This manual is for GNU Gnulib (updated 2022-02-24 16:33:25), which is a library of common routines intended to be shared at the source level.

Copyright © 2004–2022 Free Software Foundation, Inc.

Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.3 or any later version published by the Free Software Foundation; with no Invariant Sections, no Front-Cover Texts, and no Back-Cover Texts. A copy of the license is included in the section entitled “GNU Free Documentation License”.

# 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

## 2 Philosophy ....................................................... 8
  2.1 Benefits of using Gnulib................................. 8
  2.2 Library vs. Reusable Code............................... 8
  2.3 Portability and Application Code....................... 8
  2.4 Target Platforms......................................... 9
    2.4.1 Supported Platforms................................ 9
    2.4.2 Formerly Supported Platforms....................... 10
    2.4.3 Unsupported Platforms............................... 10
  2.5 Modules.................................................. 11
  2.6 Various Kinds of Modules............................... 12
    2.6.1 Support for ISO C or POSIX functions................ 12
    2.6.2 Enhancements of ISO C or POSIX functions........... 13
    2.6.3 Portable general use facilities...................... 13
    2.6.4 Reusable application code........................... 13
    2.6.5 Object oriented classes.............................. 13
    2.6.6 Interfaces to external libraries.................... 13
    2.6.7 Build / maintenance infrastructure.................. 13
  2.7 Collaborative Development.............................. 13
  2.8 Copyright................................................ 14
  2.9 Steady Development..................................... 15
  2.10 Openness............................................... 15

## 3 Invoking gnulib-tool ........................................... 16
  3.1 Finding modules.......................................... 16
  3.2 Initial import............................................ 16
  3.3 Modified imports....................................... 20
  3.4 Simple update............................................ 21
<table>
<thead>
<tr>
<th>Page</th>
<th>Header</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.10</td>
<td>fcntl.h</td>
</tr>
<tr>
<td>8.11</td>
<td>fenv.h</td>
</tr>
<tr>
<td>8.12</td>
<td>float.h</td>
</tr>
<tr>
<td>8.13</td>
<td>fmtmsg.h</td>
</tr>
<tr>
<td>8.14</td>
<td>fmmatch.h</td>
</tr>
<tr>
<td>8.15</td>
<td>ftw.h</td>
</tr>
<tr>
<td>8.16</td>
<td>glob.h</td>
</tr>
<tr>
<td>8.17</td>
<td>grp.h</td>
</tr>
<tr>
<td>8.18</td>
<td>iconv.h</td>
</tr>
<tr>
<td>8.19</td>
<td>inttypes.h</td>
</tr>
<tr>
<td>8.20</td>
<td>iso646.h</td>
</tr>
<tr>
<td>8.21</td>
<td>langinfo.h</td>
</tr>
<tr>
<td>8.22</td>
<td>libgen.h</td>
</tr>
<tr>
<td>8.23</td>
<td>limits.h</td>
</tr>
<tr>
<td>8.24</td>
<td>locale.h</td>
</tr>
<tr>
<td>8.25</td>
<td>math.h</td>
</tr>
<tr>
<td>8.26</td>
<td>monetary.h</td>
</tr>
<tr>
<td>8.27</td>
<td>mqueue.h</td>
</tr>
<tr>
<td>8.28</td>
<td>ndbm.h</td>
</tr>
<tr>
<td>8.29</td>
<td>net/if.h</td>
</tr>
<tr>
<td>8.30</td>
<td>netdb.h</td>
</tr>
<tr>
<td>8.31</td>
<td>netinet/in.h</td>
</tr>
<tr>
<td>8.32</td>
<td>netinet/tcp.h</td>
</tr>
<tr>
<td>8.33</td>
<td>nl_types.h</td>
</tr>
<tr>
<td>8.34</td>
<td>poll.h</td>
</tr>
<tr>
<td>8.35</td>
<td>pthread.h</td>
</tr>
<tr>
<td>8.36</td>
<td>pwd.h</td>
</tr>
<tr>
<td>8.37</td>
<td>regex.h</td>
</tr>
<tr>
<td>8.38</td>
<td>sched.h</td>
</tr>
<tr>
<td>8.39</td>
<td>search.h</td>
</tr>
<tr>
<td>8.40</td>
<td>semaphore.h</td>
</tr>
<tr>
<td>8.41</td>
<td>setjmp.h</td>
</tr>
<tr>
<td>8.42</td>
<td>signal.h</td>
</tr>
<tr>
<td>8.43</td>
<td>spawn.h</td>
</tr>
<tr>
<td>8.44</td>
<td>stdalign.h</td>
</tr>
<tr>
<td>8.45</td>
<td>stdarg.h</td>
</tr>
<tr>
<td>8.46</td>
<td>stdbool.h</td>
</tr>
<tr>
<td>8.47</td>
<td>stddef.h</td>
</tr>
<tr>
<td>8.48</td>
<td>stdint.h</td>
</tr>
<tr>
<td>8.49</td>
<td>stdio.h</td>
</tr>
<tr>
<td>8.50</td>
<td>stdlib.h</td>
</tr>
<tr>
<td>8.51</td>
<td>stdnoreturn.h</td>
</tr>
<tr>
<td>8.52</td>
<td>string.h</td>
</tr>
<tr>
<td>8.53</td>
<td>strings.h</td>
</tr>
<tr>
<td>8.54</td>
<td>stropts.h</td>
</tr>
<tr>
<td>8.55</td>
<td>sys/ipc.h</td>
</tr>
<tr>
<td>8.56</td>
<td>sys/mman.h</td>
</tr>
<tr>
<td>8.57</td>
<td>sys/msg.h</td>
</tr>
<tr>
<td>9.58</td>
<td>sys/resource.h</td>
</tr>
<tr>
<td>9.59</td>
<td>sys/select.h</td>
</tr>
<tr>
<td>9.60</td>
<td>sys/sem.h</td>
</tr>
<tr>
<td>9.61</td>
<td>sys/shm.h</td>
</tr>
<tr>
<td>9.62</td>
<td>sys/socket.h</td>
</tr>
<tr>
<td>9.63</td>
<td>sys/stat.h</td>
</tr>
<tr>
<td>9.64</td>
<td>sys/statvfs.h</td>
</tr>
<tr>
<td>9.65</td>
<td>sys/time.h</td>
</tr>
<tr>
<td>9.66</td>
<td>sys/timeb.h</td>
</tr>
<tr>
<td>9.67</td>
<td>sys/times.h</td>
</tr>
<tr>
<td>9.68</td>
<td>sys/types.h</td>
</tr>
<tr>
<td>9.69</td>
<td>sys/uio.h</td>
</tr>
<tr>
<td>9.70</td>
<td>sys/un.h</td>
</tr>
<tr>
<td>9.71</td>
<td>sys/utsname.h</td>
</tr>
<tr>
<td>9.72</td>
<td>sys/wait.h</td>
</tr>
<tr>
<td>9.73</td>
<td>syslog.h</td>
</tr>
<tr>
<td>9.74</td>
<td>tar.h</td>
</tr>
<tr>
<td>9.75</td>
<td>termios.h</td>
</tr>
<tr>
<td>9.76</td>
<td>tgmath.h</td>
</tr>
<tr>
<td>9.77</td>
<td>threads.h</td>
</tr>
<tr>
<td>9.78</td>
<td>time.h</td>
</tr>
<tr>
<td>9.79</td>
<td>trace.h</td>
</tr>
<tr>
<td>9.80</td>
<td>uchar.h</td>
</tr>
<tr>
<td>9.81</td>
<td>ucontext.h</td>
</tr>
<tr>
<td>9.82</td>
<td>ulimit.h</td>
</tr>
<tr>
<td>9.83</td>
<td>unistd.h</td>
</tr>
<tr>
<td>9.84</td>
<td>utime.h</td>
</tr>
<tr>
<td>9.85</td>
<td>utmpx.h</td>
</tr>
<tr>
<td>9.86</td>
<td>wchar.h</td>
</tr>
<tr>
<td>9.87</td>
<td>wctype.h</td>
</tr>
<tr>
<td>9.88</td>
<td>wordexp.h</td>
</tr>
</tbody>
</table>

9 ISO C and POSIX Function Substitutes .... 78

| 9.1 | FD_CLR | 78 |
| 9.2 | FD_ISSET | 78 |
| 9.3 | FD_SET | 78 |
| 9.4 | FD_ZERO | 78 |
| 9.5 | _Exit | 79 |
| 9.6 | _exit | 79 |
| 9.7 | _longjmp | 79 |
| 9.8 | _setjmp | 79 |
| 9.9 | _tolower | 80 |
| 9.10 | _toupper | 80 |
| 9.11 | a64l | 80 |
| 9.12 | abort | 80 |
| 9.13 | abs | 81 |
| 9.14 | accept | 81 |
| 9.15 | access | 81 |
9.16 acos ................................................................. 82
9.17 acosf ............................................................ 82
9.18 acosh ............................................................ 82
9.19 acoshf ......................................................... 83
9.20 acoshl ......................................................... 83
9.21 acosl ........................................................... 83
9.22 aio_cancel .................................................. 83
9.23 aio_error .................................................... 84
9.24 aio_fsync ................................................... 84
9.25 aio_read .................................................... 84
9.26 aio_return ................................................ 84
9.27 aio_suspend .............................................. 85
9.28 aio_write ................................................ 85
9.29 alarm ....................................................... 85
9.30 aligned_alloc ............................................ 86
9.31 alphasort ................................................ 86
9.32 asctime .................................................... 86
9.33 asctime_r ................................................ 87
9.34 asin .......................................................... 87
9.35 asinf .......................................................... 87
9.36 asinh .......................................................... 87
9.37 asinhf ........................................................ 88
9.38 asinhl ........................................................ 88
9.39 asinl .......................................................... 88
9.40 assert .......................................................... 88
9.41 atan ............................................................ 89
9.42 atan2 ............................................................ 89
9.43 atan2f ........................................................ 89
9.44 atan2l .......................................................... 89
9.45 atan ............................................................ 90
9.46 atanh .......................................................... 90
9.47 atanhf ....................................................... 90
9.48 atanhl .......................................................... 90
9.49 atanl ............................................................ 91
9.50 atexit ........................................................ 91
9.51 atof ............................................................. 91
9.52 atoi .............................................................. 92
9.53 atol ............................................................... 92
9.54 atoll .......................................................... 92
9.55 basename .................................................. 92
9.56 bind ............................................................. 93
9.57 bsearch ...................................................... 93
9.58 btowc .......................................................... 93
9.59 c16rtomb .................................................... 94
9.60 c32rtomb .................................................... 94
9.61 cabs ............................................................ 94
9.62 cabsf ........................................................... 94
9.63 cabsl ........................................................... 95
9.64  cacos  
9.65  cacosf 
9.66  cacosl 
9.67  cacoshf 
9.68  cacoshl 
9.69  cacos 
9.70  calloc 
9.71  call_once 
9.72  canonicalize 
9.73  canonicalizef 
9.74  canonicalizel 
9.75  carg 
9.76  cargf 
9.77  cargl 
9.78  casin 
9.79  casinf 
9.80  casinh 
9.81  casinhf 
9.82  casinhl 
9.83  casinl 
9.84  catan 
9.85  catanf 
9.86  catanh 
9.87  catanhf 
9.88  catanhl 
9.89  catanl 
9.90  catclose 
9.91  catgets 
9.92  catopen 
9.93  cbrt 
9.94  cbrtf 
9.95  cbrtl 
9.96  ccos 
9.97  ccosf 
9.98  ccosh 
9.99  ccoshf 
9.100  ccoshl 
9.101  ccosl 
9.102  ceil 
9.103  ceilf 
9.104  ceill 
9.105  cexp 
9.106  cexpf 
9.107  cexpl 
9.108  cfgetispeed 
9.109  cfgetospeed 
9.110  cfsetispeed 
9.111  cfsetospeed
9.112 chdir ................................................................. 107
9.113 chmod ............................................................... 107
9.114 chown .............................................................. 108
9.115 cimag ............................................................... 108
9.116 cimagf ............................................................. 108
9.117 cimagl ............................................................. 109
9.118 clearerr .......................................................... 109
9.119 clock .............................................................. 109
9.120 clock_getcpuclockid .......................................... 109
9.121 clock_getres .................................................... 110
9.122 clock_gettime ................................................. 110
9.123 clock_nanosleep ............................................... 110
9.124 clock_settime ................................................. 111
9.125 clog ............................................................. 111
9.126 clogf ............................................................. 111
9.127 clogl ............................................................. 111
9.128 close ............................................................ 112
9.129 closedir ........................................................ 112
9.130 closelog ........................................................ 112
9.131 cnd_broadcast ................................................ 112
9.132 cnd_destroy .................................................... 113
9.133 cnd_init ........................................................ 113
9.134 cnd_signal ....................................................... 113
9.135 cnd_timedwait .................................................. 113
9.136 cnd_wait ........................................................ 114
9.137 confstr .......................................................... 114
9.138 conj .............................................................. 114
9.139 conjf ............................................................. 114
9.140 conjl ............................................................. 115
9.141 connect .......................................................... 115
9.142 copysign ........................................................ 115
9.143 copysignf ......................................................... 115
9.144 copysignl ......................................................... 116
9.145 cos ............................................................... 116
9.146 cosf ............................................................... 116
9.147 cosh ............................................................... 116
9.148 coshf ............................................................. 116
9.149 coshl ............................................................. 117
9.150 cosl ............................................................... 117
9.151 cpow ............................................................... 117
9.152 cpowf ............................................................. 118
9.153 cpowl ............................................................. 118
9.154 cproj .............................................................. 118
9.155 cprojf ............................................................. 118
9.156 cprojl ............................................................. 119
9.157 creal ............................................................. 119
9.158 crealf ........................................................... 119
9.159 creall ........................................................... 119
<table>
<thead>
<tr>
<th>Section</th>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.160</td>
<td>creat</td>
<td>120</td>
</tr>
<tr>
<td>9.161</td>
<td>crypt</td>
<td>120</td>
</tr>
<tr>
<td>9.162</td>
<td>csin</td>
<td>120</td>
</tr>
<tr>
<td>9.163</td>
<td>csinf</td>
<td>121</td>
</tr>
<tr>
<td>9.164</td>
<td>csinh</td>
<td>121</td>
</tr>
<tr>
<td>9.165</td>
<td>csinhf</td>
<td>121</td>
</tr>
<tr>
<td>9.166</td>
<td>csinhl</td>
<td>121</td>
</tr>
<tr>
<td>9.167</td>
<td>csinl</td>
<td>122</td>
</tr>
<tr>
<td>9.168</td>
<td>csqrt</td>
<td>122</td>
</tr>
<tr>
<td>9.169</td>
<td>csqrtf</td>
<td>122</td>
</tr>
<tr>
<td>9.170</td>
<td>csqrtl</td>
<td>122</td>
</tr>
<tr>
<td>9.171</td>
<td>ctan</td>
<td>123</td>
</tr>
<tr>
<td>9.172</td>
<td>ctanf</td>
<td>123</td>
</tr>
<tr>
<td>9.173</td>
<td>ctanh</td>
<td>123</td>
</tr>
<tr>
<td>9.174</td>
<td>ctanhf</td>
<td>123</td>
</tr>
<tr>
<td>9.175</td>
<td>ctanhl</td>
<td>124</td>
</tr>
<tr>
<td>9.176</td>
<td>ctanl</td>
<td>124</td>
</tr>
<tr>
<td>9.177</td>
<td>ctermid</td>
<td>124</td>
</tr>
<tr>
<td>9.178</td>
<td>ctime</td>
<td>124</td>
</tr>
<tr>
<td>9.179</td>
<td>ctime_r</td>
<td>125</td>
</tr>
<tr>
<td>9.180</td>
<td>daddl</td>
<td>125</td>
</tr>
<tr>
<td>9.181</td>
<td>daylight</td>
<td>126</td>
</tr>
<tr>
<td>9.182</td>
<td>dbm_clearerr</td>
<td>126</td>
</tr>
<tr>
<td>9.183</td>
<td>dbm_close</td>
<td>126</td>
</tr>
<tr>
<td>9.184</td>
<td>dbm_delete</td>
<td>126</td>
</tr>
<tr>
<td>9.185</td>
<td>dbm_error</td>
<td>127</td>
</tr>
<tr>
<td>9.186</td>
<td>dbm_fetch</td>
<td>127</td>
</tr>
<tr>
<td>9.187</td>
<td>dbm_firstkey</td>
<td>127</td>
</tr>
<tr>
<td>9.188</td>
<td>dbm_nextkey</td>
<td>127</td>
</tr>
<tr>
<td>9.189</td>
<td>dbm_open</td>
<td>128</td>
</tr>
<tr>
<td>9.190</td>
<td>dbm_store</td>
<td>128</td>
</tr>
<tr>
<td>9.191</td>
<td>ddivl</td>
<td>128</td>
</tr>
<tr>
<td>9.192</td>
<td>difftime</td>
<td>128</td>
</tr>
<tr>
<td>9.193</td>
<td>dirfd</td>
<td>129</td>
</tr>
<tr>
<td>9.194</td>
<td>dirname</td>
<td>129</td>
</tr>
<tr>
<td>9.195</td>
<td>div</td>
<td>129</td>
</tr>
<tr>
<td>9.196</td>
<td>dlclose</td>
<td>129</td>
</tr>
<tr>
<td>9.197</td>
<td>dlerror</td>
<td>130</td>
</tr>
<tr>
<td>9.198</td>
<td>dlopen</td>
<td>130</td>
</tr>
<tr>
<td>9.199</td>
<td>dlsec</td>
<td>130</td>
</tr>
<tr>
<td>9.200</td>
<td>dmul</td>
<td>130</td>
</tr>
<tr>
<td>9.201</td>
<td>dprintf</td>
<td>131</td>
</tr>
<tr>
<td>9.202</td>
<td>drand48</td>
<td>131</td>
</tr>
<tr>
<td>9.203</td>
<td>dsusl</td>
<td>132</td>
</tr>
<tr>
<td>9.204</td>
<td>dup</td>
<td>132</td>
</tr>
<tr>
<td>9.205</td>
<td>dup2</td>
<td>132</td>
</tr>
<tr>
<td>9.206</td>
<td>duplocale</td>
<td>133</td>
</tr>
<tr>
<td>9.207</td>
<td>encrypt</td>
<td>133</td>
</tr>
</tbody>
</table>
9.208  endgrent .................................................. 134
9.209  endhostent .............................................. 134
9.210  endnetent ................................................ 134
9.211  endprotoent ............................................. 134
9.212  endpwent ............................................... 134
9.213  endservent .............................................. 135
9.214  endutxent .............................................. 135
9.215  environ .................................................. 135
9.216  erand48 .................................................. 136
9.217  erf ...................................................... 136
9.218  erfc .................................................... 136
9.219  erfcf ..................................................... 136
9.220  erfcl .................................................... 137
9.221  erff .................................................... 137
9.222  erf1 ..................................................... 137
9.223  errno ..................................................... 137
9.224  exec1 ..................................................... 138
9.225  execle ................................................... 138
9.226  execlp ................................................... 138
9.227  execv .................................................... 139
9.228  execve ................................................... 139
9.229  execvp ................................................... 140
9.230  exit ...................................................... 140
9.231  exp ...................................................... 140
9.232  exp2 ..................................................... 141
9.233  exp2f ..................................................... 141
9.234  exp2l ..................................................... 141
9.235  expf ..................................................... 142
9.236  expl ..................................................... 142
9.237  expm1 .................................................... 142
9.238  expm1f ................................................... 143
9.239  expm1l ................................................... 143
9.240  fabs ...................................................... 143
9.241  fabsf ..................................................... 143
9.242  fabsl ..................................................... 144
9.243  faccessat ............................................... 144
9.244  fadd ...................................................... 145
9.245  faddl ..................................................... 145
9.246  fattach .................................................. 145
9.247  fchdir ................................................... 145
9.248  fchmod ................................................... 146
9.249  fchmodat ................................................. 146
9.250  fchown .................................................. 146
9.251  fchownat ............................................... 147
9.252  fclose ................................................... 147
9.253  fcntl ..................................................... 147
9.254  fdatasync ............................................... 148
9.255  fdetach .................................................. 148
9.256 fdim ................................................................. 149
9.257 fdimf ............................................................... 149
9.258 fdiml ............................................................... 149
9.259 fdiv ................................................................. 149
9.260 fdivl ................................................................. 150
9.261 fopen ............................................................... 150
9.262 fopendir ........................................................... 150
9.263 feclearexcept .................................................... 151
9.264 fegetenv .......................................................... 151
9.265 fegetexceptflag ................................................ 151
9.266 fegetmode ........................................................ 151
9.267 fegetround ......................................................... 152
9.268 feholdexcept ..................................................... 152
9.269 feof ................................................................. 152
9.270 feraiseexcept ..................................................... 152
9.271 ferror ............................................................... 153
9.272 fetestenv .......................................................... 153
9.273 fetestexcept ....................................................... 153
9.274 fetestexceptflag ................................................ 153
9.275 fetestmode ......................................................... 154
9.276 fetestround ........................................................ 154
9.277 fetestexcept ....................................................... 154
9.278 fetestexceptflag ................................................ 154
9.279 feupdateenv ....................................................... 155
9.280 fexecve ............................................................ 155
9.281 fflush .............................................................. 155
9.282 ffs ................................................................. 156
9.283 fgetc ............................................................... 156
9.284 fgetpos ............................................................ 156
9.285 fgets ............................................................... 157
9.286 fgetwc ............................................................. 157
9.287 fgetws ............................................................. 157
9.288 fileno ............................................................... 157
9.289 flockfile ........................................................... 158
9.290 floor ............................................................... 158
9.291 floorf .............................................................. 158
9.292 floorl .............................................................. 158
9.293 fma ................................................................. 159
9.294 fmaf ............................................................... 159
9.295 fmal ............................................................... 159
9.296 fmax ............................................................... 160
9.297 fmaxf .............................................................. 160
9.298 fmaxl .............................................................. 160
9.299 fmaxmag .......................................................... 160
9.300 fmaxmagf ........................................................ 161
9.301 fmaxmagl ........................................................ 161
9.302 fnemopen ........................................................ 161
9.303 fmin ............................................................... 161
<table>
<thead>
<tr>
<th>Line</th>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.304</td>
<td>fminf</td>
<td>162</td>
</tr>
<tr>
<td>9.305</td>
<td>fminl</td>
<td>162</td>
</tr>
<tr>
<td>9.306</td>
<td>fminmag</td>
<td>162</td>
</tr>
<tr>
<td>9.307</td>
<td>fminmagf</td>
<td>162</td>
</tr>
<tr>
<td>9.308</td>
<td>fminmagl</td>
<td>163</td>
</tr>
<tr>
<td>9.309</td>
<td>fmod</td>
<td>163</td>
</tr>
<tr>
<td>9.310</td>
<td>fmodf</td>
<td>163</td>
</tr>
<tr>
<td>9.311</td>
<td>fmodl</td>
<td>163</td>
</tr>
<tr>
<td>9.312</td>
<td>f routinely</td>
<td>164</td>
</tr>
<tr>
<td>9.313</td>
<td>fmul</td>
<td>164</td>
</tr>
<tr>
<td>9.314</td>
<td>fmul</td>
<td>164</td>
</tr>
<tr>
<td>9.315</td>
<td>fmumatch</td>
<td>165</td>
</tr>
<tr>
<td>9.316</td>
<td>fopen</td>
<td>165</td>
</tr>
<tr>
<td>9.317</td>
<td>fork</td>
<td>166</td>
</tr>
<tr>
<td>9.318</td>
<td>fpathconf</td>
<td>166</td>
</tr>
<tr>
<td>9.319</td>
<td>fpclassify</td>
<td>166</td>
</tr>
<tr>
<td>9.320</td>
<td>fprintf</td>
<td>166</td>
</tr>
<tr>
<td>9.321</td>
<td>fputc</td>
<td>168</td>
</tr>
<tr>
<td>9.322</td>
<td>fputs</td>
<td>168</td>
</tr>
<tr>
<td>9.323</td>
<td>fputwc</td>
<td>169</td>
</tr>
<tr>
<td>9.324</td>
<td>fputws</td>
<td>169</td>
</tr>
<tr>
<td>9.325</td>
<td>fread</td>
<td>169</td>
</tr>
<tr>
<td>9.326</td>
<td>free</td>
<td>170</td>
</tr>
<tr>
<td>9.327</td>
<td>freeaddrinfo</td>
<td>170</td>
</tr>
<tr>
<td>9.328</td>
<td>frealloc</td>
<td>170</td>
</tr>
<tr>
<td>9.329</td>
<td>freopen</td>
<td>171</td>
</tr>
<tr>
<td>9.330</td>
<td>frexp</td>
<td>171</td>
</tr>
<tr>
<td>9.331</td>
<td>frexpf</td>
<td>171</td>
</tr>
<tr>
<td>9.332</td>
<td>frexpl</td>
<td>172</td>
</tr>
<tr>
<td>9.333</td>
<td>fromfp</td>
<td>172</td>
</tr>
<tr>
<td>9.334</td>
<td>fromfpf</td>
<td>172</td>
</tr>
<tr>
<td>9.335</td>
<td>fromfpl</td>
<td>173</td>
</tr>
<tr>
<td>9.336</td>
<td>fromfpx</td>
<td>173</td>
</tr>
<tr>
<td>9.337</td>
<td>fromfpxf</td>
<td>173</td>
</tr>
<tr>
<td>9.338</td>
<td>fromfpxl</td>
<td>174</td>
</tr>
<tr>
<td>9.339</td>
<td>fscanf</td>
<td>174</td>
</tr>
<tr>
<td>9.340</td>
<td>fseek</td>
<td>174</td>
</tr>
<tr>
<td>9.341</td>
<td>fseeko</td>
<td>175</td>
</tr>
<tr>
<td>9.342</td>
<td>fsetpos</td>
<td>175</td>
</tr>
<tr>
<td>9.343</td>
<td>fstat</td>
<td>175</td>
</tr>
<tr>
<td>9.344</td>
<td>fstatat</td>
<td>176</td>
</tr>
<tr>
<td>9.345</td>
<td>fstatvfs</td>
<td>176</td>
</tr>
<tr>
<td>9.346</td>
<td>fsync</td>
<td>177</td>
</tr>
<tr>
<td>9.347</td>
<td>fsub</td>
<td>177</td>
</tr>
<tr>
<td>9.348</td>
<td>fsubl</td>
<td>177</td>
</tr>
<tr>
<td>9.349</td>
<td>ftell</td>
<td>177</td>
</tr>
<tr>
<td>9.350</td>
<td>ftello</td>
<td>178</td>
</tr>
<tr>
<td>9.351</td>
<td>ftok</td>
<td>178</td>
</tr>
</tbody>
</table>
9.352  ftruncate ........................ 179
9.353  ftrylockfile ...................... 179
9.354  ftw ................................ 179
9.355  funlockfile........................ 179
9.356  futimens ................................ 180
9.357  fwrite ................................ 180
9.358  fwpfprintf ................................ 181
9.359  fwrite ................................ 181
9.360  fscanf ................................ 181
9.361  gai_strerror........................ 182
9.362  getaddrinfo .......................... 182
9.363  getc .................................. 183
9.364  getc_unlocked ...................... 183
9.365  getchar ................................ 183
9.366  getchar_unlocked ................... 184
9.367  getcwd ................................ 184
9.368  getdate ................................ 185
9.369  getdate_err .......................... 185
9.370  getdelim .............................. 185
9.371  getegid ............................... 185
9.372  getenviron ............................ 186
9.373  geteuid ................................ 186
9.374  getgid ................................ 186
9.375  getgid ................................ 186
9.376  getgrgid .............................. 187
9.377  getgrgid_r ......................... 187
9.378  getgrnam ................................ 187
9.379  getgrnam_r ......................... 187
9.380  getgrnam ................................ 188
9.381  gethostent ......................... 188
9.382  gethostid ............................. 188
9.383  gethostbyname ...................... 189
9.384  gethostbyname ...................... 189
9.385  getline ................................ 189
9.386  getlogin ................................ 190
9.387  getlogin_r ......................... 190
9.388  getmsg ................................ 190
9.389  getnameinfo .......................... 191
9.390  getnetbyaddr ....................... 191
9.391  getnetbyname ....................... 191
9.392  getnetent ............................. 191
9.393  getopt ................................ 192
9.394  getpayload ........................... 193
9.395  getpayloadf .......................... 193
9.396  getpayloadl .......................... 193
9.397  getpeername ......................... 193
9.398  getpgid ............................... 194
9.399  getpgrp ............................... 194
9.400 getpid ................................................................. 194
9.401 getpmsg ............................................................. 194
9.402 getppid .............................................................. 195
9.403 getpriority .......................................................... 195
9.404 getprotobyname .................................................... 195
9.405 getprotobynumber ................................................ 195
9.406 getprotoent ........................................................ 196
9.407 getpwent ............................................................. 196
9.408 getpwnam ........................................................... 196
9.409 getpwnam_r ......................................................... 196
9.410 getpwuid ............................................................. 197
9.411 getpwuid_r .......................................................... 197
9.412 getrlimit ............................................................. 197
9.413 getrusage ............................................................ 198
9.414 gets ................................................................. 198
9.415 getservbyname ...................................................... 198
9.416 getservbyport ....................................................... 198
9.417 getservent .......................................................... 199
9.418 getsid ............................................................... 199
9.419 getsockname ........................................................ 199
9.420 getsockopt ........................................................... 199
9.421 getsubopt ............................................................ 200
9.422 gettimeofday ....................................................... 200
9.423 getuid ............................................................... 201
9.424 getutxent ............................................................ 201
9.425 getutxid .............................................................. 201
9.426 getutxline ........................................................... 201
9.427 getwc ............................................................... 202
9.428 getwchar ............................................................. 202
9.429 glob ................................................................. 202
9.430 globfree ............................................................. 202
9.431 gmtime ............................................................... 203
9.432 gmtime_r ............................................................. 203
9.433 grantpt .............................................................. 203
9.434 hcreate .............................................................. 203
9.435 hdestroy ............................................................. 204
9.436 hsearch ............................................................. 204
9.437 htonl ................................................................. 204
9.438 htons ............................................................... 204
9.439 hypot ............................................................... 205
9.440 hypotf ............................................................... 205
9.441 hypotl ............................................................... 205
9.442 iconv ............................................................... 206
9.443 iconv_close ......................................................... 206
9.444 iconv_open ........................................................ 206
9.445 if_freenameindex .................................................. 207
9.446 if_indextoname .................................................... 207
9.447 if_nameindex ....................................................... 208
9.448  if_nametoinx................................. 208
9.449  ilogb................................. 208
9.450  ilogbf................................. 209
9.451  ilogbl................................. 209
9.452 imaxabs................................. 209
9.453  imaxdiv................................. 209
9.454  inet_addr............................... 210
9.455  inet_ntoa............................... 210
9.456  inet_ntop............................... 210
9.457  inet_pton............................... 211
9.458  initstate............................... 211
9.459  insue.................................. 211
9.460  ioctl................................. 212
9.461  isalnum............................... 212
9.462  isalnum_l............................. 213
9.463  isalpha............................... 213
9.464  isalpha_l............................. 214
9.465  isascii............................... 214
9.466  isasync............................... 214
9.467  isatty................................. 215
9.468  isblank............................... 215
9.469  isblank_l............................. 216
9.470  iscntrl............................... 216
9.471  iscntrl_l............................. 216
9.472  isdigit............................... 217
9.473  isdigit_l............................. 217
9.474  isfinite.............................. 218
9.475  isgraph............................... 218
9.476  isgraph_l............................. 219
9.477  isgreater............................. 219
9.478  isgreaterequal......................... 219
9.479  isinf.................................. 219
9.480  isless................................. 220
9.481  islessequal............................ 220
9.482  islessgreater.......................... 220
9.483  islower............................... 220
9.484  islower_l............................. 221
9.485  isnan.................................. 221
9.486  isnormal.............................. 222
9.487  isprint............................... 222
9.488  isprint_l............................. 222
9.489  ispunct............................... 223
9.490  ispunct_l............................. 223
9.491  isspace............................... 224
9.492  isspace_l............................. 224
9.493  isunordered........................... 224
9.494  isupper............................... 225
9.495  isupper_l............................. 225
9.496  iswalnum......................................................... 226
9.497  iswalnum_l..................................................... 226
9.498  iswalpha........................................................ 226
9.499  iswalpha_l..................................................... 227
9.500  iswblank........................................................ 227
9.501  iswblank_l..................................................... 227
9.502  iswcntrl........................................................ 228
9.503  iswcntrl_l..................................................... 228
9.504  iswctype........................................................ 228
9.505  iswctype_l..................................................... 229
9.506  iswdigit........................................................ 229
9.507  iswdigit_l..................................................... 229
9.508  iswgraph....................................................... 230
9.509  iswgraph_l..................................................... 230
9.510  iswlower....................................................... 230
9.511  iswlower_l..................................................... 231
9.512  iswprint....................................................... 231
9.513  iswprint_l..................................................... 231
9.514  iswpunct....................................................... 232
9.515  iswpunct_l..................................................... 232
9.516  iswspace........................................................ 232
9.517  iswspace_l..................................................... 233
9.518  iswupper....................................................... 233
9.519  iswupper_l..................................................... 233
9.520  iswxdigit....................................................... 234
9.521  iswxdigit_l..................................................... 234
9.522  isxdigit....................................................... 234
9.523  isxdigit_l..................................................... 235
9.524  j0............................................................... 235
9.525  j1............................................................... 235
9.526  jn............................................................... 236
9.527  jrand48....................................................... 236
9.528  kill............................................................. 236
9.529  killpg.......................................................... 236
9.530  l64a............................................................. 237
9.531  labs............................................................. 237
9.532  lchown.......................................................... 237
9.533  lcong48........................................................ 237
9.534  ldexp............................................................ 238
9.535  ldexpf........................................................... 238
9.536  ldexp1........................................................... 238
9.537  ldiv............................................................... 238
9.538  lfind............................................................ 239
9.539  lgamma.......................................................... 239
9.540  lgammaf........................................................ 239
9.541  lgammal......................................................... 239
9.542  link............................................................. 240
9.543  linkat........................................................... 240
<table>
<thead>
<tr>
<th>Page</th>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.544</td>
<td>lio_listio</td>
<td>240</td>
</tr>
<tr>
<td>9.545</td>
<td>listen</td>
<td>241</td>
</tr>
<tr>
<td>9.546</td>
<td>labs</td>
<td>241</td>
</tr>
<tr>
<td>9.547</td>
<td>lldiv</td>
<td>241</td>
</tr>
<tr>
<td>9.548</td>
<td>llogb</td>
<td>241</td>
</tr>
<tr>
<td>9.549</td>
<td>llogbf</td>
<td>242</td>
</tr>
<tr>
<td>9.550</td>
<td>llogbl</td>
<td>242</td>
</tr>
<tr>
<td>9.551</td>
<td>llrint</td>
<td>242</td>
</tr>
<tr>
<td>9.552</td>
<td>llrintf</td>
<td>242</td>
</tr>
<tr>
<td>9.553</td>
<td>llrintl</td>
<td>243</td>
</tr>
<tr>
<td>9.554</td>
<td>llround</td>
<td>243</td>
</tr>
<tr>
<td>9.555</td>
<td>llroundf</td>
<td>243</td>
</tr>
<tr>
<td>9.556</td>
<td>llroundl</td>
<td>243</td>
</tr>
<tr>
<td>9.557</td>
<td>localeconv</td>
<td>244</td>
</tr>
<tr>
<td>9.558</td>
<td>localtime</td>
<td>244</td>
</tr>
<tr>
<td>9.559</td>
<td>localtime_r</td>
<td>244</td>
</tr>
<tr>
<td>9.560</td>
<td>lockf</td>
<td>245</td>
</tr>
<tr>
<td>9.561</td>
<td>log</td>
<td>245</td>
</tr>
<tr>
<td>9.562</td>
<td>log10</td>
<td>245</td>
</tr>
<tr>
<td>9.563</td>
<td>log10f</td>
<td>246</td>
</tr>
<tr>
<td>9.564</td>
<td>log10l</td>
<td>246</td>
</tr>
<tr>
<td>9.565</td>
<td>log1p</td>
<td>246</td>
</tr>
<tr>
<td>9.566</td>
<td>log1pf</td>
<td>247</td>
</tr>
<tr>
<td>9.567</td>
<td>log1pl</td>
<td>247</td>
</tr>
<tr>
<td>9.568</td>
<td>log2</td>
<td>247</td>
</tr>
<tr>
<td>9.569</td>
<td>log2f</td>
<td>248</td>
</tr>
<tr>
<td>9.570</td>
<td>log2l</td>
<td>248</td>
</tr>
<tr>
<td>9.571</td>
<td>logb</td>
<td>249</td>
</tr>
<tr>
<td>9.572</td>
<td>logbf</td>
<td>249</td>
</tr>
<tr>
<td>9.573</td>
<td>logbl</td>
<td>249</td>
</tr>
<tr>
<td>9.574</td>
<td>logf</td>
<td>249</td>
</tr>
<tr>
<td>9.575</td>
<td>logl</td>
<td>250</td>
</tr>
<tr>
<td>9.576</td>
<td>longjmp</td>
<td>250</td>
</tr>
<tr>
<td>9.577</td>
<td>lrand48</td>
<td>250</td>
</tr>
<tr>
<td>9.578</td>
<td>lrint</td>
<td>251</td>
</tr>
<tr>
<td>9.579</td>
<td>lrintf</td>
<td>251</td>
</tr>
<tr>
<td>9.580</td>
<td>lrintl</td>
<td>251</td>
</tr>
<tr>
<td>9.581</td>
<td>llround</td>
<td>251</td>
</tr>
<tr>
<td>9.582</td>
<td>llroundf</td>
<td>252</td>
</tr>
<tr>
<td>9.583</td>
<td>llroundl</td>
<td>252</td>
</tr>
<tr>
<td>9.584</td>
<td>lsearch</td>
<td>252</td>
</tr>
<tr>
<td>9.585</td>
<td>lseek</td>
<td>252</td>
</tr>
<tr>
<td>9.586</td>
<td>lstat</td>
<td>253</td>
</tr>
<tr>
<td>9.587</td>
<td>malloc</td>
<td>253</td>
</tr>
<tr>
<td>9.588</td>
<td>mblen</td>
<td>254</td>
</tr>
<tr>
<td>9.589</td>
<td>mbmblen</td>
<td>254</td>
</tr>
<tr>
<td>9.590</td>
<td>mbtocr16</td>
<td>254</td>
</tr>
<tr>
<td>9.591</td>
<td>mbtocr32</td>
<td>255</td>
</tr>
<tr>
<td>9.592</td>
<td>mbtowc</td>
<td>................................................................. 255</td>
</tr>
<tr>
<td>9.593</td>
<td>mbsinit</td>
<td>................................................................. 256</td>
</tr>
<tr>
<td>9.594</td>
<td>mbsrtowcs</td>
<td>.............................................................. 256</td>
</tr>
<tr>
<td>9.595</td>
<td>mbsrtowcs</td>
<td>.............................................................. 257</td>
</tr>
<tr>
<td>9.596</td>
<td>mbstowcs</td>
<td>................................................................. 257</td>
</tr>
<tr>
<td>9.597</td>
<td>mbtowc</td>
<td>................................................................. 257</td>
</tr>
<tr>
<td>9.598</td>
<td>memccpy</td>
<td>................................................................. 258</td>
</tr>
<tr>
<td>9.599</td>
<td>memchr</td>
<td>................................................................. 258</td>
</tr>
<tr>
<td>9.600</td>
<td>memcmp</td>
<td>................................................................. 258</td>
</tr>
<tr>
<td>9.601</td>
<td>memcpyn</td>
<td>................................................................. 258</td>
</tr>
<tr>
<td>9.602</td>
<td>memmove</td>
<td>................................................................. 259</td>
</tr>
<tr>
<td>9.603</td>
<td>memset</td>
<td>................................................................. 259</td>
</tr>
<tr>
<td>9.604</td>
<td>mkdir</td>
<td>................................................................. 259</td>
</tr>
<tr>
<td>9.605</td>
<td>mkdirat</td>
<td>................................................................. 260</td>
</tr>
<tr>
<td>9.606</td>
<td>mkdtemp</td>
<td>................................................................. 260</td>
</tr>
<tr>
<td>9.607</td>
<td>mkfifo</td>
<td>................................................................. 260</td>
</tr>
<tr>
<td>9.608</td>
<td>mkfifoat</td>
<td>............................................................... 260</td>
</tr>
<tr>
<td>9.609</td>
<td>mknod</td>
<td>................................................................. 261</td>
</tr>
<tr>
<td>9.610</td>
<td>mknodat</td>
<td>............................................................... 261</td>
</tr>
<tr>
<td>9.611</td>
<td>mkstemp</td>
<td>................................................................. 262</td>
</tr>
<tr>
<td>9.612</td>
<td>mktime</td>
<td>................................................................. 262</td>
</tr>
<tr>
<td>9.613</td>
<td>mlock</td>
<td>................................................................. 262</td>
</tr>
<tr>
<td>9.614</td>
<td>mlockall</td>
<td>............................................................... 263</td>
</tr>
<tr>
<td>9.615</td>
<td>mmap</td>
<td>................................................................. 263</td>
</tr>
<tr>
<td>9.616</td>
<td>modf</td>
<td>................................................................. 263</td>
</tr>
<tr>
<td>9.617</td>
<td>modff</td>
<td>................................................................. 264</td>
</tr>
<tr>
<td>9.618</td>
<td>modfl</td>
<td>................................................................. 264</td>
</tr>
<tr>
<td>9.619</td>
<td>mprotect</td>
<td>............................................................... 264</td>
</tr>
<tr>
<td>9.620</td>
<td>mq_close</td>
<td>............................................................... 265</td>
</tr>
<tr>
<td>9.621</td>
<td>mq_getattr</td>
<td>............................................................. 265</td>
</tr>
<tr>
<td>9.622</td>
<td>mq_notify</td>
<td>............................................................. 265</td>
</tr>
<tr>
<td>9.623</td>
<td>mq_open</td>
<td>............................................................... 265</td>
</tr>
<tr>
<td>9.624</td>
<td>mq_receive</td>
<td>............................................................ 266</td>
</tr>
<tr>
<td>9.625</td>
<td>mq_send</td>
<td>............................................................... 266</td>
</tr>
<tr>
<td>9.626</td>
<td>mq_setattr</td>
<td>............................................................. 266</td>
</tr>
<tr>
<td>9.627</td>
<td>mq_timedreceive</td>
<td>....................................................... 266</td>
</tr>
<tr>
<td>9.628</td>
<td>mq_timedsend</td>
<td>.......................................................... 267</td>
</tr>
<tr>
<td>9.629</td>
<td>mq_unlink</td>
<td>............................................................ 267</td>
</tr>
<tr>
<td>9.630</td>
<td>mrand48</td>
<td>............................................................... 267</td>
</tr>
<tr>
<td>9.631</td>
<td>msgctl</td>
<td>................................................................. 267</td>
</tr>
<tr>
<td>9.632</td>
<td>msgget</td>
<td>................................................................. 268</td>
</tr>
<tr>
<td>9.633</td>
<td>msgsnd</td>
<td>................................................................. 268</td>
</tr>
<tr>
<td>9.634</td>
<td>msync</td>
<td>................................................................. 268</td>
</tr>
<tr>
<td>9.635</td>
<td>mt_close</td>
<td>............................................................... 269</td>
</tr>
<tr>
<td>9.636</td>
<td>mtx_destroy</td>
<td>.......................................................... 269</td>
</tr>
<tr>
<td>9.637</td>
<td>mtx_init</td>
<td>............................................................... 269</td>
</tr>
<tr>
<td>9.638</td>
<td>mtx_lock</td>
<td>............................................................... 269</td>
</tr>
<tr>
<td>9.639</td>
<td>mtx_timedlock</td>
<td>......................................................... 269</td>
</tr>
</tbody>
</table>
9.640 mtx_trylock .............................................. 270
9.641 mtx_unlock ............................................. 270
9.642 munlock .................................................. 270
9.643 munlockall ............................................... 270
9.644 munmap .................................................... 271
9.645 nan .......................................................... 271
9.646 nanf ......................................................... 271
9.647 nanl .......................................................... 271
9.648 nanosleep .................................................. 272
9.649 nearbyint .................................................. 272
9.650 nearbyintf .................................................. 272
9.651 nearbyintl .................................................. 272
9.652 newlocale .................................................... 273
9.653 nextafter ................................................... 273
9.654 nextafterf ................................................... 273
9.655 nextafterl ................................................... 273
9.656 nextdown .................................................... 274
9.657 nextdownf ................................................... 274
9.658 nextdownl ................................................... 274
9.659 nexttoward .................................................. 275
9.660 nexttowardf .................................................. 275
9.661 nexttowardl .................................................. 275
9.662 nextup ........................................................ 275
9.663 nextupf ....................................................... 276
9.664 nextupl ....................................................... 276
9.665 nftw ........................................................ 276
9.666 nice ........................................................ 277
9.667 nl_langinfo ................................................ 277
9.668 nl_langinfo_1 ................................................ 277
9.669 nrand48 ...................................................... 278
9.670 ntohl ........................................................ 278
9.671 ntohs ........................................................ 278
9.672 open .......................................................... 278
9.673 openat ....................................................... 279
9.674 opendir ...................................................... 280
9.675 openlog ...................................................... 280
9.676 open_memstream ............................................ 280
9.677 open_wmemstream ......................................... 281
9.678 optarg ........................................................ 281
9.679 opterr ....................................................... 281
9.680 optind ....................................................... 281
9.681 optopt ....................................................... 282
9.682 pathconf ..................................................... 282
9.683 pause ......................................................... 282
9.684 pclose ....................................................... 282
9.685 perror ......................................................... 282
9.686 pipe .......................................................... 283
9.687 poll .......................................................... 283
<table>
<thead>
<tr>
<th>Line</th>
<th>Function Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.736</td>
<td>posix_trace_attr_setstreamsize</td>
<td>298</td>
</tr>
<tr>
<td>9.737</td>
<td>posix_trace_clear</td>
<td>298</td>
</tr>
<tr>
<td>9.738</td>
<td>posix_trace_close</td>
<td>299</td>
</tr>
<tr>
<td>9.739</td>
<td>posix_trace_create</td>
<td>299</td>
</tr>
<tr>
<td>9.740</td>
<td>posix_trace_create_withlog</td>
<td>299</td>
</tr>
<tr>
<td>9.741</td>
<td>posix_trace_event</td>
<td>299</td>
</tr>
<tr>
<td>9.742</td>
<td>posix_trace_eventid_equal</td>
<td>300</td>
</tr>
<tr>
<td>9.743</td>
<td>posix_trace_eventid_get_name</td>
<td>300</td>
</tr>
<tr>
<td>9.744</td>
<td>posix_trace_eventid_open</td>
<td>300</td>
</tr>
<tr>
<td>9.745</td>
<td>posix_trace_eventset_add</td>
<td>301</td>
</tr>
<tr>
<td>9.746</td>
<td>posix_trace_eventset_del</td>
<td>301</td>
</tr>
<tr>
<td>9.747</td>
<td>posix_trace_eventset_empty</td>
<td>301</td>
</tr>
<tr>
<td>9.748</td>
<td>posix_trace_eventset_fill</td>
<td>301</td>
</tr>
<tr>
<td>9.749</td>
<td>posix_trace_eventset_ismember</td>
<td>302</td>
</tr>
<tr>
<td>9.750</td>
<td>posix_trace_eventtypelist_getnext_id</td>
<td>302</td>
</tr>
<tr>
<td>9.751</td>
<td>posix_trace_eventtypelist_rewind</td>
<td>302</td>
</tr>
<tr>
<td>9.752</td>
<td>posix_trace_flush</td>
<td>303</td>
</tr>
<tr>
<td>9.753</td>
<td>posix_trace_get_attr</td>
<td>303</td>
</tr>
<tr>
<td>9.754</td>
<td>posix_trace_get_filter</td>
<td>303</td>
</tr>
<tr>
<td>9.755</td>
<td>posix_trace_get_status</td>
<td>303</td>
</tr>
<tr>
<td>9.756</td>
<td>posix_trace_getnext_event</td>
<td>304</td>
</tr>
<tr>
<td>9.757</td>
<td>posix_trace_open</td>
<td>304</td>
</tr>
<tr>
<td>9.758</td>
<td>posix_trace_rewind</td>
<td>304</td>
</tr>
<tr>
<td>9.759</td>
<td>posix_trace_set_filter</td>
<td>305</td>
</tr>
<tr>
<td>9.760</td>
<td>posix_trace_shutdown</td>
<td>305</td>
</tr>
<tr>
<td>9.761</td>
<td>posix_trace_start</td>
<td>305</td>
</tr>
<tr>
<td>9.762</td>
<td>posix_trace_stop</td>
<td>305</td>
</tr>
<tr>
<td>9.763</td>
<td>posix_trace_timedgetnext_event</td>
<td>306</td>
</tr>
<tr>
<td>9.764</td>
<td>posix_trace_trid_eventid_open</td>
<td>306</td>
</tr>
<tr>
<td>9.765</td>
<td>posix_trace_trygetnext_event</td>
<td>306</td>
</tr>
<tr>
<td>9.766</td>
<td>posix_typed_mem_get_info</td>
<td>307</td>
</tr>
<tr>
<td>9.767</td>
<td>posix_typed_mem_open</td>
<td>307</td>
</tr>
<tr>
<td>9.768</td>
<td>pow</td>
<td>307</td>
</tr>
<tr>
<td>9.769</td>
<td>powf</td>
<td>307</td>
</tr>
<tr>
<td>9.770</td>
<td>powl</td>
<td>308</td>
</tr>
<tr>
<td>9.771</td>
<td>pread</td>
<td>308</td>
</tr>
<tr>
<td>9.772</td>
<td>printf</td>
<td>308</td>
</tr>
<tr>
<td>9.773</td>
<td>pselect</td>
<td>310</td>
</tr>
<tr>
<td>9.774</td>
<td>psiginfo</td>
<td>310</td>
</tr>
<tr>
<td>9.775</td>
<td>psignal</td>
<td>310</td>
</tr>
<tr>
<td>9.776</td>
<td>pthread_atfork</td>
<td>310</td>
</tr>
<tr>
<td>9.777</td>
<td>pthread_attr_destroy</td>
<td>311</td>
</tr>
<tr>
<td>9.778</td>
<td>pthread_attr_getdetachstate</td>
<td>311</td>
</tr>
<tr>
<td>9.779</td>
<td>pthread_attr_getguardsize</td>
<td>311</td>
</tr>
<tr>
<td>9.780</td>
<td>pthread_attr_getinheritsched</td>
<td>312</td>
</tr>
<tr>
<td>9.781</td>
<td>pthread_attr_getschedparam</td>
<td>312</td>
</tr>
<tr>
<td>9.782</td>
<td>pthread_attr_getschedpolicy</td>
<td>312</td>
</tr>
<tr>
<td>9.783</td>
<td>pthread_attr_getscope</td>
<td>312</td>
</tr>
</tbody>
</table>
9.832  pthread_mutex_init  ........................................  325
9.833  pthread_mutex_lock  ........................................  325
9.834  pthread_mutex_setprioceiling  .........................  326
9.835  pthread_mutex_timedlock  .................................  326
9.836  pthread_mutex_trylock  ..................................  326
9.837  pthread_mutex_unlock  ....................................  326
9.838  pthread_mutexattr_destroy  ............................  327
9.839  pthread_mutexattr_getprioceiling ......................  327
9.840  pthread_mutexattr_getprotocol  .........................  327
9.841  pthread_mutexattr_getpshared  ..........................  327
9.842  pthread_mutexattr_getrobust  ..........................  328
9.843  pthread_mutexattr_gettype  ..............................  328
9.844  pthread_mutexattr_init  ................................  328
9.845  pthread_mutexattr_setprioceiling ......................  328
9.846  pthread_mutexattr_setprotocol  .........................  329
9.847  pthread_mutexattr_setpshared  .........................  329
9.848  pthread_mutexattr_setrobust  ........................  329
9.849  pthread_mutexattr_settype  ............................  329
9.850  pthread_once  ...........................................  330
9.851  pthread_rwlock_destroy  ................................  330
9.852  pthread_rwlock_init  ....................................  330
9.853  pthread_rwlock_rdlock  ..................................  330
9.854  pthread_rwlock_timedrdlock  ............................  331
9.855  pthread_rwlock_timedwrlock  ...........................  331
9.856  pthread_rwlock_tryrdlock  ..............................  331
9.857  pthread_rwlock_trywrlock  ..............................  332
9.858  pthread_rwlock_unlock  ..................................  332
9.859  pthread_rwlock_wrlock  ..................................  332
9.860  pthread_rwlockattr_destroy  .........................  333
9.861  pthread_rwlockattr_getpshared  .........................  333
9.862  pthread_rwlockattr_init  ................................  333
9.863  pthread_rwlockattr_getpshared  .........................  333
9.864  pthread_self  ............................................  334
9.865  pthread_setscancelstate  ..............................  334
9.866  pthread_setscanceltype  ...............................  334
9.867  pthread_setconcurrency  ................................  334
9.868  pthread_setschedparam  ..................................  335
9.869  pthread_setschedprio  ...................................  335
9.870  pthread_setspecific  ....................................  335
9.871  pthread_sigmask  ........................................  335
9.872  pthread_spin_destroy  ...................................  336
9.873  pthread_spin_init  .......................................  336
9.874  pthread_spin_lock  .......................................  336
9.875  pthread_spin_trylock  ...................................  337
9.876  pthread_spin_unlock  .....................................  337
9.877  pthread_testcancel  .....................................  337
9.878  ptcname  ..................................................  338
9.879  putc  .....................................................  338
<table>
<thead>
<tr>
<th>Page</th>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.880</td>
<td>putc_unlocked</td>
<td>338</td>
</tr>
<tr>
<td>9.881</td>
<td>putchar</td>
<td>339</td>
</tr>
<tr>
<td>9.882</td>
<td>putchar_unlocked</td>
<td>339</td>
</tr>
<tr>
<td>9.883</td>
<td>putenv</td>
<td>339</td>
</tr>
<tr>
<td>9.884</td>
<td>putmsg</td>
<td>340</td>
</tr>
<tr>
<td>9.885</td>
<td>putwchar</td>
<td>340</td>
</tr>
<tr>
<td>9.886</td>
<td>puts</td>
<td>340</td>
</tr>
<tr>
<td>9.887</td>
<td>putuxline</td>
<td>341</td>
</tr>
<tr>
<td>9.888</td>
<td>putwc</td>
<td>341</td>
</tr>
<tr>
<td>9.889</td>
<td>putwchar</td>
<td>341</td>
</tr>
<tr>
<td>9.890</td>
<td>pwrite</td>
<td>341</td>
</tr>
<tr>
<td>9.891</td>
<td>qsort</td>
<td>342</td>
</tr>
<tr>
<td>9.892</td>
<td>quick_exit</td>
<td>342</td>
</tr>
<tr>
<td>9.893</td>
<td>raise</td>
<td>342</td>
</tr>
<tr>
<td>9.894</td>
<td>rand</td>
<td>342</td>
</tr>
<tr>
<td>9.895</td>
<td>rand_r</td>
<td>343</td>
</tr>
<tr>
<td>9.896</td>
<td>random</td>
<td>343</td>
</tr>
<tr>
<td>9.897</td>
<td>read</td>
<td>343</td>
</tr>
<tr>
<td>9.898</td>
<td>readdir</td>
<td>344</td>
</tr>
<tr>
<td>9.899</td>
<td>readdir_r</td>
<td>344</td>
</tr>
<tr>
<td>9.900</td>
<td>readlink</td>
<td>344</td>
</tr>
<tr>
<td>9.901</td>
<td>readdirat</td>
<td>345</td>
</tr>
<tr>
<td>9.902</td>
<td>readv</td>
<td>346</td>
</tr>
<tr>
<td>9.903</td>
<td>realloc</td>
<td>346</td>
</tr>
<tr>
<td>9.904</td>
<td>realpath</td>
<td>347</td>
</tr>
<tr>
<td>9.905</td>
<td>recv</td>
<td>347</td>
</tr>
<tr>
<td>9.906</td>
<td>recvfrom</td>
<td>348</td>
</tr>
<tr>
<td>9.907</td>
<td>recvmsg</td>
<td>348</td>
</tr>
<tr>
<td>9.908</td>
<td>regcomp</td>
<td>348</td>
</tr>
<tr>
<td>9.909</td>
<td>regerror</td>
<td>348</td>
</tr>
<tr>
<td>9.910</td>
<td>regexec</td>
<td>349</td>
</tr>
<tr>
<td>9.911</td>
<td>regfree</td>
<td>349</td>
</tr>
<tr>
<td>9.912</td>
<td>remainder</td>
<td>349</td>
</tr>
<tr>
<td>9.913</td>
<td>remainderf</td>
<td>349</td>
</tr>
<tr>
<td>9.914</td>
<td>remainderl</td>
<td>350</td>
</tr>
<tr>
<td>9.915</td>
<td>remove</td>
<td>350</td>
</tr>
<tr>
<td>9.916</td>
<td>remque</td>
<td>350</td>
</tr>
<tr>
<td>9.917</td>
<td>remquo</td>
<td>351</td>
</tr>
<tr>
<td>9.918</td>
<td>remquof</td>
<td>351</td>
</tr>
<tr>
<td>9.919</td>
<td>remquol</td>
<td>351</td>
</tr>
<tr>
<td>9.920</td>
<td>rename</td>
<td>351</td>
</tr>
<tr>
<td>9.921</td>
<td>renameat</td>
<td>352</td>
</tr>
<tr>
<td>9.922</td>
<td>rewind</td>
<td>353</td>
</tr>
<tr>
<td>9.923</td>
<td>rewinddir</td>
<td>353</td>
</tr>
<tr>
<td>9.924</td>
<td>rint</td>
<td>354</td>
</tr>
<tr>
<td>9.925</td>
<td>rintf</td>
<td>354</td>
</tr>
<tr>
<td>9.926</td>
<td>rintl</td>
<td>354</td>
</tr>
<tr>
<td>9.927</td>
<td>rmdir</td>
<td>354</td>
</tr>
<tr>
<td>Function</td>
<td>Page</td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>9.928 round</td>
<td>355</td>
<td></td>
</tr>
<tr>
<td>9.929 roundeven</td>
<td>355</td>
<td></td>
</tr>
<tr>
<td>9.930 roundevenf</td>
<td>355</td>
<td></td>
</tr>
<tr>
<td>9.931 roundevenl</td>
<td>356</td>
<td></td>
</tr>
<tr>
<td>9.932 roundf</td>
<td>356</td>
<td></td>
</tr>
<tr>
<td>9.933 roundi</td>
<td>356</td>
<td></td>
</tr>
<tr>
<td>9.934 scalbln</td>
<td>357</td>
<td></td>
</tr>
<tr>
<td>9.935 scalblnf</td>
<td>357</td>
<td></td>
</tr>
<tr>
<td>9.936 scalblnl</td>
<td>357</td>
<td></td>
</tr>
<tr>
<td>9.937 scalbn</td>
<td>357</td>
<td></td>
</tr>
<tr>
<td>9.938 scalbnf</td>
<td>358</td>
<td></td>
</tr>
<tr>
<td>9.939 scalblnl</td>
<td>358</td>
<td></td>
</tr>
<tr>
<td>9.940 scandir</td>
<td>358</td>
<td></td>
</tr>
<tr>
<td>9.941 scanf</td>
<td>358</td>
<td></td>
</tr>
<tr>
<td>9.942 sched_get_priority_max</td>
<td>359</td>
<td></td>
</tr>
<tr>
<td>9.943 sched_get_priority_min</td>
<td>359</td>
<td></td>
</tr>
<tr>
<td>9.944 sched_getparam</td>
<td>359</td>
<td></td>
</tr>
<tr>
<td>9.945 sched_getscheduler</td>
<td>360</td>
<td></td>
</tr>
<tr>
<td>9.946 sched_rr_get_interval</td>
<td>360</td>
<td></td>
</tr>
<tr>
<td>9.947 sched_setparam</td>
<td>360</td>
<td></td>
</tr>
<tr>
<td>9.948 sched_setscheduler</td>
<td>360</td>
<td></td>
</tr>
<tr>
<td>9.949 sched_yield</td>
<td>361</td>
<td></td>
</tr>
<tr>
<td>9.950 seed48</td>
<td>361</td>
<td></td>
</tr>
<tr>
<td>9.951 seekdir</td>
<td>361</td>
<td></td>
</tr>
<tr>
<td>9.952 select</td>
<td>361</td>
<td></td>
</tr>
<tr>
<td>9.953 sem_close</td>
<td>362</td>
<td></td>
</tr>
<tr>
<td>9.954 sem_destroy</td>
<td>362</td>
<td></td>
</tr>
<tr>
<td>9.955 sem_getvalue</td>
<td>362</td>
<td></td>
</tr>
<tr>
<td>9.956 sem_init</td>
<td>363</td>
<td></td>
</tr>
<tr>
<td>9.957 sem_open</td>
<td>363</td>
<td></td>
</tr>
<tr>
<td>9.958 sem_post</td>
<td>363</td>
<td></td>
</tr>
<tr>
<td>9.959 sem_timedwait</td>
<td>363</td>
<td></td>
</tr>
<tr>
<td>9.960 sem_trywait</td>
<td>364</td>
<td></td>
</tr>
<tr>
<td>9.961 sem_unlink</td>
<td>364</td>
<td></td>
</tr>
<tr>
<td>9.962 sem_wait</td>
<td>364</td>
<td></td>
</tr>
<tr>
<td>9.963 semctl</td>
<td>364</td>
<td></td>
</tr>
<tr>
<td>9.964 semget</td>
<td>364</td>
<td></td>
</tr>
<tr>
<td>9.965 semop</td>
<td>365</td>
<td></td>
</tr>
<tr>
<td>9.966 send</td>
<td>365</td>
<td></td>
</tr>
<tr>
<td>9.967 sendmsg</td>
<td>365</td>
<td></td>
</tr>
<tr>
<td>9.968 sendto</td>
<td>365</td>
<td></td>
</tr>
<tr>
<td>9.969 setbuf</td>
<td>365</td>
<td></td>
</tr>
<tr>
<td>9.970 setegid</td>
<td>366</td>
<td></td>
</tr>
<tr>
<td>9.971 setenv</td>
<td>366</td>
<td></td>
</tr>
<tr>
<td>9.972 seteuid</td>
<td>366</td>
<td></td>
</tr>
<tr>
<td>9.973 setgid</td>
<td>366</td>
<td></td>
</tr>
<tr>
<td>9.974 setgrent</td>
<td>367</td>
<td></td>
</tr>
<tr>
<td>9.975 sethostent</td>
<td>367</td>
<td></td>
</tr>
</tbody>
</table>
9.976  setitimer ................................................. 367
9.977  setjmp .................................................. 367
9.978  setkey ................................................... 368
9.979  setlocale .............................................. 368
9.980  setlogmask ............................................. 369
9.981  setnetent ............................................. 369
9.982  setpayload ............................................ 369
9.983  setpayloadf .......................................... 369
9.984  setpayloadl .......................................... 370
9.985  setpayloadsig ....................................... 370
9.986  setpayloadsigf ..................................... 370
9.987  setpayloadsigl ..................................... 370
9.988  setpgid ............................................... 371
9.989  setpgrp ............................................... 371
9.990  setpriority ......................................... 371
9.991  setprotoent ......................................... 371
9.992  setpwnent ........................................... 371
9.993  setregid ............................................. 372
9.994  setreuid ............................................. 372
9.995  setrlimit ............................................. 372
9.996  setservent ........................................... 372
9.997  setsid ................................................ 373
9.998  setsockopt .......................................... 373
9.999  setstate .............................................. 373
1.1000 setsockopt ............................................ 373
1.1001 setitimer ............................................ 373
1.1002 setitimer ............................................ 373
1.1003 setitimer ............................................ 373
1.1004 setitimer ............................................ 373
1.1005 setitimer ............................................ 373
1.1006 setitimer ............................................ 373
1.1007 setitimer ............................................ 373
1.1008 setitimer ............................................ 373
1.1009 setitimer ............................................ 373
1.1010 setitimer ............................................ 373
1.1011 setitimer ............................................ 373
1.1012 setitimer ............................................ 373
1.1013 setitimer ............................................ 373
1.1014 setitimer ............................................ 373
1.1015 setitimer ............................................ 373
1.1016 setitimer ............................................ 373
1.1017 setitimer ............................................ 373
1.1018 setitimer ............................................ 373
1.1019 setitimer ............................................ 373
1.1020 setitimer ............................................ 373
1.1021 setitimer ............................................ 373
1.1022 setitimer ............................................ 373
1.1023 setitimer ............................................ 373
<table>
<thead>
<tr>
<th>Section</th>
<th>Symbol</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.1024</td>
<td>sigpause</td>
<td>380</td>
</tr>
<tr>
<td>9.1025</td>
<td>sigpending</td>
<td>380</td>
</tr>
<tr>
<td>9.1026</td>
<td>sigprocmask</td>
<td>380</td>
</tr>
<tr>
<td>9.1027</td>
<td>sigqueue</td>
<td>381</td>
</tr>
<tr>
<td>9.1028</td>
<td>sigrelse</td>
<td>381</td>
</tr>
<tr>
<td>9.1029</td>
<td>sigset</td>
<td>381</td>
</tr>
<tr>
<td>9.1030</td>
<td>sigsetjmp</td>
<td>381</td>
</tr>
<tr>
<td>9.1031</td>
<td>sigsuspend</td>
<td>382</td>
</tr>
<tr>
<td>9.1032</td>
<td>sigtimedwait</td>
<td>382</td>
</tr>
<tr>
<td>9.1033</td>
<td>sigwait</td>
<td>382</td>
</tr>
<tr>
<td>9.1034</td>
<td>sigwaitinfo</td>
<td>382</td>
</tr>
<tr>
<td>9.1035</td>
<td>sin</td>
<td>383</td>
</tr>
<tr>
<td>9.1036</td>
<td>sinf</td>
<td>383</td>
</tr>
<tr>
<td>9.1037</td>
<td>sinh</td>
<td>383</td>
</tr>
<tr>
<td>9.1038</td>
<td>sinhf</td>
<td>383</td>
</tr>
<tr>
<td>9.1039</td>
<td>sinh</td>
<td>383</td>
</tr>
<tr>
<td>9.1040</td>
<td>sinl</td>
<td>384</td>
</tr>
<tr>
<td>9.1041</td>
<td>sleep</td>
<td>384</td>
</tr>
<tr>
<td>9.1042</td>
<td>snprintf</td>
<td>384</td>
</tr>
<tr>
<td>9.1043</td>
<td>socket</td>
<td>386</td>
</tr>
<tr>
<td>9.1044</td>
<td>socketpair</td>
<td>386</td>
</tr>
<tr>
<td>9.1045</td>
<td>sprintf</td>
<td>386</td>
</tr>
<tr>
<td>9.1047</td>
<td>sqrt</td>
<td>388</td>
</tr>
<tr>
<td>9.1048</td>
<td>sqrtf</td>
<td>388</td>
</tr>
<tr>
<td>9.1049</td>
<td>sqrtl</td>
<td>388</td>
</tr>
<tr>
<td>9.1050</td>
<td>srand</td>
<td>388</td>
</tr>
<tr>
<td>9.1051</td>
<td>srand48</td>
<td>389</td>
</tr>
<tr>
<td>9.1052</td>
<td>srandom</td>
<td>389</td>
</tr>
<tr>
<td>9.1053</td>
<td>sscanf</td>
<td>389</td>
</tr>
<tr>
<td>9.1054</td>
<td>stat</td>
<td>389</td>
</tr>
<tr>
<td>9.1055</td>
<td>statvfs</td>
<td>390</td>
</tr>
<tr>
<td>9.1056</td>
<td>stderr</td>
<td>391</td>
</tr>
<tr>
<td>9.1057</td>
<td>stdin</td>
<td>391</td>
</tr>
<tr>
<td>9.1058</td>
<td>stdout</td>
<td>391</td>
</tr>
<tr>
<td>9.1059</td>
<td>stpcpy</td>
<td>392</td>
</tr>
<tr>
<td>9.1060</td>
<td>stpcpy</td>
<td>392</td>
</tr>
<tr>
<td>9.1061</td>
<td>strcasecmp</td>
<td>392</td>
</tr>
<tr>
<td>9.1062</td>
<td>strcasecmp</td>
<td>393</td>
</tr>
<tr>
<td>9.1063</td>
<td>strcat</td>
<td>393</td>
</tr>
<tr>
<td>9.1064</td>
<td>strchr</td>
<td>393</td>
</tr>
<tr>
<td>9.1065</td>
<td>strcmp</td>
<td>393</td>
</tr>
<tr>
<td>9.1066</td>
<td>strcoll</td>
<td>394</td>
</tr>
<tr>
<td>9.1067</td>
<td>strcoll</td>
<td>394</td>
</tr>
<tr>
<td>9.1068</td>
<td>strcpy</td>
<td>394</td>
</tr>
<tr>
<td>9.1069</td>
<td>strcspn</td>
<td>394</td>
</tr>
<tr>
<td>9.1070</td>
<td>strdup</td>
<td>395</td>
</tr>
<tr>
<td>9.1071</td>
<td>strerror</td>
<td>395</td>
</tr>
<tr>
<td>Function</td>
<td>Page</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>strerror_l</td>
<td>395</td>
<td></td>
</tr>
<tr>
<td>strerror_r</td>
<td>396</td>
<td></td>
</tr>
<tr>
<td>strfmon</td>
<td>397</td>
<td></td>
</tr>
<tr>
<td>strfmon_l</td>
<td>397</td>
<td></td>
</tr>
<tr>
<td>strfromd</td>
<td>397</td>
<td></td>
</tr>
<tr>
<td>strfromf</td>
<td>397</td>
<td></td>
</tr>
<tr>
<td>strfroml</td>
<td>398</td>
<td></td>
</tr>
<tr>
<td>strftime</td>
<td>398</td>
<td></td>
</tr>
<tr>
<td>strftime_l</td>
<td>399</td>
<td></td>
</tr>
<tr>
<td>strlen</td>
<td>399</td>
<td></td>
</tr>
<tr>
<td>strncasecmp</td>
<td>399</td>
<td></td>
</tr>
<tr>
<td>strncasecmp_l</td>
<td>399</td>
<td></td>
</tr>
<tr>
<td>strncat</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>strncmp</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>strncpy</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>strndup</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>strnlen</td>
<td>401</td>
<td></td>
</tr>
<tr>
<td>strpbrk</td>
<td>401</td>
<td></td>
</tr>
<tr>
<td>strptime</td>
<td>401</td>
<td></td>
</tr>
<tr>
<td>strrchr</td>
<td>402</td>
<td></td>
</tr>
<tr>
<td>strsignal</td>
<td>402</td>
<td></td>
</tr>
<tr>
<td>strspn</td>
<td>402</td>
<td></td>
</tr>
<tr>
<td>strstr</td>
<td>402</td>
<td></td>
</tr>
<tr>
<td>strtod</td>
<td>403</td>
<td></td>
</tr>
<tr>
<td>strtof</td>
<td>404</td>
<td></td>
</tr>
<tr>
<td>strtoulmax</td>
<td>404</td>
<td></td>
</tr>
<tr>
<td>strtok</td>
<td>404</td>
<td></td>
</tr>
<tr>
<td>strtok_r</td>
<td>405</td>
<td></td>
</tr>
<tr>
<td>strtol</td>
<td>405</td>
<td></td>
</tr>
<tr>
<td>strtof</td>
<td>405</td>
<td></td>
</tr>
<tr>
<td>strtof</td>
<td>406</td>
<td></td>
</tr>
<tr>
<td>strtof</td>
<td>406</td>
<td></td>
</tr>
<tr>
<td>strtof</td>
<td>406</td>
<td></td>
</tr>
<tr>
<td>strtof</td>
<td>406</td>
<td></td>
</tr>
<tr>
<td>strtof</td>
<td>406</td>
<td></td>
</tr>
<tr>
<td>strtof</td>
<td>407</td>
<td></td>
</tr>
<tr>
<td>strtof</td>
<td>407</td>
<td></td>
</tr>
<tr>
<td>strtof</td>
<td>407</td>
<td></td>
</tr>
<tr>
<td>strtof</td>
<td>407</td>
<td></td>
</tr>
<tr>
<td>strtof</td>
<td>408</td>
<td></td>
</tr>
<tr>
<td>swprintf</td>
<td>408</td>
<td></td>
</tr>
<tr>
<td>swscanf</td>
<td>408</td>
<td></td>
</tr>
<tr>
<td>symlink</td>
<td>408</td>
<td></td>
</tr>
<tr>
<td>symlink</td>
<td>409</td>
<td></td>
</tr>
<tr>
<td>symlink</td>
<td>409</td>
<td></td>
</tr>
<tr>
<td>symlink</td>
<td>409</td>
<td></td>
</tr>
<tr>
<td>symlink</td>
<td>409</td>
<td></td>
</tr>
<tr>
<td>symlink</td>
<td>410</td>
<td></td>
</tr>
<tr>
<td>syslog</td>
<td>410</td>
<td></td>
</tr>
<tr>
<td>system</td>
<td>410</td>
<td></td>
</tr>
<tr>
<td>tan</td>
<td>410</td>
<td></td>
</tr>
<tr>
<td>tan</td>
<td>410</td>
<td></td>
</tr>
<tr>
<td>tan</td>
<td>410</td>
<td></td>
</tr>
<tr>
<td>tan</td>
<td>411</td>
<td></td>
</tr>
<tr>
<td>tanh</td>
<td>411</td>
<td></td>
</tr>
<tr>
<td>Page</td>
<td>Function</td>
<td>Page</td>
</tr>
<tr>
<td>------</td>
<td>----------------</td>
<td>------</td>
</tr>
<tr>
<td>9.1120</td>
<td>tanhf</td>
<td>411</td>
</tr>
<tr>
<td>9.1121</td>
<td>tanh1</td>
<td>411</td>
</tr>
<tr>
<td>9.1122</td>
<td>tanl</td>
<td>411</td>
</tr>
<tr>
<td>9.1123</td>
<td>tcdrain</td>
<td>412</td>
</tr>
<tr>
<td>9.1124</td>
<td>tcf1ow</td>
<td>412</td>
</tr>
<tr>
<td>9.1125</td>
<td>tcf1ush</td>
<td>412</td>
</tr>
<tr>
<td>9.1126</td>
<td>tcgetattr</td>
<td>412</td>
</tr>
<tr>
<td>9.1127</td>
<td>tcgetpgrp</td>
<td>413</td>
</tr>
<tr>
<td>9.1128</td>
<td>tcgetsid</td>
<td>413</td>
</tr>
<tr>
<td>9.1129</td>
<td>tcsendbreak</td>
<td>413</td>
</tr>
<tr>
<td>9.1130</td>
<td>tcsetattr</td>
<td>413</td>
</tr>
<tr>
<td>9.1131</td>
<td>tcsetpgp</td>
<td>414</td>
</tr>
<tr>
<td>9.1132</td>
<td>tdelete</td>
<td>414</td>
</tr>
<tr>
<td>9.1133</td>
<td>telldir</td>
<td>414</td>
</tr>
<tr>
<td>9.1134</td>
<td>tempnam</td>
<td>414</td>
</tr>
<tr>
<td>9.1135</td>
<td>tfind</td>
<td>415</td>
</tr>
<tr>
<td>9.1136</td>
<td>tgamma</td>
<td>415</td>
</tr>
<tr>
<td>9.1137</td>
<td>tgammal</td>
<td>415</td>
</tr>
<tr>
<td>9.1138</td>
<td>tgammaf</td>
<td>415</td>
</tr>
<tr>
<td>9.1139</td>
<td>thrd_create</td>
<td>416</td>
</tr>
<tr>
<td>9.1140</td>
<td>thrd_current</td>
<td>416</td>
</tr>
<tr>
<td>9.1141</td>
<td>thrd_detach</td>
<td>416</td>
</tr>
<tr>
<td>9.1142</td>
<td>thrd_equal</td>
<td>416</td>
</tr>
<tr>
<td>9.1143</td>
<td>thrd_exit</td>
<td>417</td>
</tr>
<tr>
<td>9.1144</td>
<td>thrd_join</td>
<td>417</td>
</tr>
<tr>
<td>9.1145</td>
<td>thrd_sleep</td>
<td>417</td>
</tr>
<tr>
<td>9.1146</td>
<td>thrd_yield</td>
<td>418</td>
</tr>
<tr>
<td>9.1147</td>
<td>time</td>
<td>418</td>
</tr>
<tr>
<td>9.1148</td>
<td>timer_create</td>
<td>418</td>
</tr>
<tr>
<td>9.1149</td>
<td>timer_delete</td>
<td>418</td>
</tr>
<tr>
<td>9.1150</td>
<td>timer_getovrun</td>
<td>419</td>
</tr>
<tr>
<td>9.1151</td>
<td>timer_gettime</td>
<td>419</td>
</tr>
<tr>
<td>9.1152</td>
<td>timer_settime</td>
<td>419</td>
</tr>
<tr>
<td>9.1153</td>
<td>times</td>
<td>419</td>
</tr>
<tr>
<td>9.1154</td>
<td>timespec_getres</td>
<td>420</td>
</tr>
<tr>
<td>9.1155</td>
<td>timezone</td>
<td>420</td>
</tr>
<tr>
<td>9.1156</td>
<td>tmpfile</td>
<td>420</td>
</tr>
<tr>
<td>9.1157</td>
<td>tmpnam</td>
<td>421</td>
</tr>
<tr>
<td>9.1158</td>
<td>toascii</td>
<td>421</td>
</tr>
<tr>
<td>9.1159</td>
<td>tolower</td>
<td>421</td>
</tr>
<tr>
<td>9.1160</td>
<td>tolower_1</td>
<td>421</td>
</tr>
<tr>
<td>9.1161</td>
<td>totalorder</td>
<td>422</td>
</tr>
<tr>
<td>9.1162</td>
<td>totalorderf</td>
<td>422</td>
</tr>
<tr>
<td>9.1163</td>
<td>totalorderl</td>
<td>422</td>
</tr>
<tr>
<td>9.1164</td>
<td>totalordermag</td>
<td>423</td>
</tr>
<tr>
<td>9.1165</td>
<td>totalordermagf</td>
<td>423</td>
</tr>
<tr>
<td>9.1166</td>
<td>totalordermagl</td>
<td>423</td>
</tr>
<tr>
<td>9.1167</td>
<td>toupper</td>
<td>424</td>
</tr>
<tr>
<td>Page</td>
<td>Function</td>
<td>Page</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------</td>
<td>------</td>
</tr>
<tr>
<td>9.1168</td>
<td>toupper_l</td>
<td>424</td>
</tr>
<tr>
<td>9.1169</td>
<td>towctrans</td>
<td>424</td>
</tr>
<tr>
<td>9.1170</td>
<td>towctrans_l</td>
<td>424</td>
</tr>
<tr>
<td>9.1171</td>
<td>tolower</td>
<td>425</td>
</tr>
<tr>
<td>9.1172</td>
<td>tolower_l</td>
<td>425</td>
</tr>
<tr>
<td>9.1173</td>
<td>toupper</td>
<td>425</td>
</tr>
<tr>
<td>9.1174</td>
<td>toupper_l</td>
<td>426</td>
</tr>
<tr>
<td>9.1175</td>
<td>trunc</td>
<td>426</td>
</tr>
<tr>
<td>9.1176</td>
<td>truncate</td>
<td>426</td>
</tr>
<tr>
<td>9.1177</td>
<td>truncf</td>
<td>427</td>
</tr>
<tr>
<td>9.1178</td>
<td>trunct</td>
<td>427</td>
</tr>
<tr>
<td>9.1179</td>
<td>tsearch</td>
<td>427</td>
</tr>
<tr>
<td>9.1180</td>
<td>tss_create</td>
<td>427</td>
</tr>
<tr>
<td>9.1181</td>
<td>tss_delete</td>
<td>428</td>
</tr>
<tr>
<td>9.1182</td>
<td>tss_get</td>
<td>428</td>
</tr>
<tr>
<td>9.1183</td>
<td>tss_set</td>
<td>428</td>
</tr>
<tr>
<td>9.1184</td>
<td>ttignore</td>
<td>428</td>
</tr>
<tr>
<td>9.1185</td>
<td>ttignore_l</td>
<td>429</td>
</tr>
<tr>
<td>9.1186</td>
<td>twalk</td>
<td>429</td>
</tr>
<tr>
<td>9.1187</td>
<td>tzname</td>
<td>429</td>
</tr>
<tr>
<td>9.1188</td>
<td>tzset</td>
<td>430</td>
</tr>
<tr>
<td>9.1189</td>
<td>ufset</td>
<td>430</td>
</tr>
<tr>
<td>9.1190</td>
<td>ufsetfp</td>
<td>430</td>
</tr>
<tr>
<td>9.1191</td>
<td>ufsetfpf</td>
<td>431</td>
</tr>
<tr>
<td>9.1192</td>
<td>ufsetfpfx</td>
<td>431</td>
</tr>
<tr>
<td>9.1193</td>
<td>ufsetfpxf</td>
<td>431</td>
</tr>
<tr>
<td>9.1194</td>
<td>ufsetfpxfi</td>
<td>431</td>
</tr>
<tr>
<td>9.1195</td>
<td>ulimit</td>
<td>432</td>
</tr>
<tr>
<td>9.1196</td>
<td>unmask</td>
<td>432</td>
</tr>
<tr>
<td>9.1197</td>
<td>uname</td>
<td>432</td>
</tr>
<tr>
<td>9.1198</td>
<td>ungetc</td>
<td>432</td>
</tr>
<tr>
<td>9.1199</td>
<td>ungetwc</td>
<td>433</td>
</tr>
<tr>
<td>9.1200</td>
<td>unlink</td>
<td>433</td>
</tr>
<tr>
<td>9.1201</td>
<td>unlinkat</td>
<td>433</td>
</tr>
<tr>
<td>9.1202</td>
<td>unlockpt</td>
<td>434</td>
</tr>
<tr>
<td>9.1203</td>
<td>unsetenv</td>
<td>435</td>
</tr>
<tr>
<td>9.1204</td>
<td>uselocale</td>
<td>435</td>
</tr>
<tr>
<td>9.1205</td>
<td>utime</td>
<td>435</td>
</tr>
<tr>
<td>9.1206</td>
<td>utimensat</td>
<td>436</td>
</tr>
<tr>
<td>9.1207</td>
<td>utimes</td>
<td>437</td>
</tr>
<tr>
<td>9.1208</td>
<td>va_arg</td>
<td>437</td>
</tr>
<tr>
<td>9.1209</td>
<td>va_copy</td>
<td>438</td>
</tr>
<tr>
<td>9.1210</td>
<td>va_end</td>
<td>438</td>
</tr>
<tr>
<td>9.1211</td>
<td>va_start</td>
<td>438</td>
</tr>
<tr>
<td>9.1212</td>
<td>vdprintf</td>
<td>438</td>
</tr>
<tr>
<td>9.1213</td>
<td>vfprintf</td>
<td>439</td>
</tr>
<tr>
<td>9.1214</td>
<td>vscanf</td>
<td>440</td>
</tr>
<tr>
<td>9.1215</td>
<td>vfwprintf</td>
<td>441</td>
</tr>
<tr>
<td>Section</td>
<td>Function Name</td>
<td>Page</td>
</tr>
<tr>
<td>---------</td>
<td>-------------------------</td>
<td>------</td>
</tr>
<tr>
<td>9.1216</td>
<td>vfwscanf</td>
<td>441</td>
</tr>
<tr>
<td>9.1217</td>
<td>vprintf</td>
<td>442</td>
</tr>
<tr>
<td>9.1218</td>
<td>vscanf</td>
<td>443</td>
</tr>
<tr>
<td>9.1219</td>
<td>vsnprintf</td>
<td>443</td>
</tr>
<tr>
<td>9.1220</td>
<td>vsprintf</td>
<td>445</td>
</tr>
<tr>
<td>9.1221</td>
<td>vsscanf</td>
<td>446</td>
</tr>
<tr>
<td>9.1222</td>
<td>vswprintf</td>
<td>446</td>
</tr>
<tr>
<td>9.1223</td>
<td>vswscanf</td>
<td>447</td>
</tr>
<tr>
<td>9.1224</td>
<td>vwprintf</td>
<td>447</td>
</tr>
<tr>
<td>9.1225</td>
<td>vwscanf</td>
<td>447</td>
</tr>
<tr>
<td>9.1226</td>
<td>wait</td>
<td>448</td>
</tr>
<tr>
<td>9.1227</td>
<td>waitid</td>
<td>448</td>
</tr>
<tr>
<td>9.1228</td>
<td>waitpid</td>
<td>448</td>
</tr>
<tr>
<td>9.1229</td>
<td>wcpcpy</td>
<td>449</td>
</tr>
<tr>
<td>9.1230</td>
<td>wcpcpy</td>
<td>449</td>
</tr>
<tr>
<td>9.1231</td>
<td>wcrtomb</td>
<td>449</td>
</tr>
<tr>
<td>9.1232</td>
<td>wcscasecmp</td>
<td>450</td>
</tr>
<tr>
<td>9.1233</td>
<td>wcscasecmp_l</td>
<td>450</td>
</tr>
<tr>
<td>9.1234</td>
<td>wcscat</td>
<td>450</td>
</tr>
<tr>
<td>9.1235</td>
<td>wcscinf</td>
<td>451</td>
</tr>
<tr>
<td>9.1236</td>
<td>wcscmp</td>
<td>451</td>
</tr>
<tr>
<td>9.1237</td>
<td>wcscoll</td>
<td>451</td>
</tr>
<tr>
<td>9.1238</td>
<td>wcscoll_l</td>
<td>451</td>
</tr>
<tr>
<td>9.1239</td>
<td>wcscpy</td>
<td>452</td>
</tr>
<tr>
<td>9.1240</td>
<td>wcscspn</td>
<td>452</td>
</tr>
<tr>
<td>9.1241</td>
<td>wcsdup</td>
<td>452</td>
</tr>
<tr>
<td>9.1242</td>
<td>wcsftime</td>
<td>452</td>
</tr>
<tr>
<td>9.1243</td>
<td>wcslen</td>
<td>453</td>
</tr>
<tr>
<td>9.1244</td>
<td>wcsnccasecmp</td>
<td>453</td>
</tr>
<tr>
<td>9.1245</td>
<td>wcsnccasecmp_l</td>
<td>453</td>
</tr>
<tr>
<td>9.1246</td>
<td>wcsncat</td>
<td>454</td>
</tr>
<tr>
<td>9.1247</td>
<td>wcsncmp</td>
<td>454</td>
</tr>
<tr>
<td>9.1248</td>
<td>wcsncpy</td>
<td>454</td>
</tr>
<tr>
<td>9.1249</td>
<td>wcsnlen</td>
<td>455</td>
</tr>
<tr>
<td>9.1250</td>
<td>wcsnrtombs</td>
<td>455</td>
</tr>
<tr>
<td>9.1251</td>
<td>wcspbrk</td>
<td>455</td>
</tr>
<tr>
<td>9.1252</td>
<td>wcsrchr</td>
<td>456</td>
</tr>
<tr>
<td>9.1253</td>
<td>wcsrtombs</td>
<td>456</td>
</tr>
<tr>
<td>9.1254</td>
<td>wcspn</td>
<td>456</td>
</tr>
<tr>
<td>9.1255</td>
<td>wcsstr</td>
<td>456</td>
</tr>
<tr>
<td>9.1256</td>
<td>wcstod</td>
<td>457</td>
</tr>
<tr>
<td>9.1257</td>
<td>wcstof</td>
<td>457</td>
</tr>
<tr>
<td>9.1258</td>
<td>wcstoiimax</td>
<td>457</td>
</tr>
<tr>
<td>9.1259</td>
<td>wcstok</td>
<td>458</td>
</tr>
<tr>
<td>9.1260</td>
<td>wcstol</td>
<td>458</td>
</tr>
<tr>
<td>9.1261</td>
<td>wcstold</td>
<td>458</td>
</tr>
<tr>
<td>9.1262</td>
<td>wcstoll</td>
<td>459</td>
</tr>
<tr>
<td>9.1263</td>
<td>wcstombs</td>
<td>459</td>
</tr>
</tbody>
</table>
## 10 Past POSIX Function Substitutes

10.1 `bcmp` ...................................................... 468
10.2 `bcopy` .................................................... 468
10.3 `bsd_signal` ............................................. 468
10.4 `bzero` ...................................................... 469
10.5 `ecvt` ......................................................... 469
10.6 `fcvt` ......................................................... 469
10.7 `ftime` ...................................................... 469
10.8 `gcvt` ......................................................... 470
10.9 `getcontext` ............................................... 470
10.10 `gethostbyaddr` .......................................... 470
10.11 `gethostbyname` ........................................... 470
10.12 `getwd` ..................................................... 471
10.13 `h_errno` ................................................... 471
10.14 `index` ...................................................... 471
10.15 `makecontext` .............................................. 471
10.16 `mktemp` .................................................... 472
10.17 `pthread_attr_getstackaddr` ............................ 472
10.18 `pthread_attr_setstackaddr` ............................ 472
10.19 `rindex` ..................................................... 472

<table>
<thead>
<tr>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>wctoull</code></td>
<td>459</td>
</tr>
<tr>
<td><code>wctoumax</code></td>
<td>460</td>
</tr>
<tr>
<td><code>wcwidth</code></td>
<td>460</td>
</tr>
<tr>
<td><code>wcsxfm</code></td>
<td>460</td>
</tr>
<tr>
<td><code>wcsxfm_l</code></td>
<td>460</td>
</tr>
<tr>
<td><code>wctob</code></td>
<td>461</td>
</tr>
<tr>
<td><code>wctomb</code></td>
<td>461</td>
</tr>
<tr>
<td><code>wctrans</code></td>
<td>461</td>
</tr>
<tr>
<td><code>wctrans_l</code></td>
<td>462</td>
</tr>
<tr>
<td><code>wctype</code></td>
<td>462</td>
</tr>
<tr>
<td><code>wctype_l</code></td>
<td>462</td>
</tr>
<tr>
<td><code>wmemchr</code></td>
<td>463</td>
</tr>
<tr>
<td><code>wmemcmp</code></td>
<td>463</td>
</tr>
<tr>
<td><code>wmemcpy</code></td>
<td>464</td>
</tr>
<tr>
<td><code>wmemmove</code></td>
<td>464</td>
</tr>
<tr>
<td><code>wmemset</code></td>
<td>464</td>
</tr>
<tr>
<td><code>wmemcpy</code></td>
<td>464</td>
</tr>
<tr>
<td><code>wmemcmp</code></td>
<td>464</td>
</tr>
<tr>
<td><code>wchar</code></td>
<td>465</td>
</tr>
<tr>
<td><code>wprintf</code></td>
<td>465</td>
</tr>
<tr>
<td><code>writev</code></td>
<td>465</td>
</tr>
<tr>
<td><code>write</code></td>
<td>466</td>
</tr>
<tr>
<td><code>writev</code></td>
<td>466</td>
</tr>
<tr>
<td><code>wscanf</code></td>
<td>466</td>
</tr>
<tr>
<td><code>wscanf</code></td>
<td>466</td>
</tr>
<tr>
<td><code>yn</code></td>
<td>467</td>
</tr>
<tr>
<td><code>y1</code></td>
<td>467</td>
</tr>
<tr>
<td><code>y0</code></td>
<td>467</td>
</tr>
</tbody>
</table>
11 Glibc Header File Substitutes ............... 475

<table>
<thead>
<tr>
<th>Section</th>
<th>Header File</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.1</td>
<td>a.out.h</td>
<td>475</td>
</tr>
<tr>
<td>11.2</td>
<td>aliases.h</td>
<td>475</td>
</tr>
<tr>
<td>11.3</td>
<td>alloc.h</td>
<td>475</td>
</tr>
<tr>
<td>11.4</td>
<td>ar.h</td>
<td>476</td>
</tr>
<tr>
<td>11.5</td>
<td>argp.h</td>
<td>476</td>
</tr>
<tr>
<td>11.6</td>
<td>argz.h</td>
<td>476</td>
</tr>
<tr>
<td>11.7</td>
<td>byteswap.h</td>
<td>477</td>
</tr>
<tr>
<td>11.8</td>
<td>crypt.h</td>
<td>477</td>
</tr>
<tr>
<td>11.9</td>
<td>endian.h</td>
<td>477</td>
</tr>
<tr>
<td>11.10</td>
<td>envz.h</td>
<td>478</td>
</tr>
<tr>
<td>11.11</td>
<td>err.h</td>
<td>478</td>
</tr>
<tr>
<td>11.12</td>
<td>error.h</td>
<td>478</td>
</tr>
<tr>
<td>11.13</td>
<td>execinfo.h</td>
<td>479</td>
</tr>
<tr>
<td>11.14</td>
<td>fpu_control.h</td>
<td>479</td>
</tr>
<tr>
<td>11.15</td>
<td>fstab.h</td>
<td>479</td>
</tr>
<tr>
<td>11.16</td>
<td>fts.h</td>
<td>480</td>
</tr>
<tr>
<td>11.17</td>
<td>getopt.h</td>
<td>480</td>
</tr>
<tr>
<td>11.18</td>
<td>gshadow.h</td>
<td>480</td>
</tr>
<tr>
<td>11.19</td>
<td>ieee754.h</td>
<td>481</td>
</tr>
<tr>
<td>11.20</td>
<td>ifaddrs.h</td>
<td>481</td>
</tr>
<tr>
<td>11.21</td>
<td>libintl.h</td>
<td>481</td>
</tr>
<tr>
<td>11.22</td>
<td>link.h</td>
<td>482</td>
</tr>
<tr>
<td>11.23</td>
<td>malloc.h</td>
<td>482</td>
</tr>
<tr>
<td>11.24</td>
<td>mcheck.h</td>
<td>482</td>
</tr>
<tr>
<td>11.25</td>
<td>mntent.h</td>
<td>482</td>
</tr>
<tr>
<td>11.26</td>
<td>obstack.h</td>
<td>483</td>
</tr>
<tr>
<td>11.27</td>
<td>paths.h</td>
<td>483</td>
</tr>
<tr>
<td>11.28</td>
<td>printf.h</td>
<td>483</td>
</tr>
<tr>
<td>11.29</td>
<td>pty.h</td>
<td>484</td>
</tr>
<tr>
<td>11.30</td>
<td>resolv.h</td>
<td>484</td>
</tr>
<tr>
<td>11.31</td>
<td>shadow.h</td>
<td>485</td>
</tr>
<tr>
<td>11.32</td>
<td>sys/ioctl.h</td>
<td>485</td>
</tr>
<tr>
<td>11.33</td>
<td>sys/random.h</td>
<td>485</td>
</tr>
<tr>
<td>11.34</td>
<td>sysexits.h</td>
<td>486</td>
</tr>
<tr>
<td>11.35</td>
<td>ttyent.h</td>
<td>486</td>
</tr>
</tbody>
</table>
12 Glibc Function Substitutes .................... 487

12.1 Glibc Extensions to <aio.h> .................... 487
12.1.1 aio_init ........................................ 487

12.2 Glibc <aliases.h> ............................... 487
12.2.1 endaliasent ...................................... 487
12.2.2 getaliasbyname .................................. 488
12.2.3 getaliasbyname_r ................................. 488
12.2.4 getaliasent ...................................... 488
12.2.5 getaliasent_r .................................... 488
12.2.6 setaliasent ...................................... 489

12.3 Glibc <argp.h> ..................................... 489
12.3.1 argp_err_exit_status ............................ 489
12.3.2 argp_error ...................................... 489
12.3.3 argp_failure ...................................... 489
12.3.4 argp_help ........................................ 490
12.3.5 argp_parse ....................................... 490
12.3.6 argp_program_bug_address ...................... 490
12.3.7 argp_program_version ........................... 490
12.3.8 argp_program_version_hook ...................... 491
12.3.9 argp_state_help .................................. 491
12.3.10 argp_usage ...................................... 491

12.4 Glibc <argz.h> ..................................... 492
12.4.1 argz_add .......................................... 492
12.4.2 argz_add_sep ..................................... 492
12.4.3 argz_append ...................................... 492
12.4.4 argz_count ....................................... 493
12.4.5 argz_create ...................................... 493
12.4.6 argz_create_sep .................................. 494
12.4.7 argz_delete ...................................... 494
12.4.8 argz_extract ..................................... 494
12.4.9 argz_insert ...................................... 495
12.4.10 argz_next ........................................ 495
12.4.11 argz_replace ..................................... 495
12.4.12 argz_stringify .................................. 496

12.5 Glibc Extensions to <arpa/inet.h> ............ 496
12.5.1 inet_aton .......................................... 496
12.5.2 inet_lnaof ........................................ 497
12.5.3 inet_makeaddr .................................... 497
12.5.4 inet_net_ntop .................................... 497
12.5.5 inet_net_ntop .................................... 497
12.5.6 inet_netof ........................................ 498
12.5.7 inet_network ...................................... 498
12.5.8 inet_nsap_addr ................................... 498
12.5.9 inet_nsap_ntoa ................................... 498

12.6 Glibc <byteswap.h> ............................... 499
12.6.1 bswap_16 ......................................... 499
12.6.2 bswap_32 ......................................... 499
12.6.3 bswap_64 ......................................... 499
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.7</td>
<td>Glibc Extensions to <code>&lt;complex.h&gt;</code>...499</td>
</tr>
<tr>
<td>12.7.1</td>
<td><code>clog10</code>...499</td>
</tr>
<tr>
<td>12.7.2</td>
<td><code>clog10f</code>...500</td>
</tr>
<tr>
<td>12.7.3</td>
<td><code>clog10l</code>...500</td>
</tr>
<tr>
<td>12.8</td>
<td>Glibc Extensions to <code>&lt;ctype.h&gt;</code>...501</td>
</tr>
<tr>
<td>12.8.1</td>
<td><code>isctype</code>...501</td>
</tr>
<tr>
<td>12.9</td>
<td>Glibc Extensions to <code>&lt;dirent.h&gt;</code>...501</td>
</tr>
<tr>
<td>12.9.1</td>
<td><code>getdirent</code>...501</td>
</tr>
<tr>
<td>12.9.2</td>
<td><code>scandir</code>...501</td>
</tr>
<tr>
<td>12.9.3</td>
<td><code>versionsort</code>...501</td>
</tr>
<tr>
<td>12.10</td>
<td>Glibc Extensions to <code>&lt;dlfcn.h&gt;</code>...502</td>
</tr>
<tr>
<td>12.10.1</td>
<td><code>dladdr</code>...502</td>
</tr>
<tr>
<td>12.10.2</td>
<td><code>dladdr1</code>...502</td>
</tr>
<tr>
<td>12.10.3</td>
<td><code>dlinfo</code>...502</td>
</tr>
<tr>
<td>12.10.4</td>
<td><code>dlmopen</code>...503</td>
</tr>
<tr>
<td>12.10.5</td>
<td><code>dlvsym</code>...503</td>
</tr>
<tr>
<td>12.11</td>
<td>Glibc <code>&lt;envz.h&gt;</code>...503</td>
</tr>
<tr>
<td>12.11.1</td>
<td><code>envz_add</code>...503</td>
</tr>
<tr>
<td>12.11.2</td>
<td><code>envz_entry</code>...504</td>
</tr>
<tr>
<td>12.11.3</td>
<td><code>envz_get</code>...504</td>
</tr>
<tr>
<td>12.11.4</td>
<td><code>envz_merge</code>...504</td>
</tr>
<tr>
<td>12.11.5</td>
<td><code>envz_remove</code>...505</td>
</tr>
<tr>
<td>12.11.6</td>
<td><code>envz_strip</code>...505</td>
</tr>
<tr>
<td>12.12</td>
<td>Glibc <code>&lt;err.h&gt;</code>...505</td>
</tr>
<tr>
<td>12.12.1</td>
<td><code>err</code>...505</td>
</tr>
<tr>
<td>12.12.2</td>
<td><code>errx</code>...506</td>
</tr>
<tr>
<td>12.12.3</td>
<td><code>verr</code>...506</td>
</tr>
<tr>
<td>12.12.4</td>
<td><code>verrx</code>...506</td>
</tr>
<tr>
<td>12.12.5</td>
<td><code>vwarn</code>...507</td>
</tr>
<tr>
<td>12.12.6</td>
<td><code>vwar nx</code>...507</td>
</tr>
<tr>
<td>12.12.7</td>
<td><code>warn</code>...507</td>
</tr>
<tr>
<td>12.12.8</td>
<td><code>warnx</code>...507</td>
</tr>
<tr>
<td>12.13</td>
<td>Glibc Extensions to <code>&lt;errno.h&gt;</code>...508</td>
</tr>
<tr>
<td>12.13.1</td>
<td><code>program_invocation_name</code>...508</td>
</tr>
<tr>
<td>12.13.2</td>
<td><code>program_invocation_short_name</code>...508</td>
</tr>
<tr>
<td>12.14</td>
<td>Glibc <code>&lt;error.h&gt;</code>...508</td>
</tr>
<tr>
<td>12.14.1</td>
<td><code>error</code>...508</td>
</tr>
<tr>
<td>12.14.2</td>
<td><code>error_at_line</code>...509</td>
</tr>
<tr>
<td>12.14.3</td>
<td><code>error_message_count</code>...509</td>
</tr>
<tr>
<td>12.14.4</td>
<td><code>error_one_per_line</code>...509</td>
</tr>
<tr>
<td>12.14.5</td>
<td><code>error_print_pro name</code>...510</td>
</tr>
<tr>
<td>12.15</td>
<td>Glibc <code>&lt;execinfo.h&gt;</code>...510</td>
</tr>
<tr>
<td>12.15.1</td>
<td><code>backtrace</code>...510</td>
</tr>
<tr>
<td>12.15.2</td>
<td><code>backtrace_symbols</code>...510</td>
</tr>
<tr>
<td>12.15.3</td>
<td><code>backtrace_symbols_fd</code>...511</td>
</tr>
<tr>
<td>12.16</td>
<td>Glibc Extensions to <code>&lt;fcntl.h&gt;</code>...511</td>
</tr>
<tr>
<td>12.16.1</td>
<td><code>fallocate</code>...511</td>
</tr>
<tr>
<td>12.16.2</td>
<td><code>name_to_handle_at</code>...511</td>
</tr>
</tbody>
</table>
12.16.3 readahead .............................................. 512
12.16.4 open_by_handle_at ................................... 512
12.16.5 sync_file_range ....................................... 512
12.17 Glibc Extensions to <fenv.h> ............................ 512
  12.17.1 fedisableexcept .................................. 512
  12.17.2 feenableexcept .................................. 513
  12.17.3 fegetexcept ....................................... 513
12.18 Glibc Extensions to <fmtmsg.h> .......................... 514
  12.18.1 addseverity ....................................... 514
12.19 Glibc <fstab.h> ......................................... 514
  12.19.1 endsent ........................................... 514
  12.19.2 getfsent .......................................... 514
  12.19.3 getfsfile ......................................... 515
  12.19.4 getfsspec ......................................... 515
  12.19.5 setsent ........................................... 515
12.20 Glibc <fts.h> ........................................... 515
  12.20.1 fts_children ..................................... 515
  12.20.2 fts_close ......................................... 516
  12.20.3 fts_open .......................................... 516
  12.20.4 fts_read ........................................... 516
  12.20.5 fts_set ............................................ 516
12.21 Glibc <getopt.h> ........................................ 517
  12.21.1 getopt ............................................. 517
  12.21.2 getopt_long_only ................................ 517
12.22 Glibc Extensions to <glob.h> ............................. 518
  12.22.1 glob_pattern_p .................................. 518
12.23 Glibc Extensions to <gnu/libc-version.h> ............. 519
  12.23.1 gnu_get_libc_release .............................. 519
  12.23.2 gnu_get_libc_version .............................. 519
12.24 Glibc Extensions to <grp.h> ............................... 519
  12.24.1 fgetgrent ....................................... 519
  12.24.2 fgetgrent_r ..................................... 520
  12.24.3 getgrent ......................................... 520
  12.24.4 getgrouplist .................................. 520
  12.24.5 initgroups ....................................... 521
  12.24.6 putgrent ......................................... 521
  12.24.7 setgroups ....................................... 521
12.25 Glibc <gshadow.h> ....................................... 522
  12.25.1 endsgent ....................................... 522
  12.25.2 fgetgent ......................................... 522
  12.25.3 fgetgrent ....................................... 522
  12.25.4 getgrent ......................................... 522
  12.25.5 getgrent_r ....................................... 522
  12.25.6 getgnum .......................................... 523
  12.25.7 getgnum_r ....................................... 523
  12.25.8 putgnum ......................................... 523
  12.25.9 setsgent ....................................... 523
  12.25.10 sgetgnum ....................................... 523
12.25.11 sgetsgent_r.................................524
12.26 Glibc <ifaddrs.h>.............................524
  12.26.1 getifaddrs................................524
  12.26.2 freeifaddrs.............................524
12.27 Glibc <libintl.h>..............................524
  12.27.1 bind_textdomain_codeset................524
  12.27.2 bindtextdomain........................525
  12.27.3 dcgettext..............................525
  12.27.4 dcngettext............................525
  12.27.5 dgettext...............................526
  12.27.6 dgettext...............................526
  12.27.7 gettext..............................526
  12.27.8 ngettext..............................527
  12.27.9 textdomain............................527
12.28 Glibc <link.h>................................527
  12.28.1 dl_iterate_phdr..........................528
12.29 Glibc <malloc.h>................................528
  12.29.1 malloc..................................528
  12.29.2 malloc2................................528
  12.29.3 malloc_info...............................529
  12.29.4 malloc_stats.............................529
  12.29.5 malloc_trim.............................529
  12.29.6 malloc_usable_size......................529
  12.29.7 mallocpt.................................530
  12.29.8 memalign...............................530
  12.29.9 pvalloc................................530
12.30 Glibc Extensions to <math.h>..................531
  12.30.1 drem..................................531
  12.30.2 dremf..................................531
  12.30.3 dreml..................................531
  12.30.4 exp10..................................532
  12.30.5 exp10f..................................532
  12.30.6 exp10l..................................532
  12.30.7 finite..................................533
  12.30.8 finitef................................533
  12.30.9 finitel................................533
  12.30.10 gamma..................................534
  12.30.11 gammaf................................534
  12.30.12 gammal..................................534
  12.30.13 isnanf................................535
  12.30.14 isnanl................................535
  12.30.15 isnanf................................535
  12.30.16 isnanl................................536
  12.30.17 j0f..................................536
  12.30.18 j0l..................................536
  12.30.19 j1f..................................537
  12.30.20 j1l..................................537
  12.30.21 jnf..................................537
12.30.22 jnl ............................................. 538
12.30.23 lgamma_r .................................... 538
12.30.24 lgammaf_r .................................. 539
12.30.25 lgammal_r .................................. 539
12.30.26 matherr .................................... 539
12.30.27 pow10 ....................................... 540
12.30.28 pow10f ..................................... 540
12.30.29 pow10l ..................................... 540
12.30.30 scalbf ...................................... 541
12.30.31 scalbl ...................................... 541
12.30.32 significand .................................. 541
12.30.33 significandf ................................ 542
12.30.34 significandl ................................ 542
12.30.35 sincos ...................................... 542
12.30.36 sincosf ..................................... 543
12.30.37 sincosl ..................................... 543
12.30.38 y0f ......................................... 543
12.30.39 y0l ......................................... 544
12.30.40 y1f ......................................... 544
12.30.41 y1l ......................................... 544
12.30.42 ynf ......................................... 545
12.30.43 ynl ......................................... 545
12.31 Glibc <mcheck.h> ................................ 545
  12.31.1 mcheck ..................................... 545
  12.31.2 mcheck_check_all ......................... 546
  12.31.3 mcheck_pedantic .......................... 546
  12.31.4 mprobe .................................... 546
  12.31.5 mtrace .................................... 547
  12.31.6 muntrace .................................. 547
12.32 Glibc <mntent.h> ................................. 547
  12.32.1 addmntent .................................. 547
  12.32.2 endmntent .................................. 547
  12.32.3 getmntent .................................. 548
  12.32.4 getmntent_r ................................ 548
  12.32.5 hasmntopt .................................. 548
  12.32.6 setmntent ................................. 549
12.33 Glibc Extensions to <netdb.h> .................. 549
  12.33.1 endnetgrent ............................... 549
  12.33.2 gethostbyaddr_r ......................... 549
  12.33.3 gethostbyname2 ......................... 550
  12.33.4 gethostbyname2_r ....................... 550
  12.33.5 gethostbyname_r ......................... 550
  12.33.6 gethostent_r ............................. 551
  12.33.7 getnetbyaddr_r ......................... 551
  12.33.8 getnetbyname ......................... 551
  12.33.9 getnetent_r ............................. 551
  12.33.10 getnetgrent ............................. 551
  12.33.11 getnetgrent_r ......................... 552
12.34 Glibc <netinet/ether.h> ........................................ 557

12.34.1 ether_aton .......................................... 557
12.34.2 ether_aton_r ........................................ 557
12.34.3 ether_hostton ....................................... 557
12.34.4 ether_line .......................................... 557
12.34.5 ether_ntoa .......................................... 558
12.34.6 ether_ntoa_r ........................................ 558
12.34.7 ether_ntohost ....................................... 558

12.35 Glibc Extensions to <netinet/in.h> ........................... 558

12.35.1 bindresvport ........................................ 558
12.35.2 getipv4sourcefilter .................................. 559
12.35.3 getsourcefilter ...................................... 559
12.35.4 inet6addr_any ........................................ 559
12.35.5 inet6addr_loopback .................................. 559
12.35.6 inet6_option_alloc .................................. 559
12.35.7 inet6_option_append .................................. 560
12.35.8 inet6_option_find .................................... 560
12.35.9 inet6_option_init .................................... 560
12.35.10 inet6_option_next ................................... 560
12.35.11 inet6_option_space ................................... 560
12.35.12 inet6_opt_append .................................... 560
12.35.13 inet6_opt_find ..................................... 561
12.35.14 inet6_opt_finish .................................... 561
12.35.15 inet6_opt_get_val ................................... 561
12.35.16 inet6_opt_init ...................................... 561
12.35.17 inet6_opt_next ..................................... 561
12.35.18 inet6_opt_set_val ................................... 562
12.35.19 inet6_rth_add ....................................... 562
12.35.20 inet6_rth_getaddr ................................... 562
12.35.21 inet6_rth_init ...................................... 562
12.35.22 inet6_rth_reverse ............................................. 562
12.35.23 inet6_rth_segments .......................... 563
12.35.24 inet6_rth_space ............................................. 563
12.35.25 setipv4sourcefilter .......................... 563
12.35.26 setsourcefilter ............................................. 563
12.36 Glibc <obstack.h> ............................................. 563
  12.36.1 obstack_alloc_failed_handler .......................... 563
  12.36.2 obstack_exit_failure ..................................... 564
  12.36.3 obstack_free ............................................. 564
  12.36.4 obstack_printf ............................................. 564
  12.36.5 obstack_vprintf ............................................. 565
12.37 Glibc Extensions to <poll.h> ..................................... 566
  12.37.1 ppoll ..................................................... 566
12.38 Glibc <printf.h> ............................................. 567
  12.38.1 parse_printf_format ..................................... 567
  12.38.2 printf_size ............................................. 567
  12.38.3 printf_size_info ......................................... 567
  12.38.4 register_printf_function ............................. 567
  12.38.5 register_printf_modifier .............................. 568
  12.38.6 register_printf_specifier .............................. 568
  12.38.7 register_printf_type ..................................... 568
12.39 Glibc Extensions to <pthread.h> ..................................... 568
  12.39.1 pthread_attr_getaffinity_np .......................... 568
  12.39.2 pthread_attr_setsaffinity_np ......................... 569
  12.39.3 pthread_attr_getsigmask_np .......................... 569
  12.39.4 pthread_attr_setsigmask_np .......................... 569
  12.39.5 pthread_clockjoin_np ..................................... 569
  12.39.6 pthread_cond_clockwait .................................. 570
  12.39.7 pthread_getaffinity_np .................................. 570
  12.39.8 pthread_getattr_default_np ........................... 570
  12.39.9 pthread_getattr_np ....................................... 570
  12.39.10 pthread_getname_np ..................................... 571
  12.39.11 pthread_kill_other_threads_np ....................... 571
  12.39.12 pthread_mutex_clocklock .............................. 571
  12.39.13 pthread_rwlock_clocklock ......................... 572
  12.39.14 pthread_rwlock_clockwrlock ............................ 572
  12.39.15 pthread_rwlockattr_getkind_np ....................... 572
  12.39.16 pthread_rwlockattr_setkind_np ....................... 572
  12.39.17 pthread_setaffinity_np .................................. 573
  12.39.18 pthread_setattr_default_np .......................... 573
  12.39.19 pthread_setname_np ..................................... 573
  12.39.20 pthread_setsigmask_np .................................. 574
  12.39.21 pthread_setsigmask_np .................................. 574
  12.39.22 pthread_setpriority ..................................... 574
12.40 Glibc <pty.h> ............................................. 574
  12.40.1 forkpty ................................................... 574
  12.40.2 openpty ................................................... 575
12.41 Glibc Extensions to <pwd.h> ..................................... 575
12.41.1  fgetpwent ........................................... 576
12.41.2  fgetpwent_r ......................................... 576
12.41.3  getpw .................................................. 576
12.41.4  getpwent .............................................. 576
12.41.5  putpwent ............................................... 577
12.42  Glibc Extensions to <regex.h> .......................... 577
  12.42.1  re_comp ............................................. 577
  12.42.2  re_compile_fastmap ................................. 577
  12.42.3  re_compile_pattern ................................. 578
  12.42.4  re_exec ............................................ 578
  12.42.5  re_match ............................................ 578
  12.42.6  re_match_2 .......................................... 578
  12.42.7  re_search ........................................... 578
  12.42.8  re_search_2 .......................................... 579
  12.42.9  re_set_registers ................................. 579
  12.42.10 re_set_syntax ..................................... 579
  12.42.11 re_syntax_options ................................. 579
12.43  Glibc <regexp.h> ....................................... 579
  12.43.1  advance ............................................ 579
  12.43.2  loc1 ................................................ 580
  12.43.3  loc2 ................................................ 580
  12.43.4  locs ................................................. 580
  12.43.5  step ................................................ 580
12.44  Glibc <resolv.h> ....................................... 580
  12.44.1  dn_comp ............................................. 580
  12.44.2  dn_expand .......................................... 581
  12.44.3  dn_skipname ...................................... 581
  12.44.4  res_dnok ........................................... 581
  12.44.5  res_hnok ........................................... 581
  12.44.6  res_init ............................................ 581
  12.44.7  res_mailok ......................................... 582
  12.44.8  res_mkquery ...................................... 582
  12.44.9  res_nmquery ....................................... 582
  12.44.10 res_nquery ........................................ 582
  12.44.11 res_nquerydomain ................................. 583
  12.44.12 res_nsearch ...................................... 583
  12.44.13 res_nsend ......................................... 583
  12.44.14 res_ownok ......................................... 583
  12.44.15 res_query .......................................... 584
  12.44.16 res_querydomain .................................. 584
  12.44.17 res_search ....................................... 584
  12.44.18 res_send ......................................... 584
12.45  Glibc <rpc/auth.h> .................................... 584
  12.45.1  authdes_create .................................... 584
  12.45.2  authdes_pk_create .................................. 585
  12.45.3  authnone_create .................................... 585
  12.45.4  authunix_create ................................... 585
  12.45.5  authunix_create_default ......................... 585
12.45.6 getnetname..............................585
12.45.7 host2netname..........................586
12.45.8 key_decryptsession....................586
12.45.9 key_decryptsession_pk..................586
12.45.10 key_encryptsession....................586
12.45.11 key_encryptsession_pk..................586
12.45.12 key_gendes............................587
12.45.13 key_get_conv..........................587
12.45.14 key_secretkey_is_set..................587
12.45.15 key_setsecret.........................587
12.45.16 netname2host..........................587
12.45.17 netname2user..........................588
12.45.18 user2netname..........................588
12.45.19 xdr_des_block.........................588
12.45.20 xdr_opaque_auth.......................588
12.46 Glibc <rpc/auth_des.h>...................588
12.46.1 authdes_getucred......................588
12.46.2 getpublickey..........................589
12.46.3 getsecretkey...........................589
12.46.4 rtime..................................589
12.47 Glibc <rpc/auth_unix.h>..................589
12.47.1 xdr_authunix_parms.....................589
12.48 Glibc <rpc/clnt.h>.......................589
12.48.1 callrpc................................590
12.48.2 clnt_create............................590
12.48.3 clnt_pcreateerror......................590
12.48.4 clnt_perorno...........................590
12.48.5 clnt_perror............................590
12.48.6 clnt_spcreateerror.....................591
12.48.7 clnt_sperrno...........................591
12.48.8 clnt_sperror...........................591
12.48.9 clntraw_create........................591
12.48.10 clnttcp_create........................592
12.48.11 clntudp_bufcreate.....................592
12.48.12 clntudp_create........................592
12.48.13 clntunix_create.......................592
12.48.14 get_myaddress........................592
12.48.15 getrpcport............................593
12.48.16 rpc_createerr........................593
12.49 Glibc <rpc/key_prot.h>...................593
12.49.1 xdr_cryptkeyarg........................593
12.49.2 xdr_cryptkeyarg2.......................593
12.49.3 xdr_cryptkeyres.......................594
12.49.4 xdr_getcredres.........................594
12.49.5 xdr_key_netstarg.......................594
12.49.6 xdr_key_netstres.......................594
12.49.7 xdr_keybuf.............................594
12.49.8 xdr_keystatus..........................594
12.49.9 xdr_netnamestr ........................................... 595
12.49.10 xdr_unixcred ............................................. 595
12.50 Glibc <rpc/netdb.h> ......................................... 595
  12.50.1 endrpcent ................................................. 595
  12.50.2 getrpcbyname ............................................. 595
  12.50.3 getrpcbyname_r ........................................... 595
  12.50.4 getrpcbyname_number .................................... 596
  12.50.5 getrpcbyname_number_r .................................. 596
  12.50.6 getrpcent ................................................. 596
  12.50.7 getrpcent_r ............................................... 596
  12.50.8 setrpcent .................................................. 596
12.51 Glibc <rpc/pmap_clnt.h> ..................................... 597
  12.51.1 clnt_broadcast .......................................... 597
  12.51.2 pmap_getmaps ............................................ 597
  12.51.3 pmap_getport ............................................. 597
  12.51.4 pmap_rmtcall ............................................ 598
  12.51.5 pmap_set .................................................. 598
  12.51.6 pmap_unset ................................................ 598
12.52 Glibc <rpc/pmap_prot.h> ..................................... 598
  12.52.1 xdr_pmap .................................................. 598
  12.52.2 xdr_pmaplist ............................................. 599
12.53 Glibc <rpc/pmap_rmt.h> ...................................... 599
  12.53.1 xdr_rmtcall_args ........................................ 599
  12.53.2 xdr_rmtcallres .......................................... 599
12.54 Glibc <rpc/rpc_msg.h> ....................................... 599
  12.54.1 xdr_callhdr ............................................... 599
  12.54.2 xdr_callmsg ............................................... 600
  12.54.3 xdr_replymsg ............................................. 600
12.55 Glibc <rpc/svc.h> ............................................ 600
  12.55.1 svc_exit ................................................... 600
  12.55.2 svc_fdset .................................................. 600
  12.55.3 svc_getreq ............................................... 600
  12.55.4 svc_getreq_common ....................................... 601
  12.55.5 svc_getreq_poll ......................................... 601
  12.55.6 svc_getreqset ............................................. 601
  12.55.7 svc_max_pollfd .......................................... 601
  12.55.8 svc_pollfd ................................................. 601
  12.55.9 svc_register ............................................. 602
  12.55.10 svc_run ................................................... 602
  12.55.11 svc_sendreply .......................................... 602
  12.55.12 svc_unregister .......................................... 602
  12.55.13 svcerr_auth .............................................. 603
  12.55.14 svcerr_decode .......................................... 603
  12.55.15 svcerr_noproc .......................................... 603
  12.55.16 svcerr_noprog .......................................... 603
  12.55.17 svcerr_progvers ........................................ 604
  12.55.18 svcerr_systemerr ....................................... 604
  12.55.19 svcerr_weakauth ....................................... 604
12.56  Glibc <rpc/xdr.h> ................................................. 606
12.56.1  xdr_array ................................................. 606
12.56.2  xdr_bool .................................................. 606
12.56.3  xdr_bytes .................................................. 606
12.56.4  xdr_char ................................................... 607
12.56.5  xdr_double .................................................. 607
12.56.6  xdr_enum .................................................... 607
12.56.7  xdr_float .................................................... 607
12.56.8  xdr_free ..................................................... 607
12.56.9  xdr_hyper .................................................... 608
12.56.10  xdr_int ...................................................... 608
12.56.11  xdr_int16_t ................................................ 608
12.56.12  xdr_int32_t ................................................ 608
12.56.13  xdr_int64_t ................................................ 608
12.56.14  xdr_int8_t .................................................. 609
12.56.15  xdr_long .................................................... 609
12.56.16  xdr_longlong_t ............................................. 609
12.56.17  xdr_netobj .................................................. 609
12.56.18  xdrOpaque .................................................... 609
12.56.19  xdr_pointer ................................................ 610
12.56.20  xdr_quad_t .................................................. 610
12.56.21  xdr_reference .............................................. 610
12.56.22  xdr_short ..................................................... 610
12.56.23  xdr_sizeof .................................................. 610
12.56.24  xdr_string .................................................. 611
12.56.25  xdr_u_char ................................................... 611
12.56.26  xdr_u_hyper .................................................. 611
12.56.27  xdr_u_int ..................................................... 611
12.56.28  xdr_u_long ..................................................... 612
12.56.29  xdr_u_longlong_t .......................................... 612
12.56.30  xdr_u_quad_t ................................................ 612
12.56.31  xdr_u_short ................................................... 612
12.56.32  xdr_uint16_t ................................................ 612
12.56.33  xdr_uint32_t ................................................ 613
12.56.34  xdr_uint64_t ................................................ 613
12.56.35  xdr_uint8_t ................................................... 613
12.56.36  xdr_union ..................................................... 613
12.56.37  xdr_vector .................................................... 613
12.56.38  xdr_void ....................................................... 614
12.56.39  xdr_wrapstring .............................................. 614
12.56.40  xdrmem_create .............................................. 614
12.56.41 xdrrec_create ................................. 614
12.56.42 xdrrec_endofrecord ......................... 615
12.56.43 xdrrec_eof .................................. 615
12.56.44 xdrrec_skiprecord ......................... 615
12.56.45 xdrstdio_create ........................... 615
12.57 Glibc <rpcsvc/nislib.h> ....................... 616
12.57.1 nis_add .................................. 616
12.57.2 nis_add_entry .............................. 616
12.57.3 nis_addmember .............................. 616
12.57.4 nis_checkpoint .............................. 616
12.57.5 nis_clone_object ............................ 616
12.57.6 nis_creategroup ............................ 617
12.57.7 nis_destroy_object .......................... 617
12.57.8 nis_destroygroup ............................ 617
12.57.9 nis_dir_cmp ................................ 617
12.57.10 nis_domain_of............................. 617
12.57.11 nis_domain_of_r ......................... 618
12.57.12 nis_first_entry ............................ 618
12.57.13 nis_freenames ............................. 618
12.57.14 nis_feereresult ........................... 618
12.57.15 nis_freeservlist ........................... 618
12.57.16 nis_freetags ............................... 619
12.57.17 nis_getnames .............................. 619
12.57.18 nis_getservlist ........................... 619
12.57.19 nis_ismember .............................. 619
12.57.20 nis_leaf_of ............................... 619
12.57.21 nis_leaf_of_r ......................... 620
12.57.22 nis_lerror ................................. 620
12.57.23 nis_list ................................. 620
12.57.24 nis_local_directory ....................... 620
12.57.25 nis_local_group ........................... 620
12.57.26 nis_local_host ............................ 621
12.57.27 nis_local_principal ....................... 621
12.57.28 nis_lookup ............................... 621
12.57.29 nis_mkdir ................................ 621
12.57.30 nis_modify ............................... 621
12.57.31 nis_modify_entry .......................... 622
12.57.32 nis_name_of ............................... 622
12.57.33 nis_name_of_r ............................ 622
12.57.34 nis_next_entry ............................ 622
12.57.35 nis_perror .............................. 622
12.57.36 nis_ping ............................... 623
12.57.37 nis_print_directory ....................... 623
12.57.38 nis_print_entry .......................... 623
12.57.39 nis_print_group .......................... 623
12.57.40 nis_print_group_entry ..................... 623
12.57.41 nis_print_link ............................ 624
12.57.42 nis_print_object .......................... 624
12.57.43 nis_print_result ........................................ 624
12.57.44 nis_print_rights ...................................... 624
12.57.45 nis_print_table ...................................... 624
12.57.46 nis_remove ........................................... 625
12.57.47 nis_remove_entry .................................... 625
12.57.48 nis_removemember ................................... 625
12.57.49 nis_rmdir ............................................ 625
12.57.50 nis_servstate ........................................ 625
12.57.51 nis_sperrno ........................................ 626
12.57.52 nis_sperror ......................................... 626
12.57.53 nis_sperror_r ....................................... 626
12.57.54 nis_stats ........................................... 626
12.57.55 nis_verifygroup ..................................... 626
12.58 Glibc <rpcsvc/nis_callback.h> .......................... 627
12.58.1 xdr_cback_data ....................................... 627
12.58.2 xdr_obj_p ............................................ 627
12.59 Glibc <rpcsvc/yp.h> ..................................... 627
12.59.1 xdr_domainname ....................................... 627
12.59.2 xdr_keydat ........................................... 627
12.59.3 xdr_valdat ........................................... 627
12.59.4 xdr_ypbind_resptype ................................ 628
12.59.5 xdr_ypmap_parms ..................................... 628
12.59.6 xdr_ypmaplist ........................................ 628
12.59.7 xdr_yppushresp_xfr ................................ 628
12.59.8 xdr_ypreq_key ........................................ 628
12.59.9 xdr_ypreq_nokey ..................................... 628
12.59.10 xdr_ypreq_xfr ....................................... 629
12.59.11 xdr_ypresp_all ...................................... 629
12.59.12 xdr_ypresp_key_val ................................ 629
12.59.13 xdr_ypresp_maplist ................................ 629
12.59.14 xdr_ypresp_master .................................. 629
12.59.15 xdr_ypresp_order ................................... 629
12.59.16 xdr_ypresp_val ...................................... 630
12.59.17 xdr_ypresp_xfr ..................................... 630
12.59.18 xdr ypstat .......................................... 630
12.59.19 xdr_ypxfrstat ....................................... 630
12.60 Glibc <rpcsvc/ypclnt.h> .................................. 630
12.60.1 yp_all ................................................. 630
12.60.2 yp_bind ............................................... 631
12.60.3 yp_first .............................................. 631
12.60.4 yp_get_default_domain ................................ 631
12.60.5 yp_master ............................................. 631
12.60.6 yp_match .............................................. 631
12.60.7 yp_next ............................................... 631
12.60.8 yp_order .............................................. 632
12.60.9 yp_unbind ............................................. 632
12.60.10 ypbinderr_string .................................... 632
12.60.11 yperr_string ......................................... 632
12.60.12 ypprot_err ........................................ 632
12.61 Glibc Extensions to <sched.h> .......................... 633
  12.61.1 clone ........................................ 633
  12.61.2 getcpu ....................................... 633
  12.61.3 sched_getaффinity ............................... 633
  12.61.4 sched_getcpu ................................ 634
  12.61.5 sched_setaffinity .............................. 634
  12.61.6 setns ........................................ 634
12.62 Glibