making a GNU program relocatable. It helps overcome two obstacles. First, it aids with relocating the hard-coded references to absolute file names that GNU programs often contain. These references must be fixed up at runtime if a program is to be successfully relocated. The relocatable-prog module provides a function relocate that does this job.

Second, the loader must be able to find shared libraries linked to relocatable executables or referenced by other shared libraries linked to relocatable executables. The relocatable-prog module helps out here in a platform-specific way:

- On most operating systems, it adds a linker option (-rpath) that causes the dynamic linker to search for libraries in a directory relative to the location of the invoked executable. This works on GNU/Linux and modern versions of GNU/Hurd, GNU/kFreeBSD, macOS, FreeBSD, NetBSD, OpenBSD, Solaris, Haiku.
- On other Unix systems, it installs a trampoline executable. The trampoline sets the environment variable that controls shared library searching (usually LD_LIBRARY_PATH) and then invokes the real executable. This applies to operating systems such as AIX, HP-UX, or Minix.
- On Windows, the executable’s own directory is searched for libraries, so installing shared libraries into the executable’s directory is sufficient.

You can make your program relocatable by following these steps:

1. Import the relocatable-prog module. For libraries, use the relocatable-lib or relocatable-lib-lgpl module, if the libraries are independent. For installing multiple libraries, at least one of which depends on another one, use the relocatable-prog module. If you need more than one module, or you need to use them with different settings, you will need multiple copies of gnulib (see Section 3.10 [Multiple instances], page 26).

2. In every program, add to main as the first statement (even before setting the locale or doing anything related to libintl):

```c
set_program_name (argv[0]);
```

The prototype for this function is in progname.h.
Chapter 17: Particular Modules

800

3. If you want your code to be portable to platforms that do not support automatic
initialization, call set_relocation_prefix.
4. Everywhere where you use a constant pathname from installation-time, wrap it in
relocate so it gets translated to the run-time situation. Example:
bindtextdomain (PACKAGE, LOCALEDIR);
becomes:
bindtextdomain (PACKAGE, relocate (LOCALEDIR));
The prototype for this function is in relocatable.h.
There is also a variant of this function, named relocate2, that makes it easy to reclaim
the memory allocated by the call.
5. The set_program_name function can also configure some additional libraries to relocate
files that they access, by defining corresponding C preprocessor symbols to 1. The
libraries for which this is supported and the corresponding preprocessor symbols are:
libcharset

DEPENDS_ON_LIBCHARSET

libiconv

DEPENDS_ON_LIBICONV

libintl

DEPENDS_ON_LIBINTL

Defining the symbol for a library makes every program in the package depend on that
library, whether the program really uses the library or not, so this feature should be
used with some caution.
6. If your package installs shell scripts, also import the relocatable-script module.
Then, near the beginning of each shell script that your package installs, add the following:
@relocatable_sh@
prefix="@prefix@"
exec_prefix="@exec_prefix@"
datarootdir="@datarootdir@"

# usually needs $prefix.
# usually needs $prefix.

if test "@RELOCATABLE@" = yes; then
bindir="@bindir@"
orig_installdir="$bindir" # see Makefile.am's *_SCRIPTS variables
func_find_curr_installdir # determine curr_installdir
func_find_prefixes
relocate () {
echo "$1/" \
| sed -e "s%^${orig_installprefix}/%${curr_installprefix}/%" \
| sed -e 's,/$,,'
}
else
relocate () {
echo "$1"
}
fi
# Get some relocated directory names.
sysconfdir=`relocate "@sysconfdir@"`
# usually needs $prefix.
some_datadir=`relocate "@datadir@/something"` # usually needs $datarootdir.
bindir=`relocate "@bindir@"`
# usually needs $exec_prefix, hence $prefix.


You must adapt the definition of \texttt{orig\_installdir}, depending on where the script gets installed. Also, at the end, instead of \texttt{sysconfdir} and \texttt{some\_datadir}, transform those variables that you need.

7. If your package installs Perl scripts, also import the \texttt{relocatable-perl} module. Then, near the beginning of each Perl script that your package installs, add the following:

```perl
@relocatable_pl@
if (@"RELOCATABLE@" eq "yes") {
    my $exec_prefix = @"exec\_prefix@";
    my $orig\_installdir = @"bindir@";
    my ($orig\_installprefix, $curr\_installprefix) =
        find\_prefixes($orig\_installdir, find\_curr\_installdir());

    # the subroutine is defined whether or not the enclosing block is executed
    sub relocate { my ($dir) = @.;
        if (@"RELOCATABLE@" eq "yes") {
            $dir =~ s%^$orig\_installprefix/%$curr\_installprefix/%;
            $dir =~ s/,/,/;,
        }
        return $dir;
    }
}

# Get some relocated directory names.
# (The gnulib module 'configmake' can help with this.)
$sysconfdir = relocate("@sysconfdir@");
$some\_datadir = relocate("@datadir@/something");
```

You must adapt the definition of \texttt{orig\_installdir}, depending on where the script gets installed. Also, at the end, instead of \texttt{sysconfdir} and \texttt{some\_datadir}, transform those variables that you need.

8. In your \texttt{Makefile.am}, for every program \texttt{foo} that gets installed in, say, \$(bindir), you add:

```makefile
foo\_CPPFLAGS = -DINSTALLDIR="$(bindir)"
if \text{RELOCATABLE\_VIA\_LD}
    foo\_LDFLAGS = `$(RELOCATABLE\_LDFLAGS) $(bindir)`
endif
```

When building gnulib to use with a relocatable library, you need to define the preprocessor symbol \texttt{IN\_LIBRARY}. You may also want to build with \texttt{ENABLE\_COSTLY\_RELOCATABLE}, in which case you will also need to define \texttt{INSTALLDIR}. The following fragment can be added to an override \texttt{Makefile.\_am} used to build gnulib (see Section 3.8 [Modified build rules], page 25).

```makefile
AM\_CPPFLAGS += -DIN\_LIBRARY -DENABLE\_COSTLY\_RELOCATABLE
if \text{SHLIBS\_IN\_BINDIR}
    AM\_CPPFLAGS += -DINSTALLDIR="$(bindir)"
else
    AM\_CPPFLAGS += -DINSTALLDIR="$(libdir)"
endif
```

\texttt{SHLIBS\_IN\_BINDIR} is defined in \texttt{configure.ac} as follows:

```makefile
AM\_CONDITIONAL([\text{SHLIBS\_IN\_BINDIR}],
```
9. In your `Makefile.am`, for every library `libfoo` that gets installed in, say, `$(libdir)`, you add:

```makefile
if RELOCATABLE_VIA_LD
    libfoo_la_LDFLAGS = `$(RELOCATABLE_LDFLAGS) $(libdir)`
endif
```

10. Add a couple of variable assignments to your `Makefile.am`.

If your package (or any package you rely on, e.g. gettext-runtime) will be relocated together with a set of installed shared libraries, then set `RELOCATABLE_LIBRARY_PATH` to a colon-separated list of those libraries’ directories, e.g.

```
RELOCATABLE_LIBRARY_PATH = $(libdir)
```

If your `config.h` is not in `$(_top_builddir)`, then set `RELOCATABLE_CONFIG_H_DIR` to its directory, e.g.

```
RELOCATABLE_CONFIG_H_DIR = $(top_builddir)/src
```

## 17.20 `func`

The `func` module makes sure that you can use the predefined identifier `__func__` as defined by C99 in your code.

A small example is:

```c
#include <config.h>
#include <stdio.h> /* for printf */

int main (void)
{
    printf("%s: hello world\n", __func__);
}
```

Note that `sizeof` cannot be applied to `__func__`: On SunPRO C compiler, `sizeof __func__` evaluates to 0.

## 17.21 `stat-size`

The `stat-size` module provides a small number of macros intended for interpreting the file size information in an instance of `struct stat`.

On POSIX systems, the `st_blocks` member of `struct stat` contains the number of disk blocks occupied by a file. The `ST_NBLOCS` macro is used to estimate this quantity on systems which don’t actually have `st_blocks`. Each of these blocks contains `ST_NBLOCSIZE` bytes.

The value of `ST_NBLOCSIZE` is often quite small, small enough that performing I/O in chunks that size would be inefficient. `ST_BLKSIZE` is the I/O block size recommended for I/O to this file. This is not guaranteed to give optimum performance, but it should be reasonably efficient.
18 Regular expressions

18.1 Overview

A regular expression (or regexp, or pattern) is a text string that describes some (mathematical) set of strings. A regexp \( r \) matches a string \( s \) if \( s \) is in the set of strings described by \( r \).

Using the Regex library, you can:

• see if a string matches a specified pattern as a whole, and
• search within a string for a substring matching a specified pattern.

Some regular expressions match only one string, i.e., the set they describe has only one member. For example, the regular expression ‘foo’ matches the string ‘foo’ and no others. Other regular expressions match more than one string, i.e., the set they describe has more than one member. For example, the regular expression ‘f*’ matches the set of strings made up of any number (including zero) of ‘f’s. As you can see, some characters in regular expressions match themselves (such as ‘f’) and some don’t (such as ‘*’); the ones that don’t match themselves instead let you specify patterns that describe many different strings.

To either match or search for a regular expression with the Regex library functions, you must first compile it with a Regex pattern compiling function. A compiled pattern is a regular expression converted to the internal format used by the library functions. Once you’ve compiled a pattern, you can use it for matching or searching any number of times.

The Regex library is used by including \texttt{regex.h}. Regex provides three groups of functions with which you can operate on regular expressions. One group—the GNU group—is more powerful but not completely compatible with the other two, namely the POSIX and Berkeley Unix groups; its interface was designed specifically for GNU.

We wrote this chapter with programmers in mind, not users of programs—such as Emacs—that use Regex. We describe the Regex library in its entirety, not how to write regular expressions that a particular program understands.

18.2 Regular Expression Syntax

Characters are things you can type. Operators are things in a regular expression that match one or more characters. You compose regular expressions from operators, which in turn you specify using one or more characters.

Most characters represent what we call the match-self operator, i.e., they match themselves; we call these characters ordinary. Other characters represent either all or parts of fancier operators; e.g., ‘.’ represents what we call the match-any-character operator (which, no surprise, matches (almost) any character); we call these characters special. Two different things determine what characters represent what operators:

1. the regular expression syntax your program has told the Regex library to recognize, and
2. the context of the character in the regular expression.

In the following sections, we describe these things in more detail.
18.2.1 Syntax Bits

In any particular syntax for regular expressions, some characters are always special, others are sometimes special, and others are never special. The particular syntax that Regex recognizes for a given regular expression depends on the current syntax (as set by \texttt{re\_set\_syntax}) when the pattern buffer of that regular expression was compiled.

You get a pattern buffer by compiling a regular expression. See Section 18.6.1.1 [GNU Pattern Buffers], page 818, for more information on pattern buffers. See Section 18.6.1.2 [GNU Regular Expression Compiling], page 818, and Section 18.6.2.1 [BSD Regular Expression Compiling], page 825, for more information on compiling.

Regex considers the current syntax to be a collection of bits; we refer to these bits as syntax bits. In most cases, they affect what characters represent what operators. We describe the meanings of the operators to which we refer in Section 18.3 [Common Operators], page 809, and Section 18.4 [GNU Operators], page 817.

For reference, here is the complete list of syntax bits, in alphabetical order:

\texttt{RE\_BACKSLASH\_ESCAPE\_IN\_LISTS}
If this bit is set, then \texttt{\textbackslash} inside a list (see Section 18.3.6 [List Operators], page 812) quotes (makes ordinary, if it’s special) the following character; if this bit isn’t set, then \texttt{\textbackslash} is an ordinary character inside lists. (See Section 18.2.4 [The Backslash Character], page 808, for what \texttt{\textbackslash} does outside of lists.)

\texttt{RE\_BK\_PLUS\_QM}
If this bit is set, then \texttt{\textbackslash+} represents the match-one-or-more operator and \texttt{\textbackslash?} represents the match-zero-or-more operator; if this bit isn’t set, then \texttt{\textbackslash+} represents the match-one-or-more operator and \texttt{\textbackslash?} represents the match-zero-or-one operator. This bit is irrelevant if \texttt{RE\_LIMITED\_OPS} is set.

\texttt{RE\_CHAR\_CLASSES}
If this bit is set, then you can use character classes in lists; if this bit isn’t set, then you can’t.

\texttt{RE\_CONTEXT\_INDEP\_ANCHORS}
If this bit is set, then \texttt{^} and \texttt{$} are special anywhere outside a list; if this bit isn’t set, then these characters are special only in certain contexts. See Section 18.3.9.1 [Match-beginning-of-line Operator], page 816, and Section 18.3.9.2 [Match-end-of-line Operator], page 816.

\texttt{RE\_CONTEXT\_INDEP\_OPS}
If this bit is set, then certain characters are special anywhere outside a list; if this bit isn’t set, then those characters are special only in some contexts and are ordinary elsewhere. Specifically, if this bit isn’t set then \texttt{*}, and (if the syntax bit \texttt{RE\_LIMITED\_OPS} isn’t set) \texttt{\textbackslash+} and \texttt{\textbackslash?} (or \texttt{\textbackslash+} and \texttt{\textbackslash?}, depending on the syntax bit \texttt{RE\_BK\_PLUS\_QM}) represent repetition operators only if they’re not first in a regular expression or just after an open-group or alternation operator. The same holds for \texttt{\{} (or \texttt{\textbackslash\{}, depending on the syntax bit \texttt{RE\_NO\_BK\_BRACES}) if it is the beginning of a valid interval and the syntax bit \texttt{RE\_INTERVALS} is set.
RE_CONTEXT_INVALID_DUP
If this bit is set, then an open-interval operator cannot occur at the start of a regular expression, or immediately after an alternation, open-group or close-interval operator.

RE_CONTEXT_INVALID_OPS
If this bit is set, then repetition and alternation operators can’t be in certain positions within a regular expression. Specifically, the regular expression is invalid if it has:
• a repetition operator first in the regular expression or just after a match-beginning-of-line, open-group, or alternation operator; or
• an alternation operator first or last in the regular expression, just before a match-end-of-line operator, or just after an alternation or open-group operator.

If this bit isn’t set, then you can put the characters representing the repetition and alternation characters anywhere in a regular expression. Whether or not they will in fact be operators in certain positions depends on other syntax bits.

RE_DEBUG If this bit is set, and the regex library was compiled with -DDEBUG, then internal debugging is turned on; if unset, then it is turned off.

RE_DOT_NEWLINE If this bit is set, then the match-any-character operator matches a newline; if this bit isn’t set, then it doesn’t.

RE_DOT_NOT_NULL If this bit is set, then the match-any-character operator doesn’t match a null character; if this bit isn’t set, then it does.

RE_HAT_LISTS_NOT_NEWLINE If this bit is set, nonmatching lists ‘[^...’ do not match newline; if not set, they do.

RE_ICASE If this bit is set, then ignore case when matching; otherwise, case is significant.

RE_INTERVALS If this bit is set, then Regex recognizes interval operators; if this bit isn’t set, then it doesn’t.

RE_INVALID_INTERVAL_ORD If this bit is set, a syntactically invalid interval is treated as a string of ordinary characters. For example, the extended regular expression ‘a{1’ is treated as ‘a\{1’.

RE_LIMITED_OPS If this bit is set, then Regex doesn’t recognize the match-one-or-more, match-zero-or-one or alternation operators; if this bit isn’t set, then it does.

RE_NEWLINE_ALT If this bit is set, then newline represents the alternation operator; if this bit isn’t set, then newline is ordinary.
RE_NO_BK_BRACES
If this bit is set, then ‘{’ represents the open-interval operator and ‘}’ represents the close-interval operator; if this bit isn’t set, then ‘\{’ represents the open-interval operator and ‘\}’ represents the close-interval operator. This bit is relevant only if RE_INTERVALS is set.

RE_NO_BK_PARENS
If this bit is set, then ‘(’ represents the open-group operator and ‘)’ represents the close-group operator; if this bit isn’t set, then ‘\(’ represents the open-group operator and ‘\)’ represents the close-group operator.

RE_NO_BK_REFS
If this bit is set, then Regex doesn’t recognize ‘\’digit as the back-reference operator; if this bit isn’t set, then it does.

RE_NO_BK_VBAR
If this bit is set, then ‘|’ represents the alternation operator; if this bit isn’t set, then ‘\|’ represents the alternation operator. This bit is irrelevant if RE_LIMITED_OPS is set.

RE_NO_EMPTY_RANGES
If this bit is set, then a regular expression with a range whose ending point collates lower than its starting point is invalid; if this bit isn’t set, then Regex considers such a range to be empty.

RE_NO_GNU_OPS
If this bit is set, GNU regex operators are not recognized; otherwise, they are.

RE_NO_POSIX_BACKTRACKING
If this bit is set, succeed as soon as we match the whole pattern, without further backtracking. This means that a match may not be the leftmost longest; see Section 18.5 [What Gets Matched?], page 818, for what this means.

RE_NO_SUB
If this bit is set, then no_sub will be set to one during re_compile_pattern. This causes matching and searching routines not to record substring match information.

RE_UNMATCHED_RIGHT_PAREN_ORD
If this bit is set and the regular expression has no matching open-group operator, then Regex considers what would otherwise be a close-group operator (based on how RE_NO_BK_PARENS is set) to match ‘)’.

18.2.2 Predefined Syntaxes
If you’re programming with Regex, you can set a pattern buffer’s (see Section 18.6.1.1 [GNU Pattern Buffers], page 818) syntax either to an arbitrary combination of syntax bits (see Section 18.2.1 [Syntax Bits], page 804) or else to the configurations defined by Regex. These configurations define the syntaxes used by certain programs—GNU Emacs, POSIX Awk, traditional Awk, Grep, Egrep—in addition to syntaxes for POSIX basic and extended regular expressions.

The predefined syntaxes—taken directly from regex.h—are:
#define RE_SYNTAX_EMACS 0
#define RE_SYNTAX_AWK
(RE_BACKSLASH_ESCAPE_IN_LISTS | RE_DOT_NOT_NULL | RE_NO_BK_PARENS | RE_NO_BK_REFS | RE_NO_BK_VBAR | RE_NO_EMPTY_RANGES | RE_UNMATCHED_RIGHT_PAREN_ORD)

#define RE_SYNTAX_POSIX_AWK
(RE_SYNTAX_POSIX_EXTENDED | RE_BACKSLASH_ESCAPE_IN_LISTS)

#define RE_SYNTAX_GREP
(RE_BK_PLUS_QM | RE_CHAR_CLASSES | RE_HAT_LISTS_NOT_NEWLINE | RE_INTERVALS | RE_NEWLINE_ALT)

#define RE_SYNTAX_EGREP
(RE_CHAR_CLASSES | RE_CONTEXT_INDEP_ANCHORS | RE_CONTEXT_INDEP_OPS | RE_HAT_LISTS_NOT_NEWLINE | RE_NEWLINE_ALT | RE_NO_BK_PARENS | RE_NO_BK_VBAR)

#define RE_SYNTAX_POSIX_EGREP
(RE_SYNTAX_EGREP | RE_INTERVALS | RE_NO_BK_BRACES)

/* P1003.2/D11.2, section 4.20.7.1, lines 5078ff. */
#define RE_SYNTAX_ED RE_SYNTAX_POSIX_BASIC
#define RE_SYNTAX_SED RE_SYNTAX_POSIX_BASIC

/* Syntax bits common to both basic and extended POSIX regex syntax. */
#define _RE_SYNTAX_POSIX_COMMON
(RE_CHAR_CLASSES | RE_DOT_NEWLINE | RE_DOT_NOT_NULL | RE_INTERVALS | RE_NO_EMPTY_RANGES)

#define RE_SYNTAX_POSIX_BASIC
(_RE_SYNTAX_POSIX_COMMON | RE_BK_PLUS_QM)

/* Differs from ..._POSIX_BASIC only in that RE_BK_PLUS_QM becomes RE_LIMITED_OPS, i.e., ? \+ | are not recognized. Actually, this isn't minimal, since other operators, such as \, aren't disabled. */
#define RE_SYNTAX_POSIX_MINIMAL_BASIC
(_RE_SYNTAX_POSIX_COMMON | RE_CONTEXT_INDEP_ANCHORS | RE_CONTEXT_INVALID_OPS | RE_NO_BK_BRACES | RE_NO_BK_PARENS | RE_NO_BK_VBAR | RE_UNMATCHED_RIGHT_PAREN_ORD)

#define RE_SYNTAX_POSIX_EXTENDED
(_RE_SYNTAX_POSIX_COMMON | RE_CONTEXT_INDEP_ANCHORS | RE_CONTEXT_INDEP_OPS | RE_NO_BK_BRACES | RE_NO_BK_PARENS | RE_NO_BK_VBAR | RE_UNMATCHED_RIGHT_PAREN_ORD)

/* Differs from ..._POSIX_EXTENDED in that RE_CONTEXT_INVALID_OPS replaces RE_CONTEXT_INDEP_OPS and RE_NO_BK_REFS is added. */
#define RE_SYNTAX_POSIX_MINIMAL_EXTENDED
(_RE_SYNTAX_POSIX_COMMON | RE_CONTEXT_INDEP_ANCHORS | RE_CONTEXT_INVALID_OPS | RE_NO_BK_BRACES | RE_NO_BK_PARENS | RE_NO_BK_REFS | RE_NO_BK_VBAR | RE_UNMATCHED_RIGHT_PAREN_ORD)
18.2.3 Collating Elements vs. Characters

POSIX generalizes the notion of a character to that of a collating element. It defines a collating element to be “a sequence of one or more bytes defined in the current collating sequence as a unit of collation.”

This generalizes the notion of a character in two ways. First, a single character can map into two or more collating elements. For example, the German “ß” collates as the collating element ‘s’ followed by another collating element ‘s’. Second, two or more characters can map into one collating element. For example, the Czech ‘ch’ collates after ‘h’ and before ‘i’.

Since POSIX’s “collating element” preserves the essential idea of a “character,” we use the latter, more familiar, term in this document.

18.2.4 The Backslash Character

The ‘\’ character has one of four different meanings, depending on the context in which you use it and what syntax bits are set (see Section 18.2.1 [Syntax Bits], page 804). It can: 1) stand for itself, 2) quote the next character, 3) introduce an operator, or 4) do nothing.

1. It stands for itself inside a list (see Section 18.3.6 [List Operators], page 812) if the syntax bit RE_BACKSLASH_ESCAPE_IN_LISTS is not set. For example, ‘[\]’ would match ‘\’.

2. It quotes (makes ordinary, if it’s special) the next character when you use it either:
   - outside a list, or
   - inside a list and the syntax bit RE_BACKSLASH_ESCAPE_IN_LISTS is set.

3. It introduces an operator when followed by certain ordinary characters—sometimes only when certain syntax bits are set. See the cases RE_BK_PLUS_QM, RE_NO_BK_BRACES, RE_NO_BK_VAR, RE_NO_BK_PARENS, RE_NO_BK_REF in Section 18.2.1 [Syntax Bits], page 804. Also:
   - ‘\b’ represents the match-word-boundary operator (see Section 18.4.1.1 [Match-word-boundary Operator], page 817).
   - ‘\B’ represents the match-within-word operator (see Section 18.4.1.2 [Match-within-word Operator], page 817).
   - ‘\<’ represents the match-beginning-of-word operator (see Section 18.4.1.3 [Match-beginning-of-word Operator], page 817).
   - ‘\>’ represents the match-end-of-word operator (see Section 18.4.1.4 [Match-end-of-word Operator], page 817).
   - ‘\w’ represents the match-word-constituent operator (see Section 18.4.1.5 [Match-word-constituent Operator], page 817).

\footnote{Sometimes you don’t have to explicitly quote special characters to make them ordinary. For instance, most characters lose any special meaning inside a list (see Section 18.3.6 [List Operators], page 812). In addition, if the syntax bits RE_CONTEXT_INVALID_OPS and RE_CONTEXT_INDEP_OPS aren’t set, then (for historical reasons) the matcher considers special characters ordinary if they are in contexts where the operations they represent make no sense; for example, then the match-zero-or-more operator (represented by ‘*’) matches itself in the regular expression ‘*foo’ because there is no preceding expression on which it can operate. It is poor practice, however, to depend on this behavior; if you want a special character to be ordinary outside a list, it’s better to always quote it, regardless.}
• ‘\W’ represents the match-non-word-constituent operator (see Section 18.4.1.6 [Match-non-word-constituent Operator], page 817).
• ‘\sclass’ is equivalent to ‘[[:space:]]’ (see Section 18.4.2.1 [Match-space Operator], page 817).
• ‘\Sclass’ is equivalent to ‘^[[:space:]]’ (see Section 18.4.2.2 [Match-non-space Operator], page 817).
• ‘\’ represents the match-beginning-of-string operator and ‘\’ represents the match-end-of-string operator (see Section 18.4.3 [Whole-string Operators], page 817).

4. In all other cases, Regex ignores ‘\’. For example, ‘\n’ matches ‘n’.

18.3 Common Operators

You compose regular expressions from operators. In the following sections, we describe the regular expression operators specified by POSIX; GNU also uses these. Most operators have more than one representation as characters. See Section 18.2 [Regular Expression Syntax], page 803, for what characters represent what operators under what circumstances.

For most operators that can be represented in two ways, one representation is a single character and the other is that character preceded by ‘\’. For example, either ‘(’ or ‘\(’ represents the open-group operator. Which one does depends on the setting of a syntax bit, in this case RE_NO_BK_PARENS. Why is this so? Historical reasons dictate some of the varying representations, while POSIX dictates others.

Finally, almost all characters lose any special meaning inside a list (see Section 18.3.6 [List Operators], page 812).

18.3.1 The Match-self Operator (ordinary character)

This operator matches the character itself. All ordinary characters (see Section 18.2 [Regular Expression Syntax], page 803) represent this operator. For example, ‘f’ is always an ordinary character, so the regular expression ‘f’ matches only the string ‘f’. In particular, it does not match the string ‘ff’.

18.3.2 The Match-any-character Operator (.)

This operator matches any single printing or nonprinting character except it won’t match a:

newline if the syntax bit RE_DOT_NEWLINE isn’t set.
nul if the syntax bit RE_DOT_NOT_NULL is set.

The ‘.’ (period) character represents this operator. For example, ‘a.b’ matches any three-character string beginning with ‘a’ and ending with ‘b’.

18.3.3 The Concatenation Operator

This operator concatenates two regular expressions a and b. No character represents this operator; you simply put b after a. The result is a regular expression that will match a string if a matches its first part and b matches the rest. For example, ‘xy’ (two match-self operators) matches ‘xy’.
18.3.4 Repetition Operators

Repetition operators repeat the preceding regular expression a specified number of times.

18.3.4.1 The Match-zero-or-more Operator (\(*\))

This operator repeats the smallest possible preceding regular expression as many times as necessary (including zero) to match the pattern. \(*\) represents this operator. For example, \(o^*\) matches any string made up of zero or more \(o\)'s. Since this operator operates on the smallest preceding regular expression, \(fo^*\) has a repeating \(o\), not a repeating \(fo\). So, \(fo^*\) matches \(f\), \(fo\), \(foo\), and so on.

Since the match-zero-or-more operator is a suffix operator, it may be useless as such when no regular expression precedes it. This is the case when it:

- is first in a regular expression, or
- follows a match-beginning-of-line, open-group, or alternation operator.

Three different things can happen in these cases:

1. If the syntax bit `RE_CONTEXT_INVALID_OPS` is set, then the regular expression is invalid.
2. If `RE_CONTEXT_INVALID_OPS` isn’t set, but `RE_CONTEXT_INDEP_OPS` is, then `*` represents the match-zero-or-more operator (which then operates on the empty string).
3. Otherwise, `*` is ordinary.

The matcher processes a match-zero-or-more operator by first matching as many repetitions of the smallest preceding regular expression as it can. Then it continues to match the rest of the pattern.

If it can’t match the rest of the pattern, it backtracks (as many times as necessary), each time discarding one of the matches until it can either match the entire pattern or be certain that it cannot get a match. For example, when matching `ca*ar` against `caaar`, the matcher first matches all three `a`'s of the string with the `a*` of the regular expression. However, it cannot then match the final `ar` of the regular expression against the final `r` of the string. So it backtracks, discarding the match of the last `a` in the string. It can then match the remaining `ar`.

18.3.4.2 The Match-one-or-more Operator (+ or \(+\))

If the syntax bit `RE_LIMITED_OPS` is set, then Regex doesn’t recognize this operator. Otherwise, if the syntax bit `RE_BK_PLUS_QM` isn’t set, then `+` represents this operator; if it is, then `\+` does.

This operator is similar to the match-zero-or-more operator except that it repeats the preceding regular expression at least once; see Section 18.3.4.1 [Match-zero-or-more Operator], page 810, for what it operates on, how some syntax bits affect it, and how Regex backtracks to match it.

For example, supposing that `+` represents the match-one-or-more operator; then `ca+r` matches, e.g., `car` and `caaaar`, but not `cr`.

18.3.4.3 The Match-zero-or-one Operator (? or \(?\))

If the syntax bit `RE_LIMITED_OPS` is set, then Regex doesn’t recognize this operator. Otherwise, if the syntax bit `RE_BK_PLUS_QM` isn’t set, then `?` represents this operator; if it is, then `\?` does.
This operator is similar to the match-zero-or-more operator except that it repeats the preceding regular expression once or not at all; see Section 18.3.4.1 [Match-zero-or-more Operator], page 810, to see what it operates on, how some syntax bits affect it, and how Regex backtracks to match it.

For example, supposing that ‘?’ represents the match-zero-or-one operator; then ‘ca?r’ matches both ‘car’ and ‘cr’, but nothing else.

18.3.4.4 Interval Operators ({ . . . } or \{ . . . \})

If the syntax bit RE_INTERVALS is set, then Regex recognizes interval expressions. They repeat the smallest possible preceding regular expression a specified number of times.

If the syntax bit RE_NO_BK_BRACES is set, ‘{’ represents the open-interval operator and ‘}’ represents the close-interval operator; otherwise, ‘\{’ and ‘\}’ do.

Specifically, supposing that ‘{’ and ‘}’ represent the open-interval and close-interval operators; then:

- \{count\} matches exactly count occurrences of the preceding regular expression.
- \{min,\} matches min or more occurrences of the preceding regular expression.
- \{min, max\} matches at least min but no more than max occurrences of the preceding regular expression.

The interval expression (but not necessarily the regular expression that contains it) is invalid if:

- min is greater than max, or
- any of count, min, or max are outside the range zero to RE_DUP_MAX (which symbol regex.h defines).

If the interval expression is invalid and the syntax bit RE_NO_BK_BRACES is set, then Regex considers all the characters in the would-be interval to be ordinary. If that bit isn’t set, then the regular expression is invalid.

If the interval expression is valid but there is no preceding regular expression on which to operate, then if the syntax bit RE_CONTEXT_INVALID_OPS is set, the regular expression is invalid. If that bit isn’t set, then Regex considers all the characters—other than backslashes, which it ignores—in the would-be interval to be ordinary.

18.3.5 The Alternation Operator (| or \|)

If the syntax bit RE_LIMITED_OPS is set, then Regex doesn’t recognize this operator. Otherwise, if the syntax bit RE_NO_BK_VBAR is set, then ‘\|’ represents this operator; otherwise, ‘\|’ does.

Alternatives match one of a choice of regular expressions: if you put the character(s) representing the alternation operator between any two regular expressions a and b, the result matches the union of the strings that a and b match. For example, supposing that ‘\|’ is the alternation operator, then ‘foo|bar|quux’ would match any of ‘foo’, ‘bar’ or ‘quux’.

The alternation operator operates on the largest possible surrounding regular expressions. (Put another way, it has the lowest precedence of any regular expression operator.) Thus, the only way you can delimit its arguments is to use grouping. For example, if ‘(’ and
Regular expressions

The open and close-group operators, then `foo(o|b)ar` would match either `fooar` or `fobar`. (`foo|bar` would match `foo` or `bar`.)

The matcher usually tries all combinations of alternatives so as to match the longest possible string. For example, when matching `(foo|foo)*(qbarquux|bar)` against `fooqbarquux`, it cannot take, say, the first (“depth-first”) combination it could match, since then it would be content to match just `fooqbar`.

Note that since the default behavior is to return the leftmost longest match, when more than one of a series of alternatives matches the actual match will be the longest matching alternative, not necessarily the first in the list.

18.3.6 List Operators ([ . . . ] and [~ . . . ])

Lists, also called bracket expressions, are a set of one or more items. An item is a character, a collating symbol, an equivalence class expression, a character class expression, or a range expression. The syntax bits affect which kinds of items you can put in a list. We explain the last four items in subsections below. Empty lists are invalid.

A matching list matches a single character represented by one of the list items. You form a matching list by enclosing one or more items within an open-matching-list operator (represented by `[`) and a close-list operator (represented by `]`).

For example, `[^ab]` matches any character except `a` or `b`. `[^ad]` matches the empty string and any string composed of just `a`'s and `d`'s in any order. Regex considers invalid a regular expression with a `[` but no matching `]`.

Nonmatching lists are similar to matching lists except that they match a single character not represented by one of the list items. You use an open-nonmatching-list operator (represented by `[~`) instead of an open-matching-list operator to start a nonmatching list.

For example, `[^-ab]` matches any character except `a` or `b`.

If the syntax bit RE_HAT_LISTS_NOT_NEWLINE is set, then nonmatching lists do not match a newline.

Most characters lose any special meaning inside a list. The special characters inside a list follow.

`[ ]` ends the list if it’s not the first list item. So, if you want to make the `[` character a list item, you must put it first.

`\` quotes the next character if the syntax bit RE_BACKSLASH_ESCAPE_IN_lists is set.

`[..]` represents the open-collating-symbol operator (see Section 18.3.6.1 [Collating Symbol Operators], page 813).

`. ]` represents the close-collating-symbol operator.

`[=]` represents the open-equivalence-class operator (see Section 18.3.6.2 [Equivalence Class Operators], page 813).

`= ]` represents the close-equivalence-class operator.

---

2 Regex therefore doesn’t consider the `~` to be the first character in the list. If you put a `~` character first in (what you think is) a matching list, you’ll turn it into a nonmatching list.
Chapter 18: Regular expressions

‘[’ represents the open-character-class operator (see Section 18.3.6.3 [Character Class Operators], page 813) if the syntax bit `RE_CHAR_CLASSES` is set and what follows is a valid character class expression.

‘:]’ represents the close-character-class operator if the syntax bit `RE_CHAR_CLASSES` is set and what precedes it is an open-character-class operator followed by a valid character class name.

‘-’ represents the range operator (see Section 18.3.6.4 [Range Operator], page 814) if it’s not first or last in a list or the ending point of a range.

All other characters are ordinary. For example, ‘[.∗]’ matches ‘.’ and ‘∗’.

18.3.6.1 Collating Symbol Operators ([. . . ])  
Collating symbols can be represented inside lists. You form a *collating symbol* by putting a collating element between an open-collating-symbol operator and a close-collating-symbol operator. ‘[.’ represents the open-collating-symbol operator and ‘.]’ represents the close-collating-symbol operator. For example, if ‘11’ is a collating element, then ‘[[.11.]]’ would match ‘11’.

18.3.6.2 Equivalence Class Operators ([= . . . =])  
Regex recognizes equivalence class expressions inside lists. A *equivalence class expression* is a set of collating elements which all belong to the same equivalence class. You form an equivalence class expression by putting a collating element between an open-equivalence-class operator and a close-equivalence-class operator. ‘[=’ represents the open-equivalence-class operator and ‘=]’ represents the close-equivalence-class operator. For example, if ‘a’ and ‘A’ were an equivalence class, then both ‘[[=a=]]’ and ‘[=A=]’ would match both ‘a’ and ‘A’. If the collating element in an equivalence class expression isn’t part of an equivalence class, then the matcher considers the equivalence class expression to be a collating symbol.

18.3.6.3 Character Class Operators ([: . . . :])  
If the syntax bit `RE_CHAR_CLASSES` is set, then Regex recognizes character class expressions inside lists. A *character class expression* matches one character from a given class. You form a character class expression by putting a character class name between an open-character-class operator (represented by ‘[’ and a close-character-class operator (represented by ‘]’). The character class names and their meanings are:

- **alnum** letters and digits
- **alpha** letters
- **blank** system-dependent; for GNU, a space or tab
- **cntrl** control characters (in the ASCII encoding, code 0177 and codes less than 040)
- **digit** digits
- **graph** same as **print** except omits space
- **lower** lowercase letters
- **print** printable characters (in the ASCII encoding, space tilde—codes 040 through 0176)
Chapter 18: Regular expressions

punct neither control nor alphanumerical characters
space space, carriage return, newline, vertical tab, and form feed
upper uppercase letters
xdigit hexadecimal digits: 0–9, a–f, A–F

These correspond to the definitions in the C library’s `<ctype.h>` facility. For example, `[:alpha:]` corresponds to the standard facility `isalpha`. Regex recognizes character class expressions only inside of lists; so `[:alpha:]` matches any letter, but `[:alpha:]` outside of a bracket expression and not followed by a repetition operator matches just itself.

18.3.6.4 The Range Operator (–)

Regex recognizes range expressions inside a list. They represent those characters that fall between two elements in the current collating sequence. You form a range expression by putting a range operator between two of any of the following: characters, collating elements, collating symbols, and equivalence class expressions. The starting point of the range and the ending point of the range don’t have to be the same kind of item, e.g., the starting point could be a collating element and the ending point could be an equivalence class expression. If a range’s ending point is an equivalence class, then all the collating elements in that class will be in the range.³ `–` represents the range operator. For example, `a–f` within a list represents all the characters from `a` through `f` inclusively.

If the syntax bit `RE_NO_EMPTY_RANGES` is set, then if the range’s ending point collates less than its starting point, the range (and the regular expression containing it) is invalid. For example, the regular expression `*[z-a]` would be invalid. If this bit isn’t set, then Regex considers such a range to be empty.

Since `–` represents the range operator, if you want to make a `–` character itself a list item, you must do one of the following:

- Put the `–` either first or last in the list.
- Include a range whose starting point collates strictly lower than `–` and whose ending point collates equal or higher. Unless a range is the first item in a list, a `–` can’t be its starting point, but can be its ending point. That is because Regex considers `–` to be the range operator unless it is preceded by another `–`. For example, in the ASCII encoding, `*` and `/` are contiguous characters in the collating sequence. You might think that `/[+-]/` has two ranges: `+/` and `/–/`. Rather, it has the ranges `+/` and `/–/`, plus the character `/`, so it matches, e.g., ``, not `.
- Put a range whose starting point is `–` first in the list.

For example, `[a-zA-Z]` matches a lowercase letter or a hyphen (in English, in ASCII).

18.3.7 Grouping Operators (( . . . ) or \( . . . \))

A group, also known as a subexpression, consists of an open-group operator, any number of other operators, and a close-group operator. Regex treats this sequence as a unit, just as mathematics and programming languages treat a parenthesized expression as a unit.

³ You can’t use a character class for the starting or ending point of a range, since a character class is not a single character.
Therefore, using groups, you can:

- delimit the argument(s) to an alternation operator (see Section 18.3.5 [Alternation Operator], page 811) or a repetition operator (see Section 18.3.4 [Repetition Operators], page 810).
- keep track of the indices of the substring that matched a given group. See Section 18.6.1.8 [Using Registers], page 823, for a precise explanation. This lets you:
  - use the back-reference operator (see Section 18.3.8 [Back-reference Operator], page 815).
  - use registers (see Section 18.6.1.8 [Using Registers], page 823).

If the syntax bit `RE_NO_BK_PARENS` is set, then ‘(’ represents the open-group operator and ‘)’ represents the close-group operator; otherwise, ‘\(’ and ‘\)’ do.

If the syntax bit `RE_UNMATCHED_RIGHT_PAREN_ORD` is set and a close-group operator has no matching open-group operator, then Regex considers it to match ‘)’.

### 18.3.8 The Back-reference Operator (\(digit\))

If the syntax bit `RE_NO_BK_REF` isn’t set, then Regex recognizes back-references. A back-reference matches a specified preceding group. The back-reference operator is represented by ‘\(digit\)’ anywhere after the end of a regular expression’s `digit`-th group (see Section 18.3.7 [Grouping Operators], page 814).

`digit` must be between ‘1’ and ‘9’. The matcher assigns numbers 1 through 9 to the first nine groups it encounters. By using one of ‘\1’ through ‘\9’ after the corresponding group’s close-group operator, you can match a substring identical to the one that the group does.

Back-references match according to the following (in all examples below, ‘(’ represents the open-group, ‘)’ the close-group, ‘{’ the open-interval and ‘}’ the close-interval operator):

- If the group matches a substring, the back-reference matches an identical substring. For example, ‘(a)\1’ matches ‘aa’ and ‘(banana)\1bo\1’ matches ‘bananabananabobana’. Likewise, ‘(.*)\1’ matches any (newline-free if the syntax bit `RE_DOT_NEWLINE` isn’t set) string that is composed of two identical halves; the ‘(.*)’ matches the first half and the ‘\1’ matches the second half.
- If the group matches more than once (as it might if followed by, e.g., a repetition operator), then the back-reference matches the substring the group last matched. For example, ‘((a*)b)*\1\2’ matches ‘aabababa’; first group 1 (the outer one) matches ‘aab’ and group 2 (the inner one) matches ‘aa’. Then group 1 matches ‘ab’ and group 2 matches ‘a’. So, ‘\1’ matches ‘ab’ and ‘\2’ matches ‘a’.
- If the group doesn’t participate in a match, i.e., it is part of an alternative not taken or a repetition operator allows zero repetitions of it, then the back-reference makes the whole match fail. For example, ‘(one() | two()) and (three\2 | four\3)’ matches ‘one-and-three’ and ‘two-and-four’, but not ‘one-and-four’ or ‘two-and-three’. For example, if the pattern matches ‘one-and-’, then its group 2 matches the empty string and its group 3 doesn’t participate in the match. So, if it then matches ‘four’, then when it tries to back-reference group 3—which it will attempt to do because ‘\3’ follows the ‘four’—the match will fail because group 3 didn’t participate in the match.
You can use a back-reference as an argument to a repetition operator. For example, `(a(b))\2*` matches ‘a’ followed by two or more ‘b’s. Similarly, `(a(b))\2{3}` matches ‘abbbb’.

If there is no preceding digit-th subexpression, the regular expression is invalid.

Back-references can greatly slow down matching, as they can generate exponentially many matching possibilities that can consume both time and memory to explore. Also, the POSIX specification for back-references is at times unclear. Furthermore, many regular expression implementations have back-reference bugs that can cause programs to return incorrect answers or even crash, and fixing these bugs has often been low-priority: for example, as of 2020 the GNU C library bug database (https://sourceware.org/bugzilla/) contained back-reference bugs 52, 10844, 11053, 24269 and 25322, with little sign of forthcoming fixes. Luckily, back-references are rarely useful and it should be little trouble to avoid them in practical applications.

18.3.9 Anchoring Operators

These operators can constrain a pattern to match only at the beginning or end of the entire string or at the beginning or end of a line.

18.3.9.1 The Match-beginning-of-line Operator (\^)

This operator can match the empty string either at the beginning of the string or after a newline character. Thus, it is said to anchor the pattern to the beginning of a line.

In the cases following, ‘\^’ represents this operator. (Otherwise, ‘\^’ is ordinary.)

- It (the ‘\^’) is first in the pattern, as in ‘\^foo’.
- The syntax bit RE_CONTEXT_INDEP_ANCHORS is set, and it is outside a bracket expression.
- It follows an open-group or alternation operator, as in ‘a\(^b\)’ and ‘a\|^b’. See Section 18.3.7 [Grouping Operators], page 814, and Section 18.3.5 [Alternation Operator], page 811.

These rules imply that some valid patterns containing ‘\^’ cannot be matched; for example, ‘foo\^bar’ if RE_CONTEXT_INDEP_ANCHORS is set.

If the not_bol field is set in the pattern buffer (see Section 18.6.1.1 [GNU Pattern Buffers], page 818), then ‘\^’ fails to match at the beginning of the string. This lets you match against pieces of a line, as you would need to if, say, searching for repeated instances of a given pattern in a line; it would work correctly for patterns both with and without match-beginning-of-line operators.

18.3.9.2 The Match-end-of-line Operator ($)

This operator can match the empty string either at the end of the string or before a newline character in the string. Thus, it is said to anchor the pattern to the end of a line.

It is always represented by ‘\$’. For example, ‘foo\$’ usually matches, e.g., ‘foo’ and, e.g., the first three characters of ‘foo\nbar’.

Its interaction with the syntax bits and pattern buffer fields is exactly the dual of ‘\^’s; see the previous section. (That is, ‘\^’ becomes ‘\$’, “beginning” becomes “end”, “next” becomes “previous”, “after” becomes “before”, and “not_bol” becomes “not_eol”.)
18.4 GNU Operators

The following are operators that GNU defines (and POSIX doesn’t) that you can use unless the syntax bit `RE_NO_GNU_OPS` is set.

18.4.1 Word Operators

The operators in this section require Regex to recognize parts of words. Characters that are part of words, which are called `word-constituent`, are letters, digits, and the underscore (`_`); more precisely, any character in the POSIX class `alnum` in the current locale, or underscore.

18.4.1.1 The Match-word-boundary Operator (\b)

This operator (represented by `\b`) matches the empty string at either the beginning or the end of a word. For example, `\brat\b` matches the separate word `rat`.

18.4.1.2 The Match-within-word Operator (\B)

This operator (represented by `\B`) matches the empty string within a word. For example, `c\Brat\Be` matches `crate`, but `dirty \Brat` doesn’t match `dirty rat`.

18.4.1.3 The Match-beginning-of-word Operator (\<)

This operator (represented by `\<`) matches the empty string at the beginning of a word.

18.4.1.4 The Match-end-of-word Operator (\>)

This operator (represented by `\>`) matches the empty string at the end of a word.

18.4.1.5 The Match-word-constituent Operator (\w)

This operator (represented by `\w`) matches any word-constituent character.

18.4.1.6 The Match-non-word-constituent Operator (\W)

This operator (represented by `\W`) matches any character that is not word-constituent.

18.4.2 Space Operators

18.4.2.1 The Match-space Operator (\s)

This operator (represented by `\s`) matches any space character (that is, in the POSIX class `[:space:]`).

18.4.2.2 The Match-non-space Operator (\S)

This operator (represented by `\S`) matches any character that is not a space (that is, in the POSIX class `[:space:]`).

18.4.3 Whole-string Operators

Following are operators which work on the whole string.

18.4.3.1 The Match-beginning-of-string Operator (\`)

This operator (represented by `\` ) matches the empty string at the beginning of the string.
18.4.3.2 The Match-end-of-string Operator (\')

This operator (represented by '\') matches the empty string at the end of the string.

18.5 What Gets Matched?

Regex usually matches strings according to the “leftmost longest” rule; that is, it chooses the longest of the leftmost matches. This does not mean that for a regular expression containing subexpressions that it simply chooses the longest match for each subexpression, left to right; the overall match must also be the longest possible one.

For example, '(ac*)(c*d[ac]*)\1' matches 'acdacaaa', not 'acdaca', as it would if it were to choose the longest match for the first subexpression.

18.6 Programming with Regex

Here we describe how you use the Regex data structures and functions in C programs. Regex has three interfaces: one designed for GNU, one compatible with POSIX (as specified by POSIX, draft 1003.2/D11.2), and one compatible with Berkeley Unix. The POSIX interface is not documented here; see the documentation of GNU libc, or the POSIX man pages. The Berkeley Unix interface is documented here for convenience, since its documentation is not otherwise readily available on GNU systems.

18.6.1 GNU Regex Functions

If you’re writing code that doesn’t need to be compatible with either POSIX or Berkeley Unix, you can use these functions. They provide more options than the other interfaces.

18.6.1.1 GNU Pattern Buffers

To compile, match, or search for a given regular expression, you must supply a pattern buffer. A pattern buffer holds one compiled regular expression.\(^4\)

You can have several different pattern buffers simultaneously, each holding a compiled pattern for a different regular expression.

`regex.h` defines the pattern buffer `struct` with the following public fields:

```c
unsigned char *buffer;
unsigned long allocated;
char *fastmap;
char *translate;
size_t re_nsub;
unsigned no_sub : 1;
unsigned not_bol : 1;
unsigned not_eol : 1;
```

18.6.1.2 GNU Regular Expression Compiling

In GNU, you can both match and search for a given regular expression. To do either, you must first compile it in a pattern buffer (see Section 18.6.1.1 [GNU Pattern Buffers], page 818).

\(^4\) Regular expressions are also referred to as “patterns,” hence the name “pattern buffer.”
Regular expressions match according to the syntax with which they were compiled; with GNU, you indicate what syntax you want by setting the variable `re_syntax_options` (declared in `regex.h`) before calling the compiling function, `re_compile_pattern` (see below). See Section 18.2.1 [Syntax Bits], page 804, and Section 18.2.2 [Predefined Syntaxes], page 806.

You can change the value of `re_syntax_options` at any time. Usually, however, you set its value once and then never change it.

`re_compile_pattern` takes a pattern buffer as an argument. You must initialize the following fields:

- **translate initialization**
  - `translate`: Initialize this to point to a translate table if you want one, or to zero if you don’t. We explain translate tables in Section 18.6.1.7 [GNU Translate Tables], page 822.

- **fastmap**
  - Initialize this to nonzero if you want a fastmap, or to zero if you don’t.

- **buffer allocated**
  - If you want `re_compile_pattern` to allocate memory for the compiled pattern, set both of these to zero. If you have an existing block of memory (allocated with `malloc`) you want Regex to use, set `buffer` to its address and `allocated` to its size (in bytes).
  - `re_compile_pattern` uses `realloc` to extend the space for the compiled pattern as necessary.

To compile a pattern buffer, use:

```c
char *
re_compile_pattern (const char *regex, const int regex_size,  
                   struct re_pattern_buffer *pattern_buffer)
```

*regex* is the regular expression’s address, *regex_size* is its length, and *pattern_buffer* is the pattern buffer’s address.

If `re_compile_pattern` successfully compiles the regular expression, it returns zero and sets `*pattern_buffer` to the compiled pattern. It sets the pattern buffer’s fields as follows:

- `buffer` to the compiled pattern.
- `syntax` to the current value of `re_syntax_options`.
- `re_nsub` to the number of subexpressions in `regex`.

If `re_compile_pattern` can’t compile `regex`, it returns an error string corresponding to a POSIX error code.

### 18.6.1.3 GNU Matching

Matching the GNU way means trying to match as much of a string as possible starting at a position within it you specify. Once you’ve compiled a pattern into a pattern buffer (see Section 18.6.1.2 [GNU Regular Expression Compiling], page 818), you can ask the matcher to match that pattern against a string using:

```c
int
```

```c```
re_match (struct re_pattern_buffer *pattern_buffer,
    const char *string, const int size,
    const int start, struct re_registers *regs)

pattern_buffer is the address of a pattern buffer containing a compiled pattern. string is
the string you want to match; it can contain newline and null characters. size is the length
of that string. start is the string index at which you want to begin matching; the first
character of string is at index zero. See Section 18.6.1.8 [Using Registers], page 823, for an
explanation of regs; you can safely pass zero.

re_match matches the regular expression in pattern_buffer against the string string
according to the syntax of pattern_buffer. (See Section 18.6.1.2 [GNU Regular Expression
Compiling], page 818, for how to set it.) The function returns −1 if the compiled pattern
does not match any part of string and −2 if an internal error happens; otherwise, it returns
how many (possibly zero) characters of string the pattern matched.

An example: suppose pattern_buffer points to a pattern buffer containing the compiled
pattern for ‘a*’, and string points to ‘aaaaab’ (whereupon size should be 6). Then if start
is 2, re_match returns 3, i.e., ‘a*’ would have matched the last three ‘a’s in string. If start
is 0, re_match returns 5, i.e., ‘a*’ would have matched all the ‘a’s in string. If start is either
5 or 6, it returns zero.

If start is not between zero and size, then re_match returns −1.

18.6.1.4 GNU Searching

Searching means trying to match starting at successive positions within a string. The
function re_search does this.

Before calling re_search, you must compile your regular expression. See Section 18.6.1.2
[GNU Regular Expression Compiling], page 818.

Here is the function declaration:

int
re_search (struct re_pattern_buffer *pattern_buffer,
    const char *string, const int size,
    const int start, const int range,
    struct re_registers *regs)

whose arguments are the same as those to re_match (see Section 18.6.1.3 [GNU Matching],
page 819) except that the two arguments start and range replace re_match’s argument
start.

If range is positive, then re_search attempts a match starting first at index start, then
at start + 1 if that fails, and so on, up to start + range; if range is negative, then it attempts
a match starting first at index start, then at start − 1 if that fails, and so on.

If start is not between zero and size, then re_search returns −1. When range is positive,
re_search adjusts range so that start + range − 1 is between zero and size, if necessary;
that way it won’t search outside of string. Similarly, when range is negative, re_search
adjusts range so that start + range + 1 is between zero and size, if necessary.

If the fastmap field of pattern_buffer is zero, re_search matches starting at consecutive
positions; otherwise, it uses fastmap to make the search more efficient. See Section 18.6.1.6
[Searching with Fastmaps], page 821.
If no match is found, `re_search` returns $-1$. If a match is found, it returns the index where the match began. If an internal error happens, it returns $-2$.

### 18.6.1.5 Matching and Searching with Split Data

Using the functions `re_match_2` and `re_search_2`, you can match or search in data that is divided into two strings.

The function:

```c
int re_match_2 (struct re_pattern_buffer *buffer,
    const char *string1, const int size1,
    const char *string2, const int size2,
    const int start,
    struct re_registers *regs,
    const int stop)
```

is similar to `re_match` (see Section 18.6.1.3 [GNU Matching], page 819) except that you pass two data strings and sizes, and an index `stop` beyond which you don’t want the matcher to try matching. As with `re_match`, if it succeeds, `re_match_2` returns how many characters of `string` it matched. Regard `string1` and `string2` as concatenated when you set the arguments `start` and `stop` and use the contents of `regs`; `re_match_2` never returns a value larger than `size1 + size2`.

The function:

```c
int re_search_2 (struct re_pattern_buffer *buffer,
    const char *string1, const int size1,
    const char *string2, const int size2,
    const int start, const int range,
    struct re_registers *regs,
    const int stop)
```

is similarly related to `re_search`.

### 18.6.1.6 Searching with Fastmaps

If you’re searching through a long string, you should use a fastmap. Without one, the searcher tries to match at consecutive positions in the string. Generally, most of the characters in the string could not start a match. It takes much longer to try matching at a given position in the string than it does to check in a table whether or not the character at that position could start a match. A fastmap is such a table.

More specifically, a fastmap is an array indexed by the characters in your character set. Under the ASCII encoding, therefore, a fastmap has 256 elements. If you want the searcher to use a fastmap with a given pattern buffer, you must allocate the array and assign the array’s address to the pattern buffer’s `fastmap` field. You either can compile the fastmap yourself or have `re_search` do it for you; when `fastmap` is nonzero, it automatically compiles a fastmap the first time you search using a particular compiled pattern.

By setting the buffer’s `fastmap` field before calling `re_compile_pattern`, you can reuse a buffer data structure across multiple searches with different patterns, and allocate the
fastmap only once. Nonetheless, the fastmap must be recompiled each time the buffer has a new pattern compiled into it.

To compile a fastmap yourself, use:

```c
int
re_compile_fastmap (struct re_pattern_buffer *pattern_buffer)
```
pattern_buffer is the address of a pattern buffer. If the character c could start a match for the pattern, re_compile_fastmap makes pattern_buffer->fastmap[c] nonzero. It returns 0 if it can compile a fastmap and −2 if there is an internal error. For example, if ‘l’ is the alternation operator and pattern_buffer holds the compiled pattern for ‘a|b’, then re_compile_fastmap sets fastmap['a'] and fastmap['b'] (and no others).

re_search uses a fastmap as it moves along in the string; it checks the string’s characters until it finds one that’s in the fastmap. Then it tries matching at that character. If the match fails, it repeats the process. So, by using a fastmap, re_search doesn’t waste time trying to match at positions in the string that couldn’t start a match.

If you don’t want re_search to use a fastmap, store zero in the fastmap field of the pattern buffer before calling re_search.

Once you’ve initialized a pattern buffer’s fastmap field, you need never do so again—even if you compile a new pattern in it—provided the way the field is set still reflects whether or not you want a fastmap. re_search will still either do nothing if fastmap is null or, if it isn’t, compile a new fastmap for the new pattern.

### 18.6.1.7 GNU Translate Tables

If you set the translate field of a pattern buffer to a translate table, then the GNU Regex functions to which you’ve passed that pattern buffer use it to apply a simple transformation to all the regular expression and string characters at which they look.

A translate table is an array indexed by the characters in your character set. Under the ASCII encoding, therefore, a translate table has 256 elements. The array’s elements are also characters in your character set. When the Regex functions see a character c, they use translate[c] in its place, with one exception: the character after a ‘\’ is not translated. (This ensures that, the operators, e.g., ‘\B’ and ‘\b’, are always distinguishable.)

For example, a table that maps all lowercase letters to the corresponding uppercase ones would cause the matcher to ignore differences in case. Such a table would map all characters except lowercase letters to themselves, and lowercase letters to the corresponding uppercase ones. Under the ASCII encoding, here’s how you could initialize such a table (we’ll call it case_fold):

```c
for (i = 0; i < 256; i++)
    case_fold[i] = i;
for (i = 'a'; i <= 'z'; i++)
    case_fold[i] = i - ('a' - 'A');
```

You tell Regex to use a translate table on a given pattern buffer by assigning that table’s address to the translate field of that buffer. If you don’t want Regex to do any translation, put zero into this field. You’ll get weird results if you change the table’s contents anytime.

---

5 A table that maps all uppercase letters to the corresponding lowercase ones would work just as well for this purpose.
between compiling the pattern buffer, compiling its fastmap, and matching or searching with the pattern buffer.

### 18.6.1.8 Using Registers

A group in a regular expression can match a (possibly empty) substring of the string that regular expression as a whole matched. The matcher remembers the beginning and end of the substring matched by each group.

To find out what they matched, pass a nonzero `regs` argument to a GNU matching or searching function (see Section 18.6.1.3 [GNU Matching], page 819, and Section 18.6.1.4 [GNU Searching], page 820), i.e., the address of a structure of this type, as defined in `regex.h`:

```c
struct re_registers {
    unsigned num_regs;
    regoff_t *start;
    regoff_t *end;
};
```

Except for (possibly) the `num_regs`'th element (see below), the *i*th element of the `start` and `end` arrays records information about the *i*th group in the pattern. (They’re declared as C pointers, but this is only because not all C compilers accept zero-length arrays; conceptually, it is simplest to think of them as arrays.)

The `start` and `end` arrays are allocated in one of two ways. The simplest and perhaps most useful is to let the matcher (re)allocate enough space to record information for all the groups in the regular expression. If `re_set_registers` is not called before searching or matching, then the matcher allocates two arrays each of `1 + re_ns` elements (`re_ns` is another field in the pattern buffer; see Section 18.6.1.1 [GNU Pattern Buffers], page 818). The extra element is set to −1. Then on subsequent calls with the same pattern buffer and `regs` arguments, the matcher reallocates more space if necessary.

The function:

```c
void re_set_registers (struct re_pattern_buffer *buffer, 
                      struct re_registers *regs, 
                      size_t num_regs, 
                      regoff_t *starts, regoff_t *ends)
```

sets `regs` to hold `num_regs` registers, storing them in `starts` and `ends`. Subsequent matches using `buffer` and `regs` will use this memory for recording register information. `starts` and `ends` must be allocated with `malloc`, and must each be at least `num_regs*sizeof(regoff_t)` bytes long.

If `num_regs` is zero, then subsequent matches should allocate their own register data.

Unless this function is called, the first search or match using `buffer` will allocate its own register data, without freeing the old data.

The following examples illustrate the information recorded in the `re_registers` structure. (In all of them, ‘(’ represents the open-group and ‘)’ the close-group operator. The first character in the string `string` is at index 0.)
• If the regular expression has an \textit{i}-th group that matches a substring of \textit{string}, then the function sets \textit{regs->start[i]} to the index in \textit{string} where the substring matched by the \textit{i}-th group begins, and \textit{regs->end[i]} to the index just beyond that substring's end. The function sets \textit{regs->start[0]} and \textit{regs->end[0]} to analogous information about the entire pattern.

For example, when you match ‘((a)(b))’ against ‘ab’, you get:

• 0 in \textit{regs->start[0]} and 2 in \textit{regs->end[0]}
• 0 in \textit{regs->start[1]} and 2 in \textit{regs->end[1]}
• 0 in \textit{regs->start[2]} and 1 in \textit{regs->end[2]}
• 1 in \textit{regs->start[3]} and 2 in \textit{regs->end[3]}

• If a group matches more than once (as it might if followed by, e.g., a repetition operator), then the function reports the information about what the group last matched.

For example, when you match the pattern ‘(a)*’ against the string ‘aa’, you get:

• 0 in \textit{regs->start[0]} and 2 in \textit{regs->end[0]}
• 1 in \textit{regs->start[1]} and 2 in \textit{regs->end[1]}

• If the \textit{i}-th group does not participate in a successful match, e.g., it is an alternative not taken or a repetition operator allows zero repetitions of it, then the function sets \textit{regs->start[i]} and \textit{regs->end[i]} to −1.

For example, when you match the pattern ‘(a)*b’ against the string ‘b’, you get:

• 0 in \textit{regs->start[0]} and 1 in \textit{regs->end[0]}
• −1 in \textit{regs->start[1]} and −1 in \textit{regs->end[1]}

• If the \textit{i}-th group matches a zero-length string, then the function sets \textit{regs->start[i]} and \textit{regs->end[i]} to the index just beyond that zero-length string.

For example, when you match the pattern ‘(a*)b’ against the string ‘b’, you get:

• 0 in \textit{regs->start[0]} and 1 in \textit{regs->end[0]}
• 0 in \textit{regs->start[1]} and 0 in \textit{regs->end[1]}

• If an \textit{i}-th group contains a \textit{j}-th group in turn not contained within any other group within group \textit{i} and the function reports a match of the \textit{i}-th group, then it records in \textit{regs->start[j]} and \textit{regs->end[j]} the last match (if it matched) of the \textit{j}-th group.

For example, when you match the pattern ‘((a*)b)*’ against the string ‘abb’, group 2 last matches the empty string, so you get what it previously matched:

• 0 in \textit{regs->start[0]} and 3 in \textit{regs->end[0]}
• 2 in \textit{regs->start[1]} and 3 in \textit{regs->end[1]}
• 2 in \textit{regs->start[2]} and 2 in \textit{regs->end[2]}

When you match the pattern ‘((a)*b)∗’ against the string ‘abb’, group 2 doesn’t participate in the last match, so you get:

• 0 in \textit{regs->start[0]} and 3 in \textit{regs->end[0]}
• 2 in \textit{regs->start[1]} and 3 in \textit{regs->end[1]}
• 0 in \textit{regs->start[2]} and 1 in \textit{regs->end[2]}
• If an i-th group contains a j-th group in turn not contained within any other group within group i and the function sets \texttt{regs->start[i]} and \texttt{regs->end[i]} to $-1$, then it also sets \texttt{regs->start[j]} and \texttt{regs->end[j]} to $-1$.

For example, when you match the pattern ‘((a)*b)*c’ against the string ‘c’, you get:

• 0 in \texttt{regs->start[0]} and 1 in \texttt{regs->end[0]}
• $-1$ in \texttt{regs->start[1]} and $-1$ in \texttt{regs->end[1]}
• $-1$ in \texttt{regs->start[2]} and $-1$ in \texttt{regs->end[2]}

### 18.6.1.9 Freeing GNU Pattern Buffers

To free any allocated fields of a pattern buffer, use the POSIX function \texttt{regfree}:

```c
void
regfree (regex_t *preg)
```

\texttt{preg} is the pattern buffer whose allocated fields you want freed; this works because since the type \texttt{regex_t}—the type for POSIX pattern buffers—is equivalent to the type \texttt{re_pattern_buffer}.

\texttt{regfree} also sets \texttt{preg}’s \texttt{allocated} field to zero. After a buffer has been freed, it must have a regular expression compiled in it before passing it to a matching or searching function.

### 18.6.2 BSD Regex Functions

If you’re writing code that has to be Berkeley Unix compatible, you’ll need to use these functions whose interfaces are the same as those in Berkeley Unix.

#### 18.6.2.1 BSD Regular Expression Compiling

With Berkeley Unix, you can only search for a given regular expression; you can’t match one. To search for it, you must first compile it. Before you compile it, you must indicate the regular expression syntax you want it compiled according to by setting the variable \texttt{re_syntax_options} (declared in \texttt{regex.h}) to some syntax (see Section 18.2 [Regular Expression Syntax], page 803).

To compile a regular expression use:

```c
char *
re_comp (char *regex)
```

\texttt{regex} is the address of a null-terminated regular expression. \texttt{re_comp} uses an internal pattern buffer, so you can use only the most recently compiled pattern buffer. This means that if you want to use a given regular expression that you’ve already compiled—but it isn’t the latest one you’ve compiled—you’ll have to recompile it. If you call \texttt{re_comp} with the null string (not the empty string) as the argument, it doesn’t change the contents of the pattern buffer.

If \texttt{re_comp} successfully compiles the regular expression, it returns zero. If it can’t compile the regular expression, it returns an error string. \texttt{re_comp}’s error messages are identical to those of \texttt{re_compile_pattern} (see Section 18.6.1.2 [GNU Regular Expression Compiling], page 818).
18.6.2.2 BSD Searching

Searching the Berkeley Unix way means searching in a string starting at its first character and trying successive positions within it to find a match. Once you’ve compiled a pattern using `re_comp` (see Section 18.6.2.1 [BSD Regular Expression Compiling], page 825), you can ask Regex to search for that pattern in a string using:

```c
int re_exec (char *string)
```

`string` is the address of the null-terminated string in which you want to search.

`re_exec` returns either 1 for success or 0 for failure. It automatically uses a GNU fastmap (see Section 18.6.1.6 [Searching with Fastmaps], page 821).

18.7 Regular expression syntaxes

Gnulib supports many different types of regular expressions; although the underlying features are the same or identical, the syntax used varies. The descriptions given here for the different types are generated automatically.

18.7.1 ‘awk’ regular expression syntax

The character ‘.’ matches any single character except the null character.

- ‘+’ indicates that the regular expression should match one or more occurrences of the previous atom or regexp.
- ‘?’ indicates that the regular expression should match zero or one occurrence of the previous atom or regexp.
- ‘\+’ matches a ‘+’
- ‘\?’ matches a ‘?’.

Bracket expressions are used to match ranges of characters. Bracket expressions where the range is backward, for example ‘[z-a]’, are invalid. Within square brackets, ‘\’ can be used to quote the following character. Character classes are supported; for example ‘[[[:digit:]]]’ will match a single decimal digit.


Grouping is performed with parentheses ‘()’. An unmatched ‘)’ matches just itself. A backslash followed by a digit matches that digit.

The alternation operator is ‘|’.

The characters ‘\s’ and ‘\$’ always represent the beginning and end of a string respectively, except within square brackets. Within brackets, ‘\’ can be used to invert the membership of the character class being specified.

‘*’, ‘+’ and ‘?’ are special at any point in a regular expression except:
1. At the beginning of a regular expression
2. After an open-group, signified by ‘{‘
3. After the alternation operator ‘|’

The longest possible match is returned; this applies to the regular expression as a whole and (subject to this constraint) to subexpressions within groups.
18.7.2 ‘egrep’ regular expression syntax

The character ‘.’ matches any single character.

‘+’ indicates that the regular expression should match one or more occurrences of the previous atom or regexp.

‘?’ indicates that the regular expression should match zero or one occurrence of the previous atom or regexp.

‘\+’ matches a ‘+’

‘\?’ matches a ‘?’.

Bracket expressions are used to match ranges of characters. Bracket expressions where the range is backward, for example ‘[z-a]’, are invalid. Within square brackets, ‘\’ is taken literally. Character classes are supported; for example ‘[[[:digit:]]]’ will match a single decimal digit.

GNU extensions are supported:
1. '\w' matches a character within a word
2. '\W' matches a character which is not within a word
3. '\<' matches the beginning of a word
4. '\>' matches the end of a word
5. '\b' matches a word boundary
6. '\B' matches characters which are not a word boundary
7. '\1' matches the beginning of the whole input
8. '\' matches the end of the whole input

Grouping is performed with parentheses ‘()’. An unmatched ‘)’ matches just itself. A backslash followed by a digit acts as a back-reference and matches the same thing as the previous grouped expression indicated by that number. For example ‘\2’ matches the second group expression. The order of group expressions is determined by the position of their opening parenthesis ‘(’.

The alternation operator is ‘|’.

The characters ‘~’ and ‘$’ always represent the beginning and end of a string respectively, except within square brackets. Within brackets, ‘~’ can be used to invert the membership of the character class being specified.

The characters ‘*’, ‘+’ and ‘?’ are special anywhere in a regular expression.

Intervals are specified by ‘{’ and ‘}’. Invalid intervals are treated as literals, for example ‘a\{1’ is treated as ‘a\{1’

The longest possible match is returned; this applies to the regular expression as a whole and (subject to this constraint) to subexpressions within groups.

18.7.3 ‘ed’ regular expression syntax

The character ‘.’ matches any single character except the null character.

‘\+’ indicates that the regular expression should match one or more occurrences of the previous atom or regexp.
‘\?’ indicates that the regular expression should match zero or one occurrence of the previous atom or regexp.

‘+ and ?’ match themselves.

Bracket expressions are used to match ranges of characters. Bracket expressions where the range is backward, for example ‘[z-a]’, are invalid. Within square brackets, ‘\’ is taken literally. Character classes are supported; for example ‘[[:digit:]]’ will match a single decimal digit.

GNU extensions are supported:
1. ‘\w’ matches a character within a word
2. ‘\W’ matches a character which is not within a word
3. ‘\<’ matches the beginning of a word
4. ‘\>’ matches the end of a word
5. ‘\b’ matches a word boundary
6. ‘\B’ matches characters which are not a word boundary
7. ‘\^’ matches the beginning of the whole input
8. ‘\$’ matches the end of the whole input

Grouping is performed with backslashes followed by parentheses ‘(‘, ‘)’ . A backslash followed by a digit acts as a back-reference and matches the same thing as the previous grouped expression indicated by that number. For example ‘\2’ matches the second group expression. The order of group expressions is determined by the position of their opening parenthesis ‘(‘ .

The alternation operator is ‘\|’ .

The character ‘^’ only represents the beginning of a string when it appears:
1. At the beginning of a regular expression
2. After an open-group, signified by ‘\)’
3. After the alternation operator ‘\|’

The character ‘\$’ only represents the end of a string when it appears:
1. At the end of a regular expression
2. Before a close-group, signified by ‘\)’
3. Before the alternation operator ‘\|’

‘\*, ‘\+’ and ‘\?’ are special at any point in a regular expression except:
1. At the beginning of a regular expression
2. After an open-group, signified by ‘\)’
3. After the alternation operator ‘\|’

Intervals are specified by ‘\{‘ and ‘\}’. Invalid intervals such as ‘a\{1z’ are not accepted.

The longest possible match is returned; this applies to the regular expression as a whole and (subject to this constraint) to subexpressions within groups.
18.7.4 ‘emacs’ regular expression syntax

The character ‘.’ matches any single character except newline.

‘+’ indicates that the regular expression should match one or more occurrences of the previous atom or regexp.

‘?’ indicates that the regular expression should match zero or one occurrence of the previous atom or regexp.

‘\+’ matches a ‘+’

‘\?’ matches a ‘?’.

Bracket expressions are used to match ranges of characters. Bracket expressions where the range is backward, for example ‘[z-a]’, are ignored. Within square brackets, ‘\’ is taken literally. Character classes are not supported, so for example you would need to use ‘[0-9]’ instead of ‘[[:digit:]]’.

GNU extensions are supported:
1. ‘\w’ matches a character within a word
2. ‘\W’ matches a character which is not within a word
3. ‘\<’ matches the beginning of a word
4. ‘\>’ matches the end of a word
5. ‘\b’ matches a word boundary
6. ‘\B’ matches characters which are not a word boundary
7. ‘\’ matches the beginning of the whole input
8. ‘\’ matches the end of the whole input

Grouping is performed with backslashes followed by parentheses ‘(’, ‘)’. A backslash followed by a digit acts as a back-reference and matches the same thing as the previous grouped expression indicated by that number. For example ‘\2’ matches the second group expression. The order of group expressions is determined by the position of their opening parenthesis ‘(’.

The alternation operator is ‘\|’.

The character ‘^’ only represents the beginning of a string when it appears:
1. At the beginning of a regular expression
2. After an open-group, signified by ‘(‘
3. After the alternation operator ‘\|’

The character ‘$’ only represents the end of a string when it appears:
1. At the end of a regular expression
2. Before a close-group, signified by ‘)’
3. Before the alternation operator ‘\|’

‘*’, ‘+’ and ‘?’ are special at any point in a regular expression except:
1. At the beginning of a regular expression
2. After an open-group, signified by ‘(‘
3. After the alternation operator ‘\|’
The longest possible match is returned; this applies to the regular expression as a whole and (subject to this constraint) to subexpressions within groups.

18.7.5 ‘gnu-awk’ regular expression syntax

The character ‘.’ matches any single character.

- ‘+’ indicates that the regular expression should match one or more occurrences of the previous atom or regexp.
- ‘?’ indicates that the regular expression should match zero or one occurrence of the previous atom or regexp.
- ‘\+’ matches a ‘+’
- ‘\?’ matches a ‘?’.

Bracket expressions are used to match ranges of characters. Bracket expressions where the range is backward, for example ‘[z-a]’, are invalid. Within square brackets, ‘\’ can be used to quote the following character. Character classes are supported; for example ‘[[:digit:]]’ will match a single decimal digit.

GNU extensions are supported:
1. ‘\w’ matches a character within a word
2. ‘\W’ matches a character which is not within a word
3. ‘\<’ matches the beginning of a word
4. ‘\>’ matches the end of a word
5. ‘\b’ matches a word boundary
6. ‘\B’ matches characters which are not a word boundary
7. ‘\‘ matches the beginning of the whole input
8. ‘\’ matches the end of the whole input

Grouping is performed with parentheses ‘()’. An unmatched ‘)’ matches just itself. A backslash followed by a digit acts as a back-reference and matches the same thing as the previous grouped expression indicated by that number. For example ‘\2’ matches the second group expression. The order of group expressions is determined by the position of their opening parenthesis ‘(’.

The alternation operator is ‘|’.

The characters ‘*’ and ‘$’ always represent the beginning and end of a string respectively, except within square brackets. Within brackets, ‘^’ can be used to invert the membership of the character class being specified.

‘*’, ‘+’ and ‘?’ are special at any point in a regular expression except:
1. At the beginning of a regular expression
2. After an open-group, signified by ‘(‘
3. After the alternation operator ‘|’

Intervals are specified by ‘{’ and ‘}’. Invalid intervals are treated as literals, for example ‘a{1’ is treated as ‘a\{1’

The longest possible match is returned; this applies to the regular expression as a whole and (subject to this constraint) to subexpressions within groups.
18.7.6 ‘grep’ regular expression syntax

The character ‘.’ matches any single character.

‘\+’ indicates that the regular expression should match one or more occurrences of the previous atom or regexp.

‘\?’ indicates that the regular expression should match zero or one occurrence of the previous atom or regexp.

‘+ and ?’ match themselves.

Bracket expressions are used to match ranges of characters. Bracket expressions where the range is backward, for example ‘[z-a]’, are invalid. Within square brackets, ‘\’ is taken literally. Character classes are supported; for example ‘[[:digit:]]’ will match a single decimal digit.

GNU extensions are supported:
1. ‘\w’ matches a character within a word
2. ‘\W’ matches a character which is not within a word
3. ‘\<’ matches the beginning of a word
4. ‘\>’ matches the end of a word
5. ‘\b’ matches a word boundary
6. ‘\B’ matches characters which are not a word boundary
7. ‘\`’ matches the beginning of the whole input
8. ‘\’’ matches the end of the whole input

Grouping is performed with backslashes followed by parentheses ‘( \c, \)’. A backslash followed by a digit acts as a back-reference and matches the same thing as the previous grouped expression indicated by that number. For example ‘\2’ matches the second group expression. The order of group expressions is determined by the position of their opening parenthesis ‘(’.

The alternation operator is ‘\|’.

The character ‘^’ only represents the beginning of a string when it appears:
1. At the beginning of a regular expression
2. After an open-group, signified by ‘(‘
3. After a newline
4. After the alternation operator ‘\|’

The character ‘$’ only represents the end of a string when it appears:
1. At the end of a regular expression
2. Before a close-group, signified by ‘\)’
3. Before a newline
4. Before the alternation operator ‘\|’

‘\*’, ‘\+’ and ‘\?’ are special at any point in a regular expression except:
1. At the beginning of a regular expression
2. After an open-group, signified by ‘(‘
Chapter 18: Regular expressions

3. After a newline
4. After the alternation operator ‘\|’

Intervals are specified by ‘\{’ and ‘\}’. Invalid intervals such as ‘a\{1z’ are not accepted.

The longest possible match is returned; this applies to the regular expression as a whole and (subject to this constraint) to subexpressions within groups.

18.7.7 ‘posix-awk’ regular expression syntax

The character ‘.’ matches any single character except the null character.

‘+’ indicates that the regular expression should match one or more occurrences of the previous atom or regexp.

‘?’ indicates that the regular expression should match zero or one occurrence of the previous atom or regexp.

‘\+’ matches a ‘+’

‘\?’ matches a ‘?’.

Bracket expressions are used to match ranges of characters. Bracket expressions where the range is backward, for example ‘[z-a]’, are invalid. Within square brackets, ‘\’ can be used to quote the following character. Character classes are supported; for example ‘[[:digit:]]’ will match a single decimal digit.


Grouping is performed with parentheses ‘()’. An unmatched ‘)’ matches just itself. A backslash followed by a digit acts as a back-reference and matches the same thing as the previous grouped expression indicated by that number. For example ‘\2’ matches the second group expression. The order of group expressions is determined by the position of their opening parenthesis ‘(’.

The alternation operator is ‘\|’.

The characters ‘^’ and ‘$’ always represent the beginning and end of a string respectively, except within square brackets. Within brackets, ‘^’ can be used to invert the membership of the character class being specified.

‘*’, ‘+’ and ‘?’ are special at any point in a regular expression except the following places, where they are not allowed:
1. At the beginning of a regular expression
2. After an open-group, signified by ‘(‘
3. After the alternation operator ‘\|’

Intervals are specified by ‘\{’ and ‘\}’. Invalid intervals are treated as literals, for example ‘a\{1’ is treated as ‘a\{1’

The longest possible match is returned; this applies to the regular expression as a whole and (subject to this constraint) to subexpressions within groups.

18.7.8 ‘posix-basic’ regular expression syntax

This is a synonym for ed.
18.7.9 ‘posix-egrep’ regular expression syntax

This is a synonym for egrep.

18.7.10 ‘posix-extended’ regular expression syntax

The character ‘.’ matches any single character except the null character.

‘+’ indicates that the regular expression should match one or more occurrences of the previous atom or regexp.

‘?’ indicates that the regular expression should match zero or one occurrence of the previous atom or regexp.

‘\+’ matches a ‘+’

‘\?’ matches a ‘?’.

Bracket expressions are used to match ranges of characters. Bracket expressions where the range is backward, for example ‘[z-a]’, are invalid. Within square brackets, ‘\’ is taken literally. Character classes are supported; for example ‘[[[:digit:]]]’ will match a single decimal digit.

GNU extensions are supported:
1. ‘\w’ matches a character within a word
2. ‘\W’ matches a character which is not within a word
3. ‘\<’ matches the beginning of a word
4. ‘\>’ matches the end of a word
5. ‘\b’ matches a word boundary
6. ‘\B’ matches characters which are not a word boundary
7. ‘\1’ matches the beginning of the whole input
8. ‘\’ matches the end of the whole input

Grouping is performed with parentheses ‘()’. An unmatched ‘)’ matches just itself. A backslash followed by a digit acts as a back-reference and matches the same thing as the previous grouped expression indicated by that number. For example ‘\2’ matches the second group expression. The order of group expressions is determined by the position of their opening parenthesis ‘(’.

The alternation operator is ‘|’.

The characters ‘^’ and ‘$’ always represent the beginning and end of a string respectively, except within square brackets. Within brackets, ‘^’ can be used to invert the membership of the character class being specified.

‘*’, ‘+’ and ‘?’ are special at any point in a regular expression except the following places, where they are not allowed:
1. At the beginning of a regular expression
2. After an open-group, signified by ‘(’
3. After the alternation operator ‘|’

Intervals are specified by ‘{’ and ‘}’. Invalid intervals such as ‘a{1z}’ are not accepted.

The longest possible match is returned; this applies to the regular expression as a whole and (subject to this constraint) to subexpressions within groups.
18.7.11 ‘posix-minimal-basic’ regular expression syntax

The character ‘.’ matches any single character except the null character.

Bracket expressions are used to match ranges of characters. Bracket expressions where the range is backward, for example ‘[z-a]’, are invalid. Within square brackets, ‘\’ is taken literally. Character classes are supported; for example ‘[[[:digit:]]]’ will match a single decimal digit.

GNU extensions are supported:
1. ‘\w’ matches a character within a word
2. ‘\W’ matches a character which is not within a word
3. ‘\<’ matches the beginning of a word
4. ‘\>’ matches the end of a word
5. ‘\b’ matches a word boundary
6. ‘\B’ matches characters which are not a word boundary
7. ‘\`’ matches the beginning of the whole input
8. ‘\’ matches the end of the whole input

Grouping is performed with backslashes followed by parentheses ‘\(, ‘\)’. A backslash followed by a digit acts as a back-reference and matches the same thing as the previous grouped expression indicated by that number. For example ‘\2’ matches the second group expression. The order of group expressions is determined by the position of their opening parenthesis ‘\(’.

The character ‘^’ only represents the beginning of a string when it appears:

1. At the beginning of a regular expression
2. After an open-group, signified by ‘\(’

The character ‘$’ only represents the end of a string when it appears:

1. At the end of a regular expression
2. Before a close-group, signified by ‘\)’

Intervals are specified by ‘\{’ and ‘\}'. Invalid intervals such as ‘a\{1z’ are not accepted. The longest possible match is returned; this applies to the regular expression as a whole and (subject to this constraint) to subexpressions within groups.

18.7.12 ‘sed’ regular expression syntax

This is a synonym for ed.
19 Build Infrastructure Modules

Gnulib has a couple of modules that don’t provide code, but rather extend the GNU Build System. That is, they are convenience facilities for use with GNU Automake (in particular).

19.1 Searching for Libraries

The following macros check for the presence or location of certain C, C++, or Fortran library archive files.

Simple Library Tests

The macros `AC_CHECK_LIB`, `AC_SEARCH_LIBS` from GNU Autoconf check for the presence of certain C, C++, or Fortran library archive files. The libraries are looked up in the default linker path—a system dependent list of directories, that usually contains the `/usr/lib` directory—and those directories given by `-L` options in the `LDFLAGS` variable.

Locating Libraries

The following macros, defined in the Gnulib module `havelib`, search for the location of certain C, C++, or Fortran library archive files and make the found location available to the compilation process and to further Autoconf tests.

```
AC_LIB_LINKFLAGS(name, [dependencies]) [Macro]
Searches for `lib<name>` and the libraries corresponding to explicit and implicit dependencies. Sets and AC_SUBSTs the `LIB<NAME>` and `LTLIB<NAME>` variables (with `<NAME>` in upper case) and augments the `CPPFLAGS` variable by `-I` options.
This macro should be used when `lib<name>` is expected to be found.

AC_LIB_HAVE_LINKFLAGS(name, [dependencies], [includes], [testcode], [missing-message]) [Macro]
Searches for `lib<name>` and the libraries corresponding to explicit and implicit dependencies, together with the specified include files and the ability to compile and link the specified `testcode`. The `missing-message` defaults to `no` and may contain additional hints for the user. If found, it sets and AC_SUBSTs `HAVE_LIB<NAME>=yes` and the `LIB<NAME>` and `LTLIB<NAME>` variables (with `<NAME>` in upper case) and augments the `CPPFLAGS` variable by `-I` options, and `#defines HAVE_LIB<NAME>` to 1. Otherwise, it sets and AC_SUBSTs `HAVE_LIB<NAME>=no` and `LIB<NAME>` and `LTLIB<NAME>` to empty.

These macros assume that when a library is installed in `some_directory/lib`, its include files are installed in `some_directory/include`.

The complexities that `AC_LIB_LINKFLAGS` and `AC_LIB_HAVE_LINKFLAGS` deal with are the following:

- The library is not necessarily already in the search path (`CPPFLAGS` for the include file search path, `LDFLAGS` for the library search path). The macro provides a `--with-lib<name>` option. The user of the `configure` script can use this option to indicate the location of the library and its include files. If not provided, the `--prefix` directory is searched as well.
• The library is not necessarily already in the run time library search path. To avoid the need for setting an environment variable like LD_LIBRARY_PATH, the macro adds the appropriate run time search path options to the LIB<NAME> variable. This works on most systems. It can also be inhibited: The user of ‘configure’ can use the --disable-rpath option to force an installation that doesn’t contain hardcoded library search paths but instead may require the use of an environment variable like LD_LIBRARY_PATH.

The macros also set a variable LTLIB<NAME>, that should be used when linking with libtool. Both LTLIB<NAME> and LIB<NAME> contain essentially the same option, but where LIB<NAME> contains platform dependent flags like ‘-Wl,-rpath’, LTLIB<NAME> contains platform independent flags like ‘-R’.

If you, by mistake, use LIB<NAME> instead of LTLIB<NAME> when linking with libtool, you will observe that the binaries created in the build dir will prefer the shared libraries in the installation directories over the shared libraries in the build dir; this can lead to all sorts of build failures, test failures, or crashes!

If you, on the other hand, by mistake, use LTLIB<NAME> instead of LIB<NAME> when linking without libtool, you will observe build failures, because the ‘-R’ options contained in LTLIB<NAME> are not valid options to compilers such as GCC.

Example of using AC_LIB_LINKFLAGS

Suppose you want to use libz, the compression library.

1. In configure.ac you add the line
   
   AC_CONFIG_AUX_DIR([build-aux])
   AC_LIB_LINKFLAGS([z])
   
   Note that since the AC_LIB_LINKFLAGS invocation modifies the CPPFLAGS, it should precede all tests that check for header files, declarations, structures or types.

2. To the package’s build-aux directory you add the file config.rpath, also part of the GnuLib havelib module. (gnulib-tool will usually do this for you automatically.)

3. In Makefile.in you add @LIBZ@ to the link command line of your program. Or, if you are using Automake, you add $(LIBZ) to the LDADD variable that corresponds to your program.

Dependencies

The dependencies list is a space separated list of library names that libname is known to depend upon. Example: If libfooy depends on libfoox, and libfooz depends on libfoox and libfooy, you can write:

   AC_LIB_LINKFLAGS([foox])
   AC_LIB_LINKFLAGS([fooy], [foox])
   AC_LIB_LINKFLAGS([fooz], [foox fooy])

Explicit dependencies are necessary if you cannot assume that a .la file, created by libtool, is installed. If you can assume that libfooy.la is installed by libtool (and has not been omitted by the package distributor!), you can omit the explicit dependency and just write

   AC_LIB_LINKFLAGS([fooy])

This way, you don’t need to know in advance which libraries the needed library depends upon.
Static vs. shared

The macros find the libraries regardless whether they are installed as shared or static libraries.

CPPFLAGS vs. LDFLAGS

The macros determine the directories that should be added to the compiler preprocessor’s search path and to the linker’s search path. For the compiler preprocessor, \texttt{-I} options with the necessary directories are added to the \texttt{CPPFLAGS} variable, for use by the whole package. For the linker, appropriate options are added to the \texttt{LIB<\textit{name}>} and \texttt{LTLIB<\textit{name}>} variables, for use during linking by those programs and libraries that need the dependency on \texttt{lib<\textit{name>>}. You need to use the value of \texttt{LIB<\textit{name}>} or \texttt{LTLIB<\textit{name}>} in the Makefiles. \texttt{LTLIB<\textit{name}>} is for use with libtool, whereas \texttt{LIB<\textit{name}>} is for when libtool is not involved in linking.

The macros do not check whether the include files and the library found match. If you want to verify this at configure time, one technique is to have a version number in the include files and a version number in the library, like this:

\begin{verbatim}
#define LIBNAME_VERSION 10203 extern int libname_version; /* initialized to LIBNAME_VERSION */
\end{verbatim}

and use a test like

\begin{verbatim}
AC_TRY_RUN([int main () { return libname_version != LIBNAME_VERSION; }])
\end{verbatim}

Bi-arch systems

A bi-arch system is one where

- the processor has a 32-bit execution mode and a 64-bit execution mode (for example, \texttt{x86_64}, \texttt{ia64}, \texttt{sparc64}, \texttt{powerpc64}), and
- 32-bit mode libraries and executables and 64-bit mode libraries are both installed, and
- 32-bit mode libraries and object files cannot be mixed with 64-bit mode ones.

On several types of such systems, for historical reasons, the 32-bit libraries are installed in \texttt{prefix/lib}, whereas the 64-bit libraries are installed in

- \texttt{prefix/lib64} on many glibc systems,
- \texttt{prefix/lib/64} on Solaris systems.

On such systems, in 64-bit mode,\texttt{configure} will search for the libraries in \texttt{prefix/lib64} or \texttt{prefix/lib/64}, respectively, not in \texttt{prefix/lib}. A user can adhere to these system-wide conventions by using the \texttt{‘--libdir’} option when installing packages. When a user has already installed packages in 64-bit mode using the GNU default \texttt{‘--libdir=prefix/lib’}, he can make this directory adhere to the system-wide convention by placing a symbolic link:

On glibc systems:

\begin{verbatim}
ln -s lib prefix/lib64
\end{verbatim}

On Solaris systems:

\begin{verbatim}
ln -s . prefix/lib/64
\end{verbatim}
19.2 Controlling the Exported Symbols of Shared Libraries

The `lib-symbol-visibility` module allows precise control of the symbols exported by a shared library. This is useful because

- It prevents abuse of undocumented APIs of your library. Symbols that are not exported from the library cannot be used. This eliminates the problem that when the maintainer of the library changes internals of the library, maintainers of other projects cry “breakage”. Instead, these maintainers are forced to negotiate the desired API from the maintainer of the library.
- It reduces the risk of symbol collision between your library and other libraries. For example, the symbol `readline` is defined in several libraries, most of which don’t have the same semantics and the same calling convention as the GNU readline library.
- It reduces the startup time of programs linked to the library. This is because the dynamic loader has less symbols to process.
- It allows the compiler to generate better code. Within a shared library, a call to a function that is a global symbol costs a “call” instruction to a code location in the so-called PLT (procedure linkage table) which contains a “jump” instruction to the actual function’s code. (This is needed so that the function can be overridden, for example by a function with the same name in the executable or in a shared library interposed with `LD_PRELOAD`.) Whereas a call to a function for which the compiler can assume that it is in the same shared library is just a direct “call” instructions. Similarly for variables: A reference to a global variable fetches a pointer in the so-called GOT (global offset table); this is a pointer to the variable’s memory. So the code to access it is two memory load instructions. Whereas for a variable which is known to reside in the same shared library, it is just a direct memory access: one memory load instruction.

There are traditionally three ways to specify the exported symbols of a shared library.

- The programmer specifies the list of symbols to be exported when the shared library is created. Usually a command-line option is passed to the linker, with the name of a file containing the symbols.
  
The upside of this approach is flexibility: it allows the same code to be used in different libraries with different export lists. The downsides are: 1. it’s a lot of maintenance overhead when the symbol list is platform dependent, 2. it doesn’t work well with C++, due to name mangling.
- The programmer specifies a “hidden” attribute for every variable and function that shall not be exported.
  
The drawbacks of this approach are: Symbols are still exported from the library by default. It’s a lot of maintenance work to mark every non-exported variable and function. But usually the exported API is quite small, compared to the internal API of the library. And it’s the wrong paradigm: It doesn’t force thinking when introducing new exported API.
- The programmer specifies a “hidden” attribute for all files that make up the shared library, and an “exported” attribute for those symbols in these files that shall be exported.
  
This is perfect: It burdens the maintainer only for exported API, not for library-internal API. And it keeps the annotations in the source code.
Chapter 19: Build Infrastructure Modules

839

GNU libtool’s -export-symbols option implements the first approach. The script
declared.sh from Gnulib can help to produce the list of symbols.
This gnulib module implements the third approach. For this it relies on GNU GCC 4.0
or newer, namely on its ‘-fvisibility=hidden’ command-line option and the “visibility”
attribute. (The “visibility” attribute was already supported in GCC 3.4, but without the
command line option, introduced in GCC 4.0, the third approach could not be used.)
More explanations on this subject can be found in https://gcc.gnu.org/wiki/
Visibility, which contains more details on the GCC features and additional advice for C++
libraries, and in Ulrich Drepper’s paper https://www.akkadia.org/drepper/dsohowto.
pdf, which also explains other tricks for reducing the startup time impact of shared libraries.
The gnulib autoconf macro gl_VISIBILITY tests for GCC 4.0 or newer. It defines a
Makefile variable @CFLAG_VISIBILITY@ containing ‘-fvisibility=hidden’ or nothing. It
also defines as a C macro and as a substituted variable: @HAVE VISIBILITY@. Its value
is 1 when symbol visibility control is supported, and 0 otherwise.
As of 2022, symbol visibility control is supported on
• ELF platforms (glibc, Linux, *BSD, Solaris) with GCC or clang,
• macOS,
• AIX with gcc or xlclang.
It is not supported on
• Other compilers on ELF platforms or AIX,
• Windows.
To use this module in a library, say libfoo, you will do these steps:
1. Add @CFLAG_VISIBILITY@ or (in a Makefile.am) $(CFLAG_VISIBILITY) to the
CFLAGS for the compilation of the sources that make up the library.
2. Add a C macro definition, say ‘-DBUILDING_LIBFOO’, to the CPPFLAGS for the compilation of the sources that make up the library.
3. Define a macro specific to your library like this.
#if HAVE_VISIBILITY && BUILDING_LIBFOO
#define LIBFOO_DLL_EXPORTED __attribute__((__visibility__("default")))
#else
#define LIBFOO_DLL_EXPORTED
#endif

This macro should be enabled in all public header files of your library.
4. Annotate all variable, function and class declarations in all public header files of your
library with ‘LIBFOO_DLL_EXPORTED’. This annotation can occur at different locations:
between the ‘extern’ and the type or return type, or just before the entity being
declared, or after the entire declarator. My preference is to put it right after ‘extern’,
so that the declarations in the header files remain halfway readable.
Note that the precise control of the exported symbols will not work with other compilers
than GCC >= 4.0, and will not work on systems where the assembler or linker lack the
support of “hidden” visibility. Therefore, it’s good if, in order to reduce the risk of collisions
with symbols in other libraries, you continue to use a prefix specific to your library for all
non-static variables and functions and for all C++ classes in your library.


Chapter 19: Build Infrastructure Modules

840

Note about other compilers: MSVC support can be added easily, by extending the
definition of the macro mentioned above, to something like this:
#if HAVE_VISIBILITY && BUILDING_LIBFOO
#define LIBFOO_DLL_EXPORTED __attribute__((__visibility__("default")))
#elif (defined _WIN32 && !defined __CYGWIN__) && BUILDING_SHARED && BUILDING_LIBFOO
#define LIBFOO_DLL_EXPORTED __declspec(dllexport)
#elif (defined _WIN32 && !defined __CYGWIN__) && BUILDING_SHARED
#define LIBFOO_DLL_EXPORTED __declspec(dllimport)
#else
#define LIBFOO_DLL_EXPORTED
#endif

Here BUILDING_SHARED is a C macro that you have to define. It ought to evaluate to
1 in a build configured with ‘--enable-shared’, or to 0 in a build configured with
‘--disable-shared’. You may use the following ‘configure.ac’ snippet:
if test "$enable_shared" = yes; then
building_shared=1
else
building_shared=0
fi
AC_DEFINE_UNQUOTED([BUILDING_SHARED], [$building_shared],
[Define when --enable-shared is used.])

19.3 LD Version Scripts
The lib-symbol-versions module can be used to add shared library versioning support.
Currently, only GNU LD and the Solaris linker supports this.
Version scripts provides information that can be used by GNU/Linux distribution packaging tools. For example, Debian has a tool dpkg-shlibdeps that can determine the
minimal required version of each dependency (by looking at the symbol list) and stuff the
information into the Debian specific packaging files.
For more information and other uses of version scripts, see Ulrich Drepper’s paper
https://www.akkadia.org/drepper/dsohowto.pdf
You use the module by importing it to your library, and then add the following lines to
the Makefile.am that builds the library:
if HAVE_LD_VERSION_SCRIPT
libfoo_la_LDFLAGS += -Wl,--version-script=$(srcdir)/libfoo.map
endif

The version script file format is documented in the GNU LD manual, but a small example
would be:
LIBFOO_1.0 {
global:
libfoo_init; libfoo_doit; libfoo_done;
local:
*;
};

If you target platforms that do not support linker scripts (i.e., all platforms that doesn’t
use GNU LD) you may want to consider a more portable but less powerful alternative:
libtool -export-symbols. It will hide internal symbols from your library, but will not add
ELF versioning symbols. Your usage would then be something like:
if HAVE_LD_VERSION_SCRIPT


Chapter 19: Build Infrastructure Modules

libfoo_la_LDFLAGS += -Wl,--version-script=$(srcdir)/libfoo.map
else
libfoo_la_LDFLAGS += -export-symbols $(srcdir)/libfoo.sym
endif

See the Libtool manual for the file syntax, but a small example would be:

libfoo_init
libfoo_doit
libfoo_done

To avoid the need for a *.sym file if your symbols are easily expressed using a regular expression, you may use -export-symbols-regex:

if HAVE_LD_VERSION_SCRIPT
libfoo_la_LDFLAGS += -Wl,--version-script=$(srcdir)/libfoo.map
else
libfoo_la_LDFLAGS += -export-symbols-regex '^libfoo_.*'
endif

For more discussions about symbol visibility, rather than shared library versioning, see the visibility module (see Section 19.2 [Exported Symbols of Shared Libraries], page 838).

19.4 configmake

The configmake module builds a C include file named configmake.h containing the usual installation directory values; for example, those specified by --prefix or --libdir to configure. Each variable is given a #define with an all-uppercase macro name, such as PREFIX and LIBDIR. (Automake cannot create this file directly because the user might override directory values at make time.)

Specifically, the module retrieves values of the variables through configure followed by make, not directly through configure, so that a user who sets some of these variables consistently on the make command line gets correct results.

One advantage of this approach, compared to the classical approach of adding -DLIBDIR="$(libdir)" etc. to AM_CPPFLAGS, is that it protects against the use of undefined variables. That is, if, say, $(libdir) is not set in the Makefile, LIBDIR is not defined by this module, and code using LIBDIR gives a compilation error.

Another advantage is that make output is shorter.

For the complete list of variables which are #defined this way, see the file gnulib/modules/configmake, or inspect your resulting gnulib Makefile.

19.5 warnings

The warnings module allows to regularly build a package with more GCC warnings than the default warnings emitted by GCC. It is often used indirectly through the manywarnings module (see Section 19.6 [manywarnings], page 842).

It provides the following functionality:

- You can select some warning options, such as `-Wall', to be enabled whenever building with a GCC version that supports these options. The user can choose to override these warning options by providing the opposite options in the CFLAGS variable at configuration time.
• You can make these warnings apply to selected directories only. In projects where
subprojects are maintained by different people, or where parts of the source code are
imported from external sources (for example from gnulib), it is useful to apply different
warning options to different directories.
• It lets you use ‘-Werror’ at ‘make distcheck’ time, to verify that on the maintainer’s
system, no warnings remain. (Note that use of ‘-Werror’ in CFLAGS does not work in
general, because it may break autoconfiguration.)
• Similarly, it lets you use ‘-Werror’ when the builder runs configure with an option
such as ‘--enable-gcc-warnings’.

To use this module, you need the following:
1. In configure.ac, use for example
   
   gl_WARN_ADD([-Wall], [WARN_CFLAGS])
   gl_WARN_ADD([-Wpointer-arith], [WARN_CFLAGS])

2. In the directories which shall use WARN_CFLAGS, use it in the definition of AM_CFLAGS,
   like this:
   
   AM_CFLAGS = \$\{$WARN_CFLAGS\}

   Note that the AM_CFLAGS is used in combination with CFLAGS and before CFLAGS in
   build rules emitted by Automake. This allows the user to provide CFLAGS that override
   the WARN_CFLAGS.

   ‘gl_WARN_ADD([-Werror])’ is intended for developers, and should be avoided in contexts
   where it would affect ordinary installation builds. The warnings emitted by GCC depend,
   to some extent, on the contents of the system header files, on the size and signedness of
   built-in types, etc. Use of ‘-Werror’ would cause frustration to all users on platforms that
   the maintainer has not tested before the release. It is better if ‘-Werror’ is off by default,
   and is enabled only by developers. For example, ‘-Werror’ could affect ‘make distcheck’
   or ‘configure --enable-gcc-warnings’ as mentioned above.

19.6 manywarnings

The manywarnings module enables many GCC warnings for your package. Here is an
example use:

AC_ARG_ENABLE([gcc-warnings],
   [AS_HELP_STRING([--enable-gcc-warnings=[TYPE]],
      [control generation of GCC warnings. The TYPE 'no' disables
      warnings; 'yes' (default) generates cheap warnings;
      'expensive' in addition generates expensive warnings.]))])

AS_IF([test "$enable_gcc_warnings" != no],
[
   # Set up the list of unwanted warning options.
   nw=
   if test "$enable_gcc_warnings" != expensive; then
      nw="nw -fanalyzer"
   fi
   nw="$nw -Wbad-function-cast" # Casting a function's result is not more
   # dangerous than casting any other value.
   nw="$nw -Winline" # It's OK to not inline.
   nw="$nw -Wsign-compare" # Too many false alarms.
   nw="$nw -Wstrict-overflow" # It's OK to optimize strictly.
]
nw="$nw -Wsystem-headers" # Don't warn in system headers.

# Setup the list of meaningful warning options for the C compiler.
# The list comes from manywarnings.m4. Warning options that are not
# generally meaningful have already been filtered out (cf.
# build-aux/gcc-warning.spec).
gl_MANYWARN_ALL_GCC([possible_warning_options])

# Compute the list of warning options that are desired.
gl_MANYWARN_COMPLEMENT([desired_warning_options],
                         [$possible_warning_options], [$nw])

# Compute the list of remaining undesired warning options.
# Namely those, that were not in manywarnings.m4 because they were
# already listed in build-aux/gcc-warning.spec; this includes those
# that are implied by -Wall.
gl_MANYWARN_COMPLEMENT([remaining_undesired_warning_options],
                         [$nw], [$possible_warning_options])

# Add the desired warning options to WARN_CFLAGS.
for w in $desired_warning_options; do
gl_WARN_ADD([$w])
done

# Add the opposites of the remaining undesired warning options to
# WARN_CFLAGS.
for w in `echo "$remaining_undesired_warning_options" | sed -e 's/-W/-Wno-/g'`; do
gl_WARN_ADD([$w])
done

This module sets up many GCC warning options.

When you use it for the first time, it is common practice to do it as follows:

- Start with the newest major release of GCC. This will save you time, because some
  warning options produce many false alarms with older versions of GCC (such as
  -Wstrict-overflow or -Wunsafe-loop-optimizations).

- Consider the platforms commonly used when enabling GCC warnings. This includes
  not only target architectures and operating systems, but also optimization options,
  which can greatly affect the warnings generated. Makefiles generated by configure
  default to -O2 optimization. If you also commonly build with -O0 or other optimization
  options, you can compile again with those options. Using more optimizations catches
  more bugs, because the compiler does a better static analysis of the program when op-
  timizing more. Also, some warning options that diagnose suboptimal code generation,
  such as -Winline, are not effective when not optimizing. On the other hand, if it's
  frequent to build the package with warnings but without optimizations, for debugging
  purposes, then you don't want to see undesired warnings in these phases of development
  either.

- Compile the package with an empty nw value, that is, with all possible warnings enabled.

- Then you will go through the list of warnings. Since there are likely many warnings,
  the first time, it's a good idea to sort them by warning option first:

```
$ grep warning: make-output.log \n  | sed -e 's/
  \1\(-W.*\)\$/\2 \1/' | sort -k1
```
You will likely deactivate warnings that occur often and don’t point to mistakes in the code, by adding them to the ‘nw’ variable, then reconfiguring and recompiling. When warnings point to real mistakes and bugs in the code, you will of course not disable them but fix your code to silence the warning instead.

Many GCC warning options usually don’t point to mistakes in the code; these warnings enforce a certain programming style. It is a project management decision whether you want your code to follow any of these styles. Note that some of these programming styles are conflicting. You cannot have them all; you have to choose among them.

When a warning option pinpoints real bugs occasionally, but it also whines about a few code locations which are fine, we recommend to leave the warning option enabled. Whether you then live with the remaining few warnings, or choose to disable them one-by-one through #pragma GCC diagnostic ignored "option" (see Section “Diagnostic Pragmas” in Using the GNU Compiler Collection, https://gcc.gnu.org/onlinedocs/gcc/Diagnostic-Pragmas.html), is again a project management decision.

When a new major version of GCC is released, the GnuLib maintainers add the newly available warning options into the gl_MANYWARN_ALL_GCC macro. You will then enjoy the benefits of the new warnings, simply by updating to the newest GnuLib. If some of the new warnings are undesired, you can add them to the ‘nw’ variable, as described above.

Comments on particular warning flags:

‘-fanalyzer’

The manywarnings module by default uses GCC’s -fanalyzer option, as this issues some useful warnings. (It can also help GCC generate better code.) However, -fanalyzer can greatly slow down compilation, and in programs with large modules it can be so slow as to be unusable, so it is common for configure to disable it unless configure is given an option like --enable-gcc-warnings=expensive.

‘-fstrict-aliasing’

Although the manywarnings module does not enable GCC’s -fstrict-aliasing option, it is enabled by default if you compile with -O2 or higher optimization, and can help GCC generate better warnings.

‘-fanalyzer-malloc-leak’

The -fanalyzer option generates many false alarms about malloc leaks, which manywarnings suppresses by also using -Wno-analyzer-malloc-leak.

‘-fstrict-flex-arrays’

The manywarnings module by default uses GCC’s -fstrict-flex-arrays option if available, so that GCC can warn about nonportable usage of flexible array members. In a few cases this can help GCC generate better code, so it is not strictly a warning option.

‘-Wsign-compare’

GCC and Clang generate too many false alarms with -Wsign-compare, and we don’t recommend that warning. You can disable it by using gl_WARN_ADD([-Wno-sign-compare]) as illustrated above. Programs using GnuLib generally
don’t enable that warning when compiling GnuLib code. If you happen to find a real bug with that warning we’d like to know it.

19.7 Running self-tests under Valgrind

For projects written in C or similar languages, running the self-tests under Valgrind can reveal hard to find memory issues. GnuLib supports two ways to make use of Valgrind: one that enables use of Valgrind at configure time, when configure found it to be present; and one at the discretion of the developer.

19.7.1 Using valgrind without developer intervention

The valgrind-tests module searches for Valgrind at configure time and declares the LOG_VALGRIND automake variable for use with automake’s LOG_COMPILER.

After importing the valgrind-tests module to your project, you use it by adding the following to the Makefile.am that runs the self-tests:

```
LOG_COMPILER = $(LOG_VALGRIND)
```

This will run all self-checks under valgrind.

Replace LOG_COMPILER with TESTS_ENVIRONMENT if you are using the old serial test harness. The parallel test harness has been the default in automake since version 1.11.3, but if you are using an older automake, or put ‘serial-tests’ in ‘AM_INIT_AUTOMAKE'/AUTOMAKE_OPTIONS’ you would still be using the serial test harness.

If you desire a project-wide decision that valgrind is not enabled by default, but still allow users to enable it with --enable-valgrind-tests you may put the following in configure.ac before gl_INIT:

```
gl_VALGRIND_TESTS_DEFAULT_NO
```

19.7.2 Valgrind options

The VALGRIND variable holds the name of the valgrind binary and some options passed to valgrind. You may provide additional options that are passed to valgrind using the ‘VALGRINDFLAGS’ variable, for example:

```
./configure VALGRINDFLAGS="--suppressions="/local.supp"
```

Alternatively during build phase:

```
make check VALGRINDFLAGS="--suppressions="/local.supp"
```

This is useful if you have a valgrind suppression files that are needed to avoid triggering errors for known errors, typically in system libraries.

The VALGRIND variable include options that are useful when valgrind is run non-interactively through the test harness. The default parameters are -q to silence the output, --error-exitcode=1 to cause valgrind errors to be treated as fatal errors, and --leak-check=full to check for memory leaks.

These options can be controlled through the DEFAULT_VALGRINDFLAGS variable. For example, when configuring the package:

```
./configure DEFAULT_VALGRINDFLAGS="--quiet"
```

Alternatively, during the build phase:

```
make check DEFAULT_VALGRINDFLAGS="--quiet"
```
That would have the effect of removing `--error-exitcode=1` and `--leak-check=full` from the default options, thus causing any valgrind errors to be silently ignored, instead of causing fatal test failures.

As a developer you may use the variables in `configure.ac` before calling `gl_INIT`, like this if your program has deeply-nested call chains:

```c
gl_EARLY
...
VALGRINDFLAGS="$VALGRINDFLAGS --num-callers=42"
...
gl_INIT
```

Note that any user-supplied `VALGRINDFLAGS` value is preserved, which is usually what you want.

Finally, as a developer you may want to provide additional per-directory options to valgrind and the `AM_VALGRINDFLAGS` variable can be used for this. For example:

```c
AM_VALGRINDFLAGS = --suppressions=$(srcdir)/local-valgrind.supp
LOG_COMPILER = $(LOG_VALGRIND)
```

### 19.7.3 Using valgrind at the developer’s discretion

In this approach, you define a `Makefile.am` variable ‘`VALGRIND`’ (or, more abstractly, ‘`CHECKER`’), that is usually set to empty. When you have configured and built the package and you decide that you want to run the tests with valgrind, you do so by modifying the definition of ‘`VALGRIND`’ in the `Makefile`.

### 19.7.4 How to use Valgrind with shell scripts

It is not desirable to apply valgrind to shell scripts or other non-binaries, because

- It is wasteful, and you usually don’t want to look for memory leaks in bash.
- On a bi-arch system, you may get an error message such as "valgrind: wrong executable class (eg. 32-bit instead of 64-bit)".

There are two ways to avoid this:

- Using the Automake parallel-tests feature, you can use the following instead:

  ```
  TEST_EXTENSIONS = .pl .sh
  LOG_COMPILER = $(LOG_VALGRIND)
  ```

  Then valgrind will only be used for the non-.sh and non-.pl tests.

  For old automake (before 1.11.3), you will need `AUTOMAKE_OPTIONS = parallel-tests` to enable the parallel test harness.

- You can make use of the `build-aux/run-test` script from Gnumlib. Add these lines to your `Makefile.am`:

  ```
  LOG_COMPILER += $(SHELL) $(top_srcdir)/build-aux/run-test '$(LOG_VALGRIND)'
  ```

  Replace `LOG_COMPILER` with `TESTS_ENVIRONMENT` if you use the old serial test harness.

  However, with this measure in place, binaries invoked through scripts will not be invoked under valgrind. This can be solved by defining environment variables in the `TESTS_ENVIRONMENT` variable that are then used by the shell scripts. For example, add the following:

  ```
  TESTS_ENVIRONMENT = VALGRIND="$(LOG_VALGRIND)"
  ```

  And then modify the shell scripts to invoke the binary prefixed with `$VALGRIND`. 
19.8 VCS To ChangeLog

Gnulib provides the ‘vcs-to-changelog’ module to generate an output similar to the GNU ChangeLog format from metadata of source control software such as git. Here’s an example of using ‘vcs-to-changelog’:

```
built-aux/vcs-to-changelog.py <from_ref> <to_ref>
```

where `<from_ref>` and `<to_ref>` refer to the range of commits to generate the output.

VCS To ChangeLog currently recognises changes in C source code and can traverse commits in git. Additional source frontends and source control backends may be added to the module. ‘vcs-to-changelog’ takes the following optional arguments:

- `-d`: Run the parser debugger, used for debugging ‘vcs-to-changelog’
- `-q filename`: Load `filename` as the quirks file for the project.

The quirks file is a python module that must minimally implement a `get_project_quirks` function that returns an object of type `ProjectQuirks` or its subclass. The subclass may override the following members of `ProjectQuirks`:

- `repo`: Specify the project repo source control. The default value is `git`.
- `IGNORE_LIST`: A list of files to ignore in the changesets, either because they are not needed (such as the ChangeLog) or because they are not parseable. For example, the GNU C Library has a header file that is only assembly code, which breaks the C parser.
- `MACRO_QUIRKS`: A list of dictionary entries with indexes as `orig` and `sub` where `orig` is a Python regular expression pattern to match and `sub` is the substitution. These substitutions are used to work around C/C++ macros that are known to break parsing of C programs.
- `C_MACROS`: This is a list of C preprocessor macro definitions that are extensively used and are known to break parsing due to some characteristic, mainly the lack of a semi-colon at the end.
20 Build Infrastructure Files

Gnulib contains also a small number of files that are not part of modules. They are meant to be imported into packages by means of `gnulib-tool --copy-file`, not `gnulib-tool --import`. For example, the commands to import the files `config.guess` and `config.sub` are

```bash
for file in config.guess config.sub; do
  $GNULIB_TOOL --copy-file build-aux/$file \
  && chmod a+x build-aux/$file \
  || exit $?
done
```

Packages that don’t use Gnulib can get hold of these files through direct download from Gnulib’s git repository. The commands to do this look as follows:

```bash
for file in config.guess config.sub; do
  echo "$0: getting $file..."
  wget -q --timeout=5 -O build-aux/$file.tmp "https://git.savannah.gnu.org/gitweb/?p=gnulib.git;a=blob_plain;f=build-aux/${file};hb=HEAD" \
  && mv build-aux/$file.tmp build-aux/$file \
  && chmod a+x build-aux/$file
  retval=$?
  rm -f build-aux/$file.tmp
  test $retval -eq 0 || exit $retval
done
```

20.1 Recognizing platforms

`build-aux/config.guess`

`build-aux/config.sub`

These files are helper scripts, invoked by the `configure` script. `config.guess` recognizes the platform on which the script is running, and produces a triplet of the form `cpu-type-vendor-operating_system`. `config.sub` receives a possibly abbreviated triplet and produces a canonical triplet for a platform. For more information, see [https://www.gnu.org/prep/standards/html_node/Configuration.html](https://www.gnu.org/prep/standards/html_node/Configuration.html).

It is important that you always include the newest versions of these two files in your tarball, because people who work on emerging platforms otherwise have a hard time building your package.

20.2 Utilities for Makefiles

These programs can be used in Makefiles. Some of them are also described in [https://www.gnu.org/software/automake/manual/html_node/Auxiliary-Programs.html](https://www.gnu.org/software/automake/manual/html_node/Auxiliary-Programs.html).

`build-aux/ar-lib`

`build-aux/compile`

These two scripts are necessary for supporting portability to native Windows with the MSVC compiler. `compile` is a wrapper script that invokes the compiler and provides a command-line interface compatible with Unix compilers. Similarly, `ar-lib` is a wrapper script that provides a command-line interface compatible with Unix `ar`. 
Chapter 20: Build Infrastructure Files

**build-aux/depcomp**
This is a helper script, used by Makefile rules generated by GNU Automake. It generates Makefile dependencies while compiling a file.

**build-aux/install-sh**
This is a helper script, used by Makefile rules generated by GNU Automake. It installs files during the `make install` phase. In the Makefile, don’t use this file directly; always use `$\{INSTALL_PROGRAM\}` or `$\{INSTALL_DATA\}` instead.

**build-aux/mdate-sh**
This script determines the modification time of a file and pretty-prints it. The typical use is to add a “Last modified” line to the documentation.

**build-aux/mkinstalldirs**
This is a helper script, used by Makefile rules generated by GNU Automake. It creates directories during the `make install` phase. It is roughly equivalent to `mkdir -p` (except that the latter is not portable). In the Makefile, don’t use this file directly; always use `$\{MKDIR_P\}` instead.

**build-aux/mktempd**
This script creates a temporary directory. It is roughly equivalent to `mktemp -d` (except that the latter is not portable).

**build-aux/move-if-change**
This script moves a freshly generated file to a destination file, with a special optimization for the case that both files are identical. In this case the freshly generated file is deleted, and the time stamp of the destination file is not changed. This is useful when updating a file that rarely actually changes and which many Makefile targets depend upon.

### 20.3 Programs for developing in Git checkouts

These programs can help when developing in a Git checkout. The maintainer of the package copies these programs into the version control of the package, so that co-developers can use these tools right away.

**top/gitsub.sh**
This program manages the subdirectories of a Git checkout that come from other packages, including Gnulib.

**top/bootstrap**
**top/autopull.sh**
**top/autogen.sh**
**top/bootstrap-funclib.sh**
This is a set of three programs and a function library, that manage the source directory of a package, preparing for the state where ‘./configure’ can be used.

**autopull.sh** is a program for fetching dependencies that may require network accesses. It manages the Git submodules, including Gnulib – assuming that Gnulib is a Git submodule. It also can fetch the PO files for internationalized packages.
autogen.sh is a program that is meant to be run after autopull.sh. It generates all autogeneratable files that are omitted from version control. Usually this means that it invokes gnulib-tool and automake, that generate files from other files.

bootstrap is a wrapper around both: ./bootstrap --pull is equivalent to ./autopull.sh, ./bootstrap --gen is equivalent to ./autogen.sh. Plain ./bootstrap is equivalent to ./autopull.sh immediately followed by ./autogen.sh; however, because plain ./bootstrap mixes version control management and generation of files in non-obvious ways, it has a number of usability issues for the advanced developer.

bootstrap-funclib.sh is a function library for these three programs. It is not meant to be used directly.

All three programs make use of a configuration file, called bootstrap.conf.

build-aux/bootstrap
This acts like top/bootstrap, except it does not need the companion files autogen.sh, autopull.sh, and bootstrap-funclib.sh so it avoids some clutter in your project’s top level directory. With this approach, you update via ./bootstrap --pull and ./bootstrap --gen instead of via ./autopull.sh and ./autogen.sh. Otherwise this approach acts similarly, and uses the same bootstrap.conf file.

build-aux/bootstrap.conf
This is the template configuration file. After copying it into the top-level directory of your package, you need to customize it.

build-aux/po/Makefile.in.in
build-aux/po/remove-potcdate.sin
These are auxiliary files used by bootstrap. You don’t have to copy them yourself; bootstrap will do that.

20.4 Utilities for building documentation
These are auxiliary files for building documentation.

build-aux/texinfo.tex
This file is needed for the conversion of Texinfo-format documentation to PDF, PostScript, or DVI formats. It implements the GNU Texinfo commands on top of plain TeX.

build-aux/x-to-1.in
This file, once processed, gives a program x-to-1, that produces a manual page for a program, by combining a skeleton with the program’s --help output.

20.5 Utilities for building libraries

build-aux/declared.sh
This program extracts the declared global symbols of a C header file. It is useful when you want to control the set of symbols exported by a library. See Section 19.2 [Exported Symbols of Shared Libraries], page 838.
20.6 Utilities for running test suites

build-aux/run-test
This file is a test driver that supports running a test under valgrind.

build-aux/test-driver.diff
This is a patch, against Automake’s test driver, that supports running a test suite on Android.
21 Release Management Files

Gnulib also contain a few scripts that are useful for the release management of a package. They can be used directly off the Gnulib checkout; they don’t need to copied first.

21.1 Tools for releasing packages with shared libraries

build-aux/libtool-next-version

This program is a wizard that helps a maintainer update the libtool version of a shared library, without making mistakes in this process. For background documentation, see https://www.gnu.org/software/libtool/manual/html_node/Updating-version-info.html.

21.2 Tools for uploading release tarballs

build-aux/gnupload

This program is a user-friendly way to upload a release tarball to one of the GNU servers (ftp.gnu.org or alpha.gnu.org). It implements the interface described in https://www.gnu.org/prep/maintain/html_node/Automated-FTP-Uploads.html.

build-aux/ncftpput-ftp

This is a helper program that mimics the ncftpput program used by gnupload. If you want to use gnupload but don’t have ncftp installed, copy this file into your $PATH, renaming it to ncftpput.
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### A

<table>
<thead>
<tr>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>a64l</td>
<td>87</td>
</tr>
<tr>
<td>abort</td>
<td>87</td>
</tr>
<tr>
<td>Aborting execution</td>
<td>43</td>
</tr>
<tr>
<td>abs</td>
<td>88</td>
</tr>
<tr>
<td>AC_LIB_HAVE_LINKFLAGS(name, [dependencies], [includes], [testcode], [missing-message])</td>
<td>835</td>
</tr>
<tr>
<td>AC_LIB_LINKFLAGS(name, [dependencies])</td>
<td>835</td>
</tr>
<tr>
<td>accept</td>
<td>88</td>
</tr>
<tr>
<td>accept4</td>
<td>709</td>
</tr>
<tr>
<td>access</td>
<td>88</td>
</tr>
<tr>
<td>acct</td>
<td>729</td>
</tr>
<tr>
<td>acos</td>
<td>89</td>
</tr>
<tr>
<td>acosf</td>
<td>89</td>
</tr>
<tr>
<td>acosh</td>
<td>89</td>
</tr>
<tr>
<td>acoshf</td>
<td>90</td>
</tr>
<tr>
<td>acoshl</td>
<td>90</td>
</tr>
<tr>
<td>acosl</td>
<td>90</td>
</tr>
<tr>
<td>addmntent</td>
<td>564</td>
</tr>
<tr>
<td>addseverity</td>
<td>530</td>
</tr>
<tr>
<td>adjtime</td>
<td>715</td>
</tr>
<tr>
<td>adjtimex</td>
<td>718</td>
</tr>
<tr>
<td>advance</td>
<td>597</td>
</tr>
<tr>
<td>aio_cancel</td>
<td>90</td>
</tr>
<tr>
<td>aio_error</td>
<td>91</td>
</tr>
<tr>
<td>aio_fsync</td>
<td>91</td>
</tr>
<tr>
<td>aio_init</td>
<td>504</td>
</tr>
<tr>
<td>aio_read</td>
<td>91</td>
</tr>
<tr>
<td>aio_return</td>
<td>91</td>
</tr>
<tr>
<td>aio_suspend</td>
<td>92</td>
</tr>
<tr>
<td>aio_write</td>
<td>92</td>
</tr>
<tr>
<td>alarm</td>
<td>92</td>
</tr>
<tr>
<td>aligned_alloc</td>
<td>93</td>
</tr>
<tr>
<td>alloca</td>
<td>772</td>
</tr>
<tr>
<td>allocated initialization</td>
<td>819</td>
</tr>
<tr>
<td>ALLOC</td>
<td>773</td>
</tr>
<tr>
<td>ALLOC_N</td>
<td>773</td>
</tr>
<tr>
<td>ALLOC_N_UNINITIALIZED</td>
<td>773</td>
</tr>
<tr>
<td>alphasort</td>
<td>93</td>
</tr>
<tr>
<td>alternation operator</td>
<td>811</td>
</tr>
<tr>
<td>alternation operator and &quot;=&quot;</td>
<td>816</td>
</tr>
<tr>
<td>anchoring</td>
<td>816</td>
</tr>
<tr>
<td>anchors</td>
<td>816</td>
</tr>
<tr>
<td>argp_errno_exit_status</td>
<td>506</td>
</tr>
<tr>
<td>argp_error</td>
<td>506</td>
</tr>
<tr>
<td>argp_failure</td>
<td>506</td>
</tr>
<tr>
<td>argp_help</td>
<td>507</td>
</tr>
<tr>
<td>argp_parse</td>
<td>507</td>
</tr>
<tr>
<td>argp_program_bug_address</td>
<td>507</td>
</tr>
<tr>
<td>argp_program_version</td>
<td>507</td>
</tr>
<tr>
<td>argp_program_version_hook</td>
<td>507</td>
</tr>
<tr>
<td>argp_state_help</td>
<td>508</td>
</tr>
<tr>
<td>argp_usage</td>
<td>508</td>
</tr>
<tr>
<td>argz_add</td>
<td>508</td>
</tr>
<tr>
<td>argz_add_sep</td>
<td>509</td>
</tr>
<tr>
<td>argz_append</td>
<td>509</td>
</tr>
<tr>
<td>argz_count</td>
<td>510</td>
</tr>
</tbody>
</table>

---

### B

<table>
<thead>
<tr>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>back-references</td>
<td>815</td>
</tr>
<tr>
<td>backtrace</td>
<td>527</td>
</tr>
<tr>
<td>backtrace_symbols</td>
<td>527</td>
</tr>
<tr>
<td>backtrace_symbols_fd</td>
<td>527</td>
</tr>
<tr>
<td>backtracking</td>
<td>810, 812</td>
</tr>
<tr>
<td>basename</td>
<td>100</td>
</tr>
<tr>
<td>bcmv</td>
<td>484</td>
</tr>
<tr>
<td>bccopy</td>
<td>484</td>
</tr>
<tr>
<td>bdflush</td>
<td>699</td>
</tr>
<tr>
<td>beginning-of-line operator</td>
<td>816</td>
</tr>
<tr>
<td>bind</td>
<td>100</td>
</tr>
<tr>
<td>bind_textdomain_codeset</td>
<td>541</td>
</tr>
<tr>
<td>bindresvport</td>
<td>575</td>
</tr>
</tbody>
</table>
bindtextdomain................................. 541
block size........................................ 802
bracket expression......................... 812
brk................................................. 729
bsd_signal........................................ 484
bsearch........................................... 100
bswap_16.......................................... 515
bswap_32........................................... 516
bswap_64........................................... 516
btowc.............................................. 100
buffer field, set by re_compile_pattern.... 819
buffer initialization......................... 819
bzero................................................. 485

c
clntudp_create................................. 609
clogetsockopt................................... 608
clog............................................... 110
clog10............................................. 516
clog10f............................................. 516
clog10l............................................. 516
clogf............................................... 119
clogfl............................................. 119
clog1............................................... 516
clog1f............................................. 516
clog1l............................................. 516
clog............................................... 119
clog1............................................... 516
clog1f............................................. 516
clog1l............................................. 516

cbrtf.............................................. 110
cbrtl............................................... 110
ccos............................................... 111
ccosf............................................. 111
ccosh............................................. 111
ccoshf............................................ 111
ccoshl............................................ 112
ccosl.............................................. 112
cos................................................. 112
cosf................................................ 113
cosl................................................ 112
cosh.............................................. 112
coshf............................................. 112

cabs............................................... 102
cabsf.............................................. 102
cabsl.............................................. 102
cacos............................................... 102
cacosf............................................. 102
cacosh............................................. 103
cacoshf............................................ 103
cacoshl............................................ 103
cacosl.............................................. 104
call_once........................................ 104
calloc............................................. 104
callrpc.......................................... 607
canonicalize................................. 105

"Canonicalize file name".......................... 673
"Canonicalize"................................. 105
"Canonicalize"................................. 105

capget........................................... 693
capset............................................ 693
carg............................................... 105
cargf............................................. 106
carg1............................................. 106
casin.............................................. 106
casinf.......................................... 106
casin............................................. 107
casinfl.......................................... 107
casinhl.......................................... 107
catan............................................. 108
catanf............................................ 108
catanh.......................................... 108
catanhf.......................................... 108
catanhl.......................................... 109
catanl............................................ 109
catclos.......................... 863

catclose......................................... 109
catget.......................... 863

catgets........................................ 109
catopendir................................. 110
cbrtf.............................................. 110
Index

clone .............................................. 650
close ........................................... 119
closedir ....................................... 120
closefrom ................................. 730
closelog .................................... 120
cnd_broadcast .............................. 120
cnd_destroy ................................ 120
cnd_init ..................................... 121
cnd_signal .................................. 121
cnd_timedwait .............................. 121
cnd_wait .................................... 121
'colon' in regex .............................. 813
comments describing functions .......... 36
conditional dependencies ................. 32
configmake module .......................... 841
configmake.h, module for updating ..... 841
confstr ...................................... 122
conj ........................................... 122
conjf ......................................... 122
conjl ......................................... 122
connect ....................................... 123
copy_file_range ............................ 730
copysign ...................................... 123
copysignf .................................... 123
copysignl .................................... 123
cos ............................................. 124
cosf ........................................... 124
cosh ........................................... 124
coshf ......................................... 124
cosl ........................................... 125
cpouv ......................................... 125
cpowl .......................................... 126
cproj ........................................... 126
cprojf ......................................... 126
cprojl ......................................... 126
creal ........................................... 127
crealf ......................................... 127
crealf ......................................... 127
creat ........................................... 127
crypt ........................................... 128
csin ............................................ 128
csinf ........................................... 128
csinh ........................................... 129
csinhf ......................................... 129
csinl ........................................... 129
csqrt ........................................... 130
csqrtf ......................................... 130
csqrtl ......................................... 130
ctan ............................................ 130
ctanf ........................................... 131
ctanl ........................................... 131
catah ........................................... 131
catan ............................................ 131
ctermid ....................................... 132
cftime .......................................... 132
cftime_r ....................................... 133
cuserid ......................................... 665
cftime .......................................... 132
cftime_r ....................................... 133
cuserid ......................................... 665

d

daddl ........................................... 133
ddaemon ......................................... 731
daylight ....................................... 133
dbm_clearerr ................................. 134
dbm_close ...................................... 134
dbm_delete .................................... 134
dbm_error ..................................... 134
dbm_fetch ...................................... 135
dbm_firstkey .................................. 135
dbm_nextkey ................................... 135
dbm_open ....................................... 135
dbm_openkey .................................. 135
dbm_store ...................................... 136
dcgettext ..................................... 542
dcgettext ..................................... 542
dcgettext ..................................... 542
div .............................................. 137
dir ............................................. 137
difftime ....................................... 136
dirent-safer .................................. 785
dirfd .......................................... 136
dirname ........................................ 137
dlnaddr ........................................ 518
dladdr .......................................... 519
dladdr1 ......................................... 519
dlclose ......................................... 137
dlerror ......................................... 137
dlinfo .......................................... 519
dlclose ......................................... 137
dlerror ......................................... 137
dlinfo .......................................... 519
dlsym ............................................ 138
dlsvym .......................................... 519
dlsvym .......................................... 519
dmull ............................................ 138
dmull ............................................ 138
dn_comp ....................................... 598
dn_expand ..................................... 598
dn_getext ...................................... 543
dn_getext ...................................... 543
double inclusion of header files ......... 34
dprintf .......................................... 139
drand48 ......................................... 140
drand48 ......................................... 140
drand48 ......................................... 140
drem ............................................. 547
drem ............................................. 547
drem ............................................. 547
drem ............................................. 547
dsub ............................................ 140
dup .............................................. 140
dup .............................................. 140
dup2 ............................................. 140
dup3 ............................................. 140
dup .............................................. 140
dup .............................................. 140
dup .............................................. 140
dup .............................................. 140
dup .............................................. 140
dup .............................................. 140
dup .............................................. 140
dup .............................................. 140
dup .............................................. 140
dup .............................................. 140
dup .............................................. 140

dyload ........................................... 726
<table>
<thead>
<tr>
<th>E</th>
<th>865</th>
</tr>
</thead>
<tbody>
<tr>
<td>eaccess</td>
<td>731</td>
</tr>
<tr>
<td>ecvt</td>
<td>485</td>
</tr>
<tr>
<td>ecvt_r</td>
<td>674</td>
</tr>
<tr>
<td>Egrep</td>
<td>806</td>
</tr>
<tr>
<td>Emacs</td>
<td>806</td>
</tr>
<tr>
<td>encrypt</td>
<td>141</td>
</tr>
<tr>
<td>end in struct re_registers</td>
<td>823</td>
</tr>
<tr>
<td>end-of-line operator</td>
<td>816</td>
</tr>
<tr>
<td>endaliasent</td>
<td>504</td>
</tr>
<tr>
<td>endfmt</td>
<td>531</td>
</tr>
<tr>
<td>endgrent</td>
<td>142</td>
</tr>
<tr>
<td>endhostent</td>
<td>142</td>
</tr>
<tr>
<td>endmntent</td>
<td>564</td>
</tr>
<tr>
<td>endnetent</td>
<td>142</td>
</tr>
<tr>
<td>endnetgrent</td>
<td>565</td>
</tr>
<tr>
<td>endprotoent</td>
<td>142</td>
</tr>
<tr>
<td>endpwait</td>
<td>613</td>
</tr>
<tr>
<td>endserver</td>
<td>538</td>
</tr>
<tr>
<td>endspent</td>
<td>656</td>
</tr>
<tr>
<td>endttyent</td>
<td>728</td>
</tr>
<tr>
<td>endusershell</td>
<td>731</td>
</tr>
<tr>
<td>endutent</td>
<td>740</td>
</tr>
<tr>
<td>endutxent</td>
<td>143</td>
</tr>
<tr>
<td>environ</td>
<td>143</td>
</tr>
<tr>
<td>envz_add</td>
<td>520</td>
</tr>
<tr>
<td>envz_entry</td>
<td>520</td>
</tr>
<tr>
<td>envz_get</td>
<td>521</td>
</tr>
<tr>
<td>envz_merge</td>
<td>521</td>
</tr>
<tr>
<td>envz_remove</td>
<td>521</td>
</tr>
<tr>
<td>envz_strip</td>
<td>522</td>
</tr>
<tr>
<td>epoll_create</td>
<td>694</td>
</tr>
<tr>
<td>epoll_create1</td>
<td>694</td>
</tr>
<tr>
<td>epoll_ctl</td>
<td>694</td>
</tr>
<tr>
<td>epoll_pwait</td>
<td>694</td>
</tr>
<tr>
<td>epoll_wait</td>
<td>695</td>
</tr>
<tr>
<td>equivalence class expression in regex</td>
<td>813</td>
</tr>
<tr>
<td>erand48</td>
<td>144</td>
</tr>
<tr>
<td>erand48_r</td>
<td>674</td>
</tr>
<tr>
<td>erf</td>
<td>144</td>
</tr>
<tr>
<td>erfc</td>
<td>144</td>
</tr>
<tr>
<td>erfcc</td>
<td>144</td>
</tr>
<tr>
<td>erfcl</td>
<td>151</td>
</tr>
<tr>
<td>erf</td>
<td>151</td>
</tr>
<tr>
<td>erf1</td>
<td>151</td>
</tr>
<tr>
<td>err</td>
<td>522</td>
</tr>
<tr>
<td>errno</td>
<td>145</td>
</tr>
<tr>
<td>error</td>
<td>525</td>
</tr>
<tr>
<td>error_at_line</td>
<td>525</td>
</tr>
<tr>
<td>error_message_count</td>
<td>526</td>
</tr>
<tr>
<td>error_one_per_line</td>
<td>526</td>
</tr>
<tr>
<td>error_print_progname</td>
<td>526</td>
</tr>
<tr>
<td>errx</td>
<td>522</td>
</tr>
<tr>
<td>ether_aton</td>
<td>573</td>
</tr>
<tr>
<td>ether_aton_r</td>
<td>574</td>
</tr>
<tr>
<td>ether_hostton</td>
<td>574</td>
</tr>
<tr>
<td>ether_line</td>
<td>574</td>
</tr>
<tr>
<td>ether_ntoa</td>
<td>574</td>
</tr>
<tr>
<td>ether_ntoa_r</td>
<td>575</td>
</tr>
<tr>
<td>ether_ntohost</td>
<td>575</td>
</tr>
<tr>
<td>errx</td>
<td>695</td>
</tr>
<tr>
<td>eventfd</td>
<td>695</td>
</tr>
<tr>
<td>eventfd_read</td>
<td>695</td>
</tr>
<tr>
<td>eventfd_write</td>
<td>696</td>
</tr>
<tr>
<td>exec1</td>
<td>146</td>
</tr>
<tr>
<td>exec1c</td>
<td>146</td>
</tr>
<tr>
<td>exec1p</td>
<td>146</td>
</tr>
<tr>
<td>execv</td>
<td>147</td>
</tr>
<tr>
<td>execve</td>
<td>147</td>
</tr>
<tr>
<td>execveat</td>
<td>732</td>
</tr>
<tr>
<td>execvp</td>
<td>148</td>
</tr>
<tr>
<td>execvpe</td>
<td>732</td>
</tr>
<tr>
<td>exit</td>
<td>148</td>
</tr>
<tr>
<td>exp</td>
<td>148</td>
</tr>
<tr>
<td>exp10</td>
<td>548</td>
</tr>
<tr>
<td>exp10f</td>
<td>549</td>
</tr>
<tr>
<td>exp10l</td>
<td>549</td>
</tr>
<tr>
<td>exp2</td>
<td>149</td>
</tr>
<tr>
<td>exp2f</td>
<td>149</td>
</tr>
<tr>
<td>exp2l</td>
<td>149</td>
</tr>
<tr>
<td>expf</td>
<td>150</td>
</tr>
<tr>
<td>expl</td>
<td>150</td>
</tr>
<tr>
<td>explicit_bzero</td>
<td>686</td>
</tr>
<tr>
<td>expml</td>
<td>150</td>
</tr>
<tr>
<td>expmlf</td>
<td>151</td>
</tr>
<tr>
<td>expmll</td>
<td>151</td>
</tr>
<tr>
<td>EXPR_SIGNED</td>
<td>777</td>
</tr>
<tr>
<td>extern inline</td>
<td>784</td>
</tr>
<tr>
<td>Extra tests modules</td>
<td>43</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>F</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>fabs.</td>
<td>151</td>
</tr>
<tr>
<td>fabsf</td>
<td>151</td>
</tr>
<tr>
<td>fabsl</td>
<td>152</td>
</tr>
<tr>
<td>faccessat</td>
<td>152</td>
</tr>
<tr>
<td>fadd</td>
<td>153</td>
</tr>
<tr>
<td>faddl</td>
<td>153</td>
</tr>
<tr>
<td>fallallocate</td>
<td>528</td>
</tr>
<tr>
<td>fanotify_init</td>
<td>696</td>
</tr>
<tr>
<td>fanotify_mark</td>
<td>696</td>
</tr>
<tr>
<td>fastmap initialization</td>
<td>819</td>
</tr>
<tr>
<td>fastmaps</td>
<td>821</td>
</tr>
<tr>
<td>fattach</td>
<td>153</td>
</tr>
<tr>
<td>fchdir</td>
<td>153</td>
</tr>
<tr>
<td>fchmod</td>
<td>154</td>
</tr>
<tr>
<td>fchmodat</td>
<td>154</td>
</tr>
<tr>
<td>fchown</td>
<td>154</td>
</tr>
<tr>
<td>fchownat</td>
<td>155</td>
</tr>
<tr>
<td>fclose</td>
<td>155</td>
</tr>
<tr>
<td>fcloseall</td>
<td>665</td>
</tr>
<tr>
<td>fcntl</td>
<td>155</td>
</tr>
<tr>
<td>fcntl-safer</td>
<td>785</td>
</tr>
<tr>
<td>fcvt</td>
<td>485</td>
</tr>
<tr>
<td>Function</td>
<td>Page</td>
</tr>
<tr>
<td>---------------------</td>
<td>------</td>
</tr>
<tr>
<td>fd_clr</td>
<td>85</td>
</tr>
<tr>
<td>FD_CLR</td>
<td>85</td>
</tr>
<tr>
<td>FD_ISSET</td>
<td>85</td>
</tr>
<tr>
<td>FD_SET</td>
<td>85</td>
</tr>
<tr>
<td>FD_ZERO</td>
<td>85</td>
</tr>
<tr>
<td>fdataasync</td>
<td>156</td>
</tr>
<tr>
<td>fdetach</td>
<td>156</td>
</tr>
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<td>157</td>
</tr>
<tr>
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<td>157</td>
</tr>
<tr>
<td>fdiml</td>
<td>157</td>
</tr>
<tr>
<td>fdiv</td>
<td>157</td>
</tr>
<tr>
<td>fopen</td>
<td>158</td>
</tr>
<tr>
<td>fopendir</td>
<td>158</td>
</tr>
<tr>
<td>feclearexcep</td>
<td>159</td>
</tr>
<tr>
<td>fedisableexcept</td>
<td>529</td>
</tr>
<tr>
<td>feenableexcept</td>
<td>529</td>
</tr>
<tr>
<td>feground</td>
<td>160</td>
</tr>
<tr>
<td>feholdexcept</td>
<td>160</td>
</tr>
<tr>
<td>feof</td>
<td>160</td>
</tr>
<tr>
<td>feoverflow</td>
<td>160</td>
</tr>
<tr>
<td>ferror</td>
<td>160</td>
</tr>
<tr>
<td>ferror_unlocked</td>
<td>666</td>
</tr>
<tr>
<td>fesetenv</td>
<td>161</td>
</tr>
<tr>
<td>fesetexceptr</td>
<td>161</td>
</tr>
<tr>
<td>fesetexceptflag</td>
<td>161</td>
</tr>
<tr>
<td>fesetmode</td>
<td>162</td>
</tr>
<tr>
<td>fesetround</td>
<td>162</td>
</tr>
<tr>
<td>fexecve</td>
<td>163</td>
</tr>
<tr>
<td>fflsh</td>
<td>163</td>
</tr>
<tr>
<td>fflsh_unlocked</td>
<td>666</td>
</tr>
<tr>
<td>ffs</td>
<td>164</td>
</tr>
<tr>
<td>ffsll</td>
<td>687</td>
</tr>
<tr>
<td>fgetcl</td>
<td>164</td>
</tr>
<tr>
<td>fgetc</td>
<td>164</td>
</tr>
<tr>
<td>fgetc_unlocked</td>
<td>667</td>
</tr>
<tr>
<td>fgetfilecon</td>
<td>654</td>
</tr>
<tr>
<td>fgetgrent</td>
<td>536</td>
</tr>
<tr>
<td>fgetgrent_r</td>
<td>536</td>
</tr>
<tr>
<td>fgetgrent_unlocked</td>
<td>667</td>
</tr>
<tr>
<td>fgetgrentsent</td>
<td>538</td>
</tr>
<tr>
<td>fgetgrentsent_r</td>
<td>538</td>
</tr>
<tr>
<td>fgetspent</td>
<td>656</td>
</tr>
<tr>
<td>fgetspent</td>
<td>656</td>
</tr>
<tr>
<td>fgetspent_r</td>
<td>656</td>
</tr>
<tr>
<td>fgetwc</td>
<td>165</td>
</tr>
<tr>
<td>fgetwc_unlocked</td>
<td>745</td>
</tr>
<tr>
<td>fgetwc</td>
<td>745</td>
</tr>
<tr>
<td>fgetws</td>
<td>165</td>
</tr>
<tr>
<td>fgetws_unlocked</td>
<td>746</td>
</tr>
<tr>
<td>fgetxattr</td>
<td>722</td>
</tr>
<tr>
<td>fileno</td>
<td>165</td>
</tr>
<tr>
<td>fileno_unlocked</td>
<td>667</td>
</tr>
<tr>
<td>fiock</td>
<td>696</td>
</tr>
<tr>
<td>flockfile</td>
<td>166</td>
</tr>
<tr>
<td>floor</td>
<td>166</td>
</tr>
<tr>
<td>floorf</td>
<td>166</td>
</tr>
<tr>
<td>fmax</td>
<td>168</td>
</tr>
<tr>
<td>fmaxf</td>
<td>168</td>
</tr>
<tr>
<td>fmaxl</td>
<td>168</td>
</tr>
<tr>
<td>fmaxmag</td>
<td>168</td>
</tr>
<tr>
<td>fmerror</td>
<td>169</td>
</tr>
<tr>
<td>fnerror</td>
<td>169</td>
</tr>
<tr>
<td>fnmopen</td>
<td>169</td>
</tr>
<tr>
<td>fnmin</td>
<td>170</td>
</tr>
<tr>
<td>fnminf</td>
<td>170</td>
</tr>
<tr>
<td>fnminl</td>
<td>170</td>
</tr>
<tr>
<td>fnminmag</td>
<td>170</td>
</tr>
<tr>
<td>fnmpin</td>
<td>171</td>
</tr>
<tr>
<td>fnmod</td>
<td>171</td>
</tr>
<tr>
<td>fnmodf</td>
<td>171</td>
</tr>
<tr>
<td>fnmodl</td>
<td>171</td>
</tr>
<tr>
<td>fnmsg</td>
<td>172</td>
</tr>
<tr>
<td>fnmopen</td>
<td>173</td>
</tr>
<tr>
<td>fopen</td>
<td>173</td>
</tr>
<tr>
<td>fopen safer</td>
<td>785</td>
</tr>
<tr>
<td>fopencookie</td>
<td>668</td>
</tr>
<tr>
<td>fork</td>
<td>174</td>
</tr>
<tr>
<td>fopenter</td>
<td>176</td>
</tr>
<tr>
<td>fputc</td>
<td>176</td>
</tr>
<tr>
<td>fputc_unlocked</td>
<td>668</td>
</tr>
<tr>
<td>fputs</td>
<td>177</td>
</tr>
<tr>
<td>fputs_unlocked</td>
<td>668</td>
</tr>
<tr>
<td>fputwc</td>
<td>177</td>
</tr>
<tr>
<td>fputw</td>
<td>177</td>
</tr>
<tr>
<td>fputwc_unlocked</td>
<td>746</td>
</tr>
<tr>
<td>fputws</td>
<td>177</td>
</tr>
<tr>
<td>fputws_unlocked</td>
<td>747</td>
</tr>
<tr>
<td>fread</td>
<td>178</td>
</tr>
<tr>
<td>fread_unlocked</td>
<td>669</td>
</tr>
<tr>
<td>free</td>
<td>178</td>
</tr>
<tr>
<td>freeaddrinfo</td>
<td>178</td>
</tr>
</tbody>
</table>
freeifaddrs.......................... 541
freelocale.......................... 179
FREE................................ 773
fremovexattr........................ 723
freopen.............................. 179
freopen-safer....................... 785
frexp................................ 179
frexpf................................ 180
frexpl................................ 180
fromfp................................ 181
fromfpf................................ 181
fromfpix.............................. 181
fromfx................................. 182
fromfxp............................... 182
fts_read............................. 532
fts_close............................ 532
fts_open............................. 532
fts_read............................. 533
fts_set............................... 533
ftw.................................. 188
funlockfile.......................... 188
futimens............................. 188
futimes................................ 716
futimesat............................ 716
fvide................................. 189
fvpprintf............................ 189
fwrite.............................. 190
fwrite_unlocked...................... 669
fwsbcanf............................ 190
G

gai_strerror.......................... 190
gamma................................. 190
gammaf............................... 551
gammal............................... 551
gcd.................................. 796
gcv.................................. 486
get_avphys_pages.................... 712
get_current_dir_name................ 733
get_mynamespace.......................... 610
get_nprocs........................... 713
get_nprocs_conf...................... 713
get_phys_pages........................ 713
getaddinfo........................... 191
getaclocal........................... 605
getaliasbyname....................... 505
getaliasbyname_r..................... 505
getaliasent.......................... 505
getauxval............................ 693
getc.................................. 191
getcpu................................ 651
getcwd................................. 192
getdate................................ 193
getdate_err........................... 193
getdate_r............................. 726
getdelim.............................. 194
getdirent............................. 518
getdomainname........................ 733
getdtablesize........................ 733
getenv................................. 194
geteuid............................... 194
getentropy............................ 705
geteuid............................... 194
getenv................................. 654
getfilecon............................ 531
getfsent.............................. 531
getfsfile............................. 531
getgfile.............................. 531
getgid................................. 195
getgrgid.............................. 195
getgrgid_r........................... 195
getgrnam.............................. 196
getgrnam_r............................ 196
getgrnam.............................. 196
getgrnam_r............................ 196
getgrnam.............................. 196
getgroup............................. 537
getgrouplist.......................... 196
getgroups............................. 196
gethostbyaddr........................ 486
gethostbyaddr........................ 486
gethostbyname........................ 486
gethostbyname........................ 567
gethostbyname........................ 567
gethostbyname2........................ 566
gethostbyname2........................ 566
gethostent............................ 197
gethostent_r.......................... 567
gethostid............................. 197
gethostid............................. 197
gethostname........................... 197
gethostname........................... 197
getifaddrs........................... 540
getipv4sourcefilter.................. 575
getitimer............................. 197
getline............................... 198
getloadavg........................... 675
getlogin.............................. 198
<table>
<thead>
<tr>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>getlogin_r</td>
<td>198</td>
</tr>
<tr>
<td>getmntent</td>
<td>564</td>
</tr>
<tr>
<td>getmntent_r</td>
<td>565</td>
</tr>
<tr>
<td>getmsg</td>
<td>199</td>
</tr>
<tr>
<td>getnameinfo</td>
<td>199</td>
</tr>
<tr>
<td>getnetbyaddr</td>
<td>199</td>
</tr>
<tr>
<td>getnetbyaddr_r</td>
<td>567</td>
</tr>
<tr>
<td>getnetbyname</td>
<td>200</td>
</tr>
<tr>
<td>getnetbyname_r</td>
<td>568</td>
</tr>
<tr>
<td>getnetent_r</td>
<td>568</td>
</tr>
<tr>
<td>getnetgrent</td>
<td>568</td>
</tr>
<tr>
<td>getnetgrent_r</td>
<td>568</td>
</tr>
<tr>
<td>gettext</td>
<td>603</td>
</tr>
<tr>
<td>getopt</td>
<td>200</td>
</tr>
<tr>
<td>getopt_long</td>
<td>533</td>
</tr>
<tr>
<td>getopt_long_only</td>
<td>534</td>
</tr>
<tr>
<td>getpagesize</td>
<td>734</td>
</tr>
<tr>
<td>getpass</td>
<td>734</td>
</tr>
<tr>
<td>getpayload</td>
<td>201</td>
</tr>
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<td>getpayloadf</td>
<td>201</td>
</tr>
<tr>
<td>getpayloadl</td>
<td>202</td>
</tr>
<tr>
<td>getpeername</td>
<td>202</td>
</tr>
<tr>
<td>getpgid</td>
<td>202</td>
</tr>
<tr>
<td>getpgrp</td>
<td>202</td>
</tr>
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<td>203</td>
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<td>getpriority</td>
<td>203</td>
</tr>
<tr>
<td>getprofilename</td>
<td>796</td>
</tr>
<tr>
<td>getprotobyname</td>
<td>203</td>
</tr>
<tr>
<td>getprotobyname_r</td>
<td>569</td>
</tr>
<tr>
<td>getprotobyname</td>
<td>204</td>
</tr>
<tr>
<td>getprotobyname_r</td>
<td>569</td>
</tr>
<tr>
<td>getprotent</td>
<td>204</td>
</tr>
<tr>
<td>getprotent_r</td>
<td>569</td>
</tr>
<tr>
<td>getpt</td>
<td>675</td>
</tr>
<tr>
<td>getpublickey</td>
<td>606</td>
</tr>
<tr>
<td>getpw</td>
<td>594</td>
</tr>
<tr>
<td>getpwent</td>
<td>204</td>
</tr>
<tr>
<td>getpwent_r</td>
<td>594</td>
</tr>
<tr>
<td>getpwnam</td>
<td>204</td>
</tr>
<tr>
<td>getpwnam_r</td>
<td>205</td>
</tr>
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<td>205</td>
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</tr>
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<td>getrandom</td>
<td>706</td>
</tr>
<tr>
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<td>735</td>
</tr>
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<td>735</td>
</tr>
<tr>
<td>getrlimit</td>
<td>205</td>
</tr>
<tr>
<td>getrscbyname</td>
<td>613</td>
</tr>
<tr>
<td>getrscbyname_r</td>
<td>613</td>
</tr>
<tr>
<td>getrscbyname</td>
<td>613</td>
</tr>
<tr>
<td>getrscbyname_r</td>
<td>613</td>
</tr>
<tr>
<td>getrscbynumber</td>
<td>613</td>
</tr>
<tr>
<td>getrscbynumber_r</td>
<td>613</td>
</tr>
<tr>
<td>getrscfreq</td>
<td>614</td>
</tr>
<tr>
<td>getrscfreq_r</td>
<td>614</td>
</tr>
<tr>
<td>getrpcport</td>
<td>610</td>
</tr>
<tr>
<td>getresusage</td>
<td>206</td>
</tr>
<tr>
<td>gets</td>
<td>206</td>
</tr>
<tr>
<td>getsecretkey</td>
<td>606</td>
</tr>
<tr>
<td>getservbyname</td>
<td>206</td>
</tr>
<tr>
<td>getservbyname_r</td>
<td>569</td>
</tr>
<tr>
<td>getservbyport</td>
<td>207</td>
</tr>
<tr>
<td>getservbyport_r</td>
<td>570</td>
</tr>
<tr>
<td>getservevent</td>
<td>207</td>
</tr>
<tr>
<td>getservevent_r</td>
<td>570</td>
</tr>
<tr>
<td>getsgента</td>
<td>539</td>
</tr>
<tr>
<td>getsgent_r</td>
<td>539</td>
</tr>
<tr>
<td>getsgnam</td>
<td>539</td>
</tr>
<tr>
<td>getsid</td>
<td>207</td>
</tr>
<tr>
<td>getsid_r</td>
<td>539</td>
</tr>
<tr>
<td>getsockkeeper</td>
<td>208</td>
</tr>
<tr>
<td>getsockopt</td>
<td>576</td>
</tr>
<tr>
<td>getsockoptfilter</td>
<td>576</td>
</tr>
<tr>
<td>gettextname</td>
<td>533</td>
</tr>
<tr>
<td>gettext_init</td>
<td>28</td>
</tr>
<tr>
<td>gettext</td>
<td>735</td>
</tr>
<tr>
<td>gettimeofday</td>
<td>208</td>
</tr>
<tr>
<td>gettyent</td>
<td>728</td>
</tr>
<tr>
<td>getuid</td>
<td>209</td>
</tr>
<tr>
<td>getumask</td>
<td>710</td>
</tr>
<tr>
<td>getusershell</td>
<td>735</td>
</tr>
<tr>
<td>getutent</td>
<td>740</td>
</tr>
<tr>
<td>getutent_r</td>
<td>741</td>
</tr>
<tr>
<td>getutid</td>
<td>741</td>
</tr>
<tr>
<td>getutid_r</td>
<td>741</td>
</tr>
<tr>
<td>getutline</td>
<td>742</td>
</tr>
<tr>
<td>getutline_r</td>
<td>742</td>
</tr>
<tr>
<td>getutmp</td>
<td>744</td>
</tr>
<tr>
<td>getutmpx</td>
<td>745</td>
</tr>
<tr>
<td>getutxent</td>
<td>209</td>
</tr>
<tr>
<td>getutxid</td>
<td>209</td>
</tr>
<tr>
<td>getutxline</td>
<td>209</td>
</tr>
<tr>
<td>getw</td>
<td>669</td>
</tr>
<tr>
<td>getwc</td>
<td>210</td>
</tr>
<tr>
<td>getwc_unlocked</td>
<td>747</td>
</tr>
<tr>
<td>getwchar</td>
<td>210</td>
</tr>
<tr>
<td>getwchar_unlocked</td>
<td>747</td>
</tr>
<tr>
<td>getwd</td>
<td>487</td>
</tr>
<tr>
<td>getxattr</td>
<td>723</td>
</tr>
<tr>
<td>glob</td>
<td>210</td>
</tr>
<tr>
<td>glob_pattern_p</td>
<td>535</td>
</tr>
<tr>
<td>globfree</td>
<td>210</td>
</tr>
<tr>
<td>gmtime</td>
<td>211</td>
</tr>
<tr>
<td>gmtime_r</td>
<td>211</td>
</tr>
<tr>
<td>gnu_dev_major</td>
<td>714</td>
</tr>
<tr>
<td>gnu_dev_makedev</td>
<td>715</td>
</tr>
<tr>
<td>gnu_dev_minor</td>
<td>715</td>
</tr>
<tr>
<td>gnu_get_libc_release</td>
<td>535</td>
</tr>
<tr>
<td>gnu_get_libc_version</td>
<td>535</td>
</tr>
<tr>
<td>gnuib_tool</td>
<td>18</td>
</tr>
</tbody>
</table>
integer type overflow .......................... 781
interval expression .............................. 811
invoking gnu-lib-tool ............................ 18
ioctl ............................................. 220
ioperm .......................................... 699
iopl .............................................. 699
isalnum .......................................... 220
isalnum_l ......................................... 221
isalpha .......................................... 221
isalpha_l ......................................... 222
isascii ........................................... 222
isastream ......................................... 223
isatty ............................................. 223
isblank ........................................... 224
isblank_l ......................................... 224
iscntrl ........................................... 225
iscntrl_l ......................................... 225
isctype ............................................ 517
isdigit ........................................... 225
isdigit_l .......................................... 226
isdtype ........................................... 709
isfinite .......................................... 226
isgraph ........................................... 227
isgraph_l ......................................... 227
isgreater .......................................... 228
isgreaterequal .................................... 228
isinf ............................................. 228
isinff ............................................ 551
isinfl ............................................ 552
isless ............................................ 228
islessequal ....................................... 229
islessgreater ..................................... 229
islower ............................................ 229
islower_l .......................................... 230
isnan .............................................. 230
isnanf ............................................. 552
isnanl ............................................. 552
isnormal .......................................... 230
isprint ............................................ 231
isprint_l .......................................... 231
ispunct ............................................ 232
ispunct_l .......................................... 232
isspace ............................................ 233
isspace_l .......................................... 233
isunordered ........................................ 234
isupper ............................................ 234
isupper_l .......................................... 235
iswalnum .......................................... 235
iswalnum_l ........................................ 235
iswalpha .......................................... 236
iswalpha_l ........................................ 236
iswblank .......................................... 236
iswblank_l ......................................... 237
iswcntrl .......................................... 237
iswcntrl_l ......................................... 237
iswctype .......................................... 238
iswctype_l ......................................... 238
iswdigit .......................................... 238
iswdigit_l ......................................... 239
iswgraph .......................................... 239
iswgraph_l ......................................... 239
iswlower .......................................... 240
iswlower_l ......................................... 240
iswprint ........................................... 240
iswprint_l ......................................... 241
iswpunct ........................................... 241
iswpunct_l ......................................... 241
iswspace .......................................... 242
iswspace_l ......................................... 242
iswupper .......................................... 242
iswupper_l ......................................... 243
isxdigit .......................................... 243
isxdigit_l .......................................... 243
isxdigit .......................................... 244
isxdigit_l .......................................... 244

J
j0 ..................................................... 245
jof ................................................... 553
j0f ................................................... 553
j0l ................................................... 245
j1 ................................................... 554
j1f ................................................... 553
j1l ................................................... 554
jn ................................................... 245
jn0 .................................................. 554
jn1 .................................................. 554
jrand48 ............................................. 245
jrand48_r .......................................... 676

K
key_decryptsession .................................. 603
key_decryptsession_pk .............................. 604
key_encryptsession .................................. 604
key_encryptsession_pk .............................. 604
key_gendes ........................................ 604
key_get_conv ....................................... 604
key_secretkey_is_set ................................ 605
key_setsecret ...................................... 605
kill ................................................. 245
killpg ............................................. 246
klogctl ............................................ 700
L
164a ........................................ 246
labs ........................................ 246
lchmod ..................................... 710
lchown .................................... 246
1ckpdf ................................... 657
1cng48 .................................... 247
1cng48_r ................................. 676
LD DEF files .............................. 756
ldefp ..................................... 247
1defpl .................................... 247
ldiv ........................................ 248
lfind ....................................... 248
lgamma .................................... 248
1gamma_r .................................. 555
1gammaf .................................. 248
1gammal ................................... 555
1gammal_r ................................ 249
lgamma_l ................................... 556
1getfilecon .............................. 655
1getxattr ................................ 723
link ................................ ........ 249
1inkat ..................................... 249
l[i0_listio ................................ 250
1ist ......................................... 250
1istxattr ................................ 724
1labs ....................................... 250
1ldiv ........................................ 250
1llistxattr ............................... 724
11lob ........................................ 251
11logf ...................................... 251
11logbl .................................... 251
11rint ....................................... 252
11rintf ..................................... 252
11rinti ..................................... 252
11round ..................................... 252
11roundf ................................... 252
11roundl ................................... 253
loc1 ......................................... 597
loc2 ......................................... 597
localeconv ................................ 253
localtime .................................. 253
localtime_r ............................... 254
lockf ....................................... 254
loc .......................................... 597
log .......................................... 254
1log10 ...................................... 255
1log10f ..................................... 255
1log10l ..................................... 255
1log1p ...................................... 256
1log1pf ..................................... 256
1log1pl ..................................... 256
log2 .......................................... 257
log2f ........................................ 257
log2l ........................................ 257
logb ......................................... 258
logbf ........................................ 258
logbl ........................................ 258
logf .......................................... 259
log ......................................... 744
1login ...................................... 744
1login_tty ................................ 744
log1 ......................................... 259
long-running tests modules ............. 43
longjmp .................................... 259
1rand48 .................................... 260
1rand48_r .................................. 677
1removexattr ............................. 724
lrint ........................................ 260
lrintf ....................................... 260
lrintl ....................................... 260
lround ...................................... 261
lroundf ..................................... 261
lroundl ..................................... 261
lsearch ..................................... 262
lseek ........................................ 262
1setxattr .................................. 724
1stat ......................................... 262
lutimes ..................................... 716

M
madivise ..................................... 700
makecontext ................................ 487
mallinfo ................................... 545
mallinfo2 ................................ 545
malloc ....................................... 263
malloc ....................................... 819
malloc_info ................................ 545
malloc_stats ................................ 546
malloc_trim ................................ 546
malloc_usable_size ....................... 546
malloc ....................................... 546
matching_list ................................ 812
matching_newline ......................... 812
matching_with_GNU_functions .......... 819
matherr .................................... 556
mblen ....................................... 263
mblen ....................................... 263
mbtowc ..................................... 264
mbtowc ..................................... 264
mbtowc ..................................... 265
mbtowc ..................................... 264
mbtowc ..................................... 267
mbtowcs ................................... 267
mbtowcs ................................... 267
mbtowcs ................................... 267
mbtowc ..................................... 267
mbtowc ..................................... 267
mcheck ..................................... 562
mcheck_check_all ......................... 562
mcheck_pedantic .......................... 563
memalign .................................. 547
memccpy ................................... 268
memchr ..................................... 268
memcmp ..................................... 268
memcpy ..................................... 269
memfd_create ................................ 700
memfrob ........................................ 688
memmem ........................................ 688
memmove ........................................ 269
Memory allocation failure .................. 43
memcpy ......................................... 689
memchr ......................................... 689
memset ......................................... 269
memset_explicit ................................ 269
mincoring ..................................... 701
mkdir ........................................... 270
mkdirat ........................................ 270
mkfifo ......................................... 271
mkfifoat ....................................... 271
knode .......................................... 271
knodeat ........................................ 271
mkostep ........................................ 677
mkostep ........................................ 677
mkstemp ........................................ 272
mkstemp ........................................ 272
mktime ......................................... 273
mlock .......................................... 273
mlock2 ......................................... 273
mlockall ....................................... 273
mmap ............................................ 273
mmod ............................................ 274
moff ............................................. 274
modf ............................................ 275
monstartup ..................................... 697
mount .......................................... 703
mp anlaşen ...................................... 563
mprotect ........................................ 275
mq_close ....................................... 275
mq_getattr ..................................... 275
mq_notify ....................................... 276
mq_open ........................................ 276
mq_receive ...................................... 276
mq_send ........................................ 276
mq_setattr ..................................... 277
mq_timedreceive ................................ 277
mq_timedsend .................................. 277
mq_unlink ..................................... 277
mrand48 ....................................... 278
mrand48_r ...................................... 278
mremap ........................................ 701
msgctl ......................................... 278
msgget ......................................... 278
msgqueue ...................................... 278
msync .......................................... 279
mtrace ......................................... 563
mtx_destroy ................................... 279
mtx_init ........................................ 279
mtx_lock ....................................... 280
mtx_timedlock .................................. 280
mtx_trylock .................................... 280
mtx_unlock ..................................... 280
multibyte locale ......................... 761
munlock ...................................... 281
munlockall ...................................... 281
munmap ......................................... 281
muntrace ........................................ 563

N
name_to_handle_at........................... 528
nan ............................................. 281
naf ............................................. 282
nal ............................................. 282
nanosleep ...................................... 282
nearbyint ...................................... 282
nearbyintf ..................................... 283
nearbyintl ...................................... 283
netname2host .................................. 605
netname2user .................................. 605
newlocale ...................................... 283
nextafter ....................................... 283
nextafterf ..................................... 284
nextafterl ...................................... 284
nextcall .................................... 284
nextcallf ...................................... 285
nextcalll ...................................... 285
nexttoaf ....................................... 285
nexttoaf ...................................... 285
nexttoall ...................................... 286
nextup .......................................... 286
nextupf ........................................ 286
nextupl ........................................ 286
nftw ........................................... 287
ngettext ....................................... 544
nice ............................................ 287
nis_add ........................................ 633
nis_add_entry .................................. 634
nis_addmember .................................. 634
nis_checkpoint ................................ 634
nis_clone_object ................................ 634
nis_creategroup ................................ 634
nis_destroy .................................... 635
nis_destroygroup ................................ 635
nis_dir ........................................ 635
nis_domain .................................... 635
nis_domain_of ................................ 635
nis_first_entry ................................ 636
nis_fenames .................................. 636
nis_freeers .................................... 636
nis_freeervlist ................................ 636
nis_freetags .................................. 636
nis_getnames .................................. 637
nis_getervlist ................................ 637
nis_ismember .................................. 637
nis_leaf ........................................ 637
nis_leaf_of .................................... 637
nis_leaf_of .................................... 637
nis_lerror ..................................... 638
nis_list ........................................ 638
nis_local_directory ....................... 638
<table>
<thead>
<tr>
<th>Function Name</th>
<th>Line</th>
<th>Function Name</th>
<th>Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>posix_spawn_file_actions_addfchdir_np</td>
<td>663</td>
<td>posix_trace_get_status</td>
<td>314</td>
</tr>
<tr>
<td>posix_spawn_file_actions_addopen</td>
<td>297</td>
<td>posix_trace_getnext_event</td>
<td>314</td>
</tr>
<tr>
<td>posix_spawn_file_actions_destroy</td>
<td>298</td>
<td>posix_trace_open</td>
<td>314</td>
</tr>
<tr>
<td>posix_spawn_file_actions_init</td>
<td>298</td>
<td>posix_trace_rewind</td>
<td>314</td>
</tr>
<tr>
<td>posix_spawnattr_destroy</td>
<td>298</td>
<td>posix_trace_set_filter</td>
<td>315</td>
</tr>
<tr>
<td>posix_spawnattr_getflags</td>
<td>298</td>
<td>posix_trace_shutdown</td>
<td>315</td>
</tr>
<tr>
<td>posix_spawnattr_getgroup</td>
<td>299</td>
<td>posix_trace_start</td>
<td>315</td>
</tr>
<tr>
<td>posix_spawnattr_getschedparam</td>
<td>299</td>
<td>posix_trace_stop</td>
<td>316</td>
</tr>
<tr>
<td>posix_spawnattr_getschedpolicy</td>
<td>299</td>
<td>posix_trace_timedgetnext_event</td>
<td>316</td>
</tr>
<tr>
<td>posix_spawnattr_getsigdefault</td>
<td>299</td>
<td>posix_trace_trid_eventid_open</td>
<td>316</td>
</tr>
<tr>
<td>posix_spawnattr_getsigmask</td>
<td>300</td>
<td>posix_trace_get_filter</td>
<td>316</td>
</tr>
<tr>
<td>posix_spawnattr_init</td>
<td>300</td>
<td>posix_trace_trygetnext_event</td>
<td>316</td>
</tr>
<tr>
<td>posix_spawnattr_setflags</td>
<td>301</td>
<td>posix_trace_getfinfo</td>
<td>317</td>
</tr>
<tr>
<td>posix_spawnattr_setgroup</td>
<td>301</td>
<td>posix_trace_getinfo</td>
<td>317</td>
</tr>
<tr>
<td>posix_spawn_attr_destroy</td>
<td>302</td>
<td>POSIX Awk</td>
<td>806</td>
</tr>
<tr>
<td>posix_spawn_attr_getclockres</td>
<td>303</td>
<td>pow</td>
<td>317</td>
</tr>
<tr>
<td>posix_spawn_attr_getcreate</td>
<td>303</td>
<td>pow10</td>
<td>556</td>
</tr>
<tr>
<td>posix_spawn_attr_getrevision</td>
<td>303</td>
<td>pow10f</td>
<td>557</td>
</tr>
<tr>
<td>posix_trace_attr_destroy</td>
<td>305</td>
<td>pow</td>
<td>557</td>
</tr>
<tr>
<td>posix_trace_attr_getlogfullpolicy</td>
<td>304</td>
<td>powf</td>
<td>317</td>
</tr>
<tr>
<td>posix_trace_attr_getlogsize</td>
<td>304</td>
<td>pow1l</td>
<td>318</td>
</tr>
<tr>
<td>posix_trace_attr_getmaxdatasize</td>
<td>305</td>
<td>_ppoll</td>
<td>719</td>
</tr>
<tr>
<td>posix_trace_attr_getmaxsystemevents</td>
<td>305</td>
<td>printf</td>
<td>719</td>
</tr>
<tr>
<td>posix_trace_attr_getmaxuserevents</td>
<td>305</td>
<td>printf_size</td>
<td>584</td>
</tr>
<tr>
<td>posix_trace_attr_getname</td>
<td>306</td>
<td>printf_size_info</td>
<td>585</td>
</tr>
<tr>
<td>posix_trace_attr_getstreamfullpolicy</td>
<td>306</td>
<td>privileged tests modules</td>
<td>43</td>
</tr>
<tr>
<td>posix_trace_attr_getstreamsize</td>
<td>306</td>
<td>prlimit</td>
<td>707</td>
</tr>
<tr>
<td>posix_trace_attr_init</td>
<td>306</td>
<td>process_vm_readv</td>
<td>720</td>
</tr>
<tr>
<td>posix_trace_attr_setinherited</td>
<td>306</td>
<td>process_vm_writev</td>
<td>720</td>
</tr>
<tr>
<td>posix_trace_attr_setlogfullpolicy</td>
<td>307</td>
<td>prof</td>
<td>736</td>
</tr>
<tr>
<td>posix_trace_attr_setlogsize</td>
<td>307</td>
<td>proglname</td>
<td>796</td>
</tr>
<tr>
<td>posix_trace_attr_setmaxdatasize</td>
<td>307</td>
<td>program_invocation_name</td>
<td>524</td>
</tr>
<tr>
<td>posix_trace_attr_setmaxsystemevents</td>
<td>307</td>
<td>program_invocation_short_name</td>
<td>525</td>
</tr>
<tr>
<td>posix_trace_attr_setname</td>
<td>308</td>
<td>program_name</td>
<td>796</td>
</tr>
<tr>
<td>posix_trace_attr_setstreamfullpolicy</td>
<td>308</td>
<td>pselect</td>
<td>320</td>
</tr>
<tr>
<td>posix_trace_attr_setstreamsize</td>
<td>308</td>
<td>psinfo</td>
<td>320</td>
</tr>
<tr>
<td>posix_close</td>
<td>308</td>
<td>psignal</td>
<td>321</td>
</tr>
<tr>
<td>posix_create</td>
<td>309</td>
<td>pthread_atfork</td>
<td>321</td>
</tr>
<tr>
<td>posix_create_withlog</td>
<td>309</td>
<td>pthread_attr_destroy</td>
<td>321</td>
</tr>
<tr>
<td>posix_event</td>
<td>310</td>
<td>pthread_attr_getaffinity_np</td>
<td>586</td>
</tr>
<tr>
<td>posix_eventid_equal</td>
<td>310</td>
<td>pthread_attr_getdetachstate</td>
<td>321</td>
</tr>
<tr>
<td>posix_eventid_get_name</td>
<td>310</td>
<td>pthread_attr_getguardsize</td>
<td>322</td>
</tr>
<tr>
<td>posix_eventid_open</td>
<td>310</td>
<td>pthread_attr_getinherited</td>
<td>322</td>
</tr>
<tr>
<td>posix_eventset_add</td>
<td>311</td>
<td>pthread_attr_getschedparam</td>
<td>322</td>
</tr>
<tr>
<td>posix_eventset_del</td>
<td>311</td>
<td>pthread_attr_getschedpolicy</td>
<td>322</td>
</tr>
<tr>
<td>posix_eventset_empty</td>
<td>311</td>
<td>pthread_attr_getscope</td>
<td>323</td>
</tr>
<tr>
<td>posix_eventset_fill</td>
<td>312</td>
<td>pthread_attr_getstack</td>
<td>323</td>
</tr>
<tr>
<td>posix_eventset_ismember</td>
<td>312</td>
<td>pthread_attr_getstackaddr</td>
<td>488</td>
</tr>
<tr>
<td>posix_eventtypelist_getnext_id</td>
<td>312</td>
<td>pthread_attr_getstacksize</td>
<td>323</td>
</tr>
<tr>
<td>pthread_attr_init</td>
<td>313</td>
<td>pthread_attr_atfork</td>
<td>323</td>
</tr>
<tr>
<td>pthread_attr_setaffinity_np</td>
<td>313</td>
<td>pthread_attr_create</td>
<td>324</td>
</tr>
<tr>
<td>pthread_attr_setdetachstate</td>
<td>313</td>
<td>pthread_attr_setgroupprivilege</td>
<td>324</td>
</tr>
<tr>
<td>pthread_attr_setguardsize</td>
<td>313</td>
<td>pthread_attr_setinherited</td>
<td>324</td>
</tr>
</tbody>
</table>

Index 874
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>pthread_attr_setschedparam</td>
<td>324</td>
</tr>
<tr>
<td>pthread_attr_setschedpolicy</td>
<td>325</td>
</tr>
<tr>
<td>pthread_attr_setscopes</td>
<td>325</td>
</tr>
<tr>
<td>pthread_attr_setsigmask_np</td>
<td>587</td>
</tr>
<tr>
<td>pthread_attr_setstack</td>
<td>325</td>
</tr>
<tr>
<td>pthread_attr_setstackaddr</td>
<td>488</td>
</tr>
<tr>
<td>pthread_attr_setstacksize</td>
<td>325</td>
</tr>
<tr>
<td>pthread_barrier_destroy</td>
<td>326</td>
</tr>
<tr>
<td>pthread_barrier_init</td>
<td>326</td>
</tr>
<tr>
<td>pthread_barrier_wait</td>
<td>326</td>
</tr>
<tr>
<td>pthread_barrierattr_destroy</td>
<td>326</td>
</tr>
<tr>
<td>pthread_barrierattr_getshared</td>
<td>327</td>
</tr>
<tr>
<td>pthread_barrierattr_init</td>
<td>327</td>
</tr>
<tr>
<td>pthread_barrierattr_setshared</td>
<td>327</td>
</tr>
<tr>
<td>pthread_cancel</td>
<td>328</td>
</tr>
<tr>
<td>pthread_cleanup_pop</td>
<td>328</td>
</tr>
<tr>
<td>pthread_cleanup_push</td>
<td>328</td>
</tr>
<tr>
<td>pthread_clockjoin_np</td>
<td>587</td>
</tr>
<tr>
<td>pthread_cond_broadcast</td>
<td>328</td>
</tr>
<tr>
<td>pthread_cond_clockwait</td>
<td>587</td>
</tr>
<tr>
<td>pthread_cond_destroy</td>
<td>329</td>
</tr>
<tr>
<td>pthread_cond_init</td>
<td>329</td>
</tr>
<tr>
<td>pthread_cond_signal</td>
<td>329</td>
</tr>
<tr>
<td>pthread_cond_timedwait</td>
<td>329</td>
</tr>
<tr>
<td>pthread_cond_wait</td>
<td>330</td>
</tr>
<tr>
<td>pthread_condattr_destroy</td>
<td>330</td>
</tr>
<tr>
<td>pthread_condattr_getclock</td>
<td>330</td>
</tr>
<tr>
<td>pthread_condattr_getshared</td>
<td>330</td>
</tr>
<tr>
<td>pthread_condattr_init</td>
<td>331</td>
</tr>
<tr>
<td>pthread_condattr_setclock</td>
<td>331</td>
</tr>
<tr>
<td>pthread_condattr_setpshared</td>
<td>331</td>
</tr>
<tr>
<td>pthread_create</td>
<td>331</td>
</tr>
<tr>
<td>pthread_detach</td>
<td>332</td>
</tr>
<tr>
<td>pthread_equal</td>
<td>332</td>
</tr>
<tr>
<td>pthread_exit</td>
<td>332</td>
</tr>
<tr>
<td>pthread_getaffinity_np</td>
<td>587</td>
</tr>
<tr>
<td>pthread_getattr_default_np</td>
<td>588</td>
</tr>
<tr>
<td>pthread_getattr_np</td>
<td>588</td>
</tr>
<tr>
<td>pthread_getconcurrency</td>
<td>332</td>
</tr>
<tr>
<td>pthread_getcpu_clockid</td>
<td>333</td>
</tr>
<tr>
<td>pthread_getname_np</td>
<td>588</td>
</tr>
<tr>
<td>pthread_getschedparam</td>
<td>333</td>
</tr>
<tr>
<td>pthread_getspecific</td>
<td>333</td>
</tr>
<tr>
<td>pthread_join</td>
<td>334</td>
</tr>
<tr>
<td>pthread_key_create</td>
<td>334</td>
</tr>
<tr>
<td>pthread_key_delete</td>
<td>334</td>
</tr>
<tr>
<td>pthread_kill</td>
<td>334</td>
</tr>
<tr>
<td>pthread_kill_other_threads_np</td>
<td>589</td>
</tr>
<tr>
<td>pthread_mutex_clocklock</td>
<td>589</td>
</tr>
<tr>
<td>pthread_mutex_consistent</td>
<td>335</td>
</tr>
<tr>
<td>pthread_mutex_destroy</td>
<td>335</td>
</tr>
<tr>
<td>pthread_mutex_getprioceiling</td>
<td>335</td>
</tr>
<tr>
<td>pthread_mutex_init</td>
<td>335</td>
</tr>
<tr>
<td>pthread_mutex_lock</td>
<td>336</td>
</tr>
<tr>
<td>pthread_mutex_setprioceiling</td>
<td>336</td>
</tr>
<tr>
<td>pthread_mutex_timedlock</td>
<td>336</td>
</tr>
<tr>
<td>pthread_mutex_trylock</td>
<td>336</td>
</tr>
<tr>
<td>pthread_mutex_unlock</td>
<td>337</td>
</tr>
<tr>
<td>pthread_mutexattr_destroy</td>
<td>337</td>
</tr>
<tr>
<td>pthread_mutexattr_getprioceiling</td>
<td>337</td>
</tr>
<tr>
<td>pthread_mutexattr_getprotocol</td>
<td>337</td>
</tr>
<tr>
<td>pthread_mutexattr_getshared</td>
<td>338</td>
</tr>
<tr>
<td>pthread_mutexattr_getshared</td>
<td>338</td>
</tr>
<tr>
<td>pthread_mutexattr_gettype</td>
<td>338</td>
</tr>
<tr>
<td>pthread_mutexattr_init</td>
<td>338</td>
</tr>
<tr>
<td>pthread_mutexattr_setprioceiling</td>
<td>339</td>
</tr>
<tr>
<td>pthread_mutexattr_setprioceiling</td>
<td>339</td>
</tr>
<tr>
<td>pthread_mutexattr_setprotocol</td>
<td>339</td>
</tr>
<tr>
<td>pthread_mutexattr_setshared</td>
<td>339</td>
</tr>
<tr>
<td>pthread_mutexattr_settype</td>
<td>340</td>
</tr>
<tr>
<td>pthread_once</td>
<td>340</td>
</tr>
<tr>
<td>pthread_rwlock_clockdlock</td>
<td>589</td>
</tr>
<tr>
<td>pthread_rwlock_clockdouble</td>
<td>589</td>
</tr>
<tr>
<td>pthread_rwlock_destroy</td>
<td>340</td>
</tr>
<tr>
<td>pthread_rwlock_init</td>
<td>340</td>
</tr>
<tr>
<td>pthread_rwlock_rdlock</td>
<td>341</td>
</tr>
<tr>
<td>pthread_rwlock_timedlock</td>
<td>341</td>
</tr>
<tr>
<td>pthread_rwlock_trylock</td>
<td>342</td>
</tr>
<tr>
<td>pthread_rwlocktrylock</td>
<td>342</td>
</tr>
<tr>
<td>pthread_rwlockunlock</td>
<td>342</td>
</tr>
<tr>
<td>pthread_rwlock_wlock</td>
<td>343</td>
</tr>
<tr>
<td>pthread_rwlockattr_destroy</td>
<td>343</td>
</tr>
<tr>
<td>pthread_rwlockattr_getkind_np</td>
<td>590</td>
</tr>
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<td>pthread_rwlockattr_setkind_np</td>
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</tr>
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<td>344</td>
</tr>
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<td>344</td>
</tr>
<tr>
<td>pthread_setaffinity_np</td>
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<td>pthread_setcancelstate</td>
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</tr>
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</tr>
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<td>591</td>
</tr>
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<td>pthread_setschedparam</td>
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<td>pthread_setschedprio</td>
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</tr>
<tr>
<td>pthread_setspecific</td>
<td>345</td>
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<td>346</td>
</tr>
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<td>346</td>
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</tr>
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<td>pthread_setspin</td>
<td>346</td>
</tr>
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<td>Function</td>
<td>Page Numbers</td>
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svecerr_decode
svecerr_noproc
svecerr_noprog
svecerr_proprog
svecerr_systemerr
svecerr_weakauth
svccrav_create
svctcp_create
svcultp_bufcreate
svcultp_create
svcunix_create
svab
swapcontext
swapoff
swapon
sprintf
svscanf
symlink
symlinkat
sync
sync_file_range
sysconf
syntax bits
syntax field, set by re_{compile_pattern}
syntax initialization
syntax of regular expressions
sys_errlist
sys_errr
sysErrlist
sysErrr
syssiglist
syscall
sysconf
sysctl
sysinfo
syslog
system
sysv_signal
tests modules, C++
tests modules, long-running
tests modules, privileged
tests modules, unportable
textdomain
tFind
tgamma
tgammaf
tgammal
tgkill
thrd_create
thrd_current
thrd_detach
thrd_equal
thrd_exit
thrd_join
thrd_sleep
thrd_yield
time
timegm
timelocal
timer_create
timer_delete
timer_getoverrun
timer_gettime
timer_gettime
timerfd_create
timerfd_gettime
timerfd_settime
	imes
	imespec_get
	imespec_getres
	imeszone
tmfile
tmfile-safer
tmpnm

tmpnam_r
toastii
tolower
tolower_l
tolowerl
totalorder
totalorderf
totalorderl
totalordermag

totalordermagf
totalordermagl
toupper
toupper_l
towtrans
towtrans_l
towlower
towlower_l
towupper
towupper_l
translate initialization
trunc
truncate
trcnf
<table>
<thead>
<tr>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>truncl</td>
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<td>tsearch</td>
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<td>447</td>
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<td>43</td>
</tr>
<tr>
<td>unsetenv</td>
<td>448</td>
</tr>
<tr>
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<td>743</td>
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<td>847</td>
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<td>VCS To Changelog</td>
<td>847</td>
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<td>Function</td>
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</tr>
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</tr>
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<td>wmemchr</td>
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</tr>
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<td>wmemcmp</td>
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<td>wmemcpy</td>
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</tr>
<tr>
<td>wmemmove</td>
<td>479</td>
</tr>
<tr>
<td>wmempcpy</td>
<td>751</td>
</tr>
<tr>
<td>wmemset</td>
<td>480</td>
</tr>
<tr>
<td>word boundaries, matching</td>
<td>817</td>
</tr>
<tr>
<td>wordexp</td>
<td>480</td>
</tr>
<tr>
<td>wordfree</td>
<td>480</td>
</tr>
<tr>
<td>wprintf</td>
<td>480</td>
</tr>
<tr>
<td>wctok</td>
<td>477</td>
</tr>
</tbody>
</table>

Wraparound integer arithmetic: 779
write: 481
writev: 482
wscanf: 482

X

xalloc_die: 43
xdr_array: 624
xdr_authunix_parms: 607
xdr_bool: 624
xdr_bytes: 624
xdr_callhdr: 617
xdr_calloc: 617
xdr_cback_data: 644
xdr_char: 624
xdr_cryptkeyarg: 611
xdr_cryptkeyarg2: 611
xdr_cryptkeyres: 611
xdr_des_block: 606
xdr_domainname: 645
xdr_double: 625
xdr_enum: 625
xdr_float: 625
xdr_free: 625
xdr_getcrid: 611
xdr_hyper: 625
xdr_int: 626
xdr_int16_t: 626
xdr_int32_t: 626
xdr_int64_t: 626
xdr_int8_t: 626
xdr_key_netstarg: 611
xdr_key_netstres: 612
xdr_keybuf: 612
xdr_keydat: 645
xdr_keystatus: 612
xdr_long: 627
xdr_longlong_t: 627
xdr_netnamestr: 612
xdr_netobj: 627
xdr_objp: 645
xdrOpaque: 627
xdrOpaque_auth: 606
xdr_pmap: 616
xdr_pmaplist: 616
xdr_pointer: 627
xdr_quad_t: 628
xdr_reference: 628
xdr_replymsg: 617
xdr_rmtcall_args: 616
xdr_rmtcallres: 617
xdr_short: 628
xdr_sizeof: 628
xdr_string: 628
xdr_u_char: 629
xdr_u_hyper: 629
xdr_u_int: 629
xdr_u_long ........................................ 629
xdr_u_longlong_t ................................ 630
xdr_u_quad_t .................................... 630
xdr_u_short .................................... 630
xdr_uint16_t .................................... 630
xdr_uint32_t .................................... 630
xdr_uint64_t .................................... 631
xdr_uint8_t ..................................... 631
xdr_union ........................................ 631
xdr_unixcred ................................... 612
xdr_valat ....................................... 645
xdr_vector ...................................... 631
xdr_void ........................................ 631
xdr_wrapstring ................................ 632
xdr_ypbind_resptype ............................ 645
xdr_ypmap_parms ................................. 646
xdr_ypmaplist ................................ 646
xdr_yppushresp_xfr ............................. 646
xdr_ypreq_key .................................. 646
xdr_ypreq_nokey ................................ 646
xdr_ypreq_xfr .................................. 646
xdr_ypresp_all ................................ 647
xdr_ypresp_key_val ............................. 647
xdr_ypresp_maplist .............................. 647
xdr_ypresp_master ................................ 647
xdr_ypresp_order ................................ 647
xdr_ypresp_val .................................. 647
xdr_ypresp_xfr .................................. 648
xdr_ypstat ...................................... 648
xdr_ypxfrstat ................................ 648
xdrmem_create .................................. 632
xdrrec_create .................................. 632
xdrrec_endofrecord ............................. 632
xdrrec_eof ...................................... 632
xdrrec_skiprecord ............................... 633
xdrstdio_create ................................ 633
xprtdio_create ................................ 633
xprt_register .................................. 623
xprt_unregister ................................. 623
xstopen ........................................ 785

Y

y0 .............................................. 482
yof ............................................. 560
y0i ............................................. 560
y1 .............................................. 483
y1f ............................................. 561
y1l ............................................. 561
yn .............................................. 483
ynf ............................................. 561
yn1 ............................................. 562
yp_all .......................................... 648
yp_bind ......................................... 648
yp_first ........................................ 649
yp_get_default_domain ......................... 649
yp_master ...................................... 649
yp_match ........................................ 649
yp_next ......................................... 649
yp_order ........................................ 649
yp_unbind ..................................... 650
ypbinderr_string ............................... 650
yperr_string .................................. 650
ypprot_err ..................................... 650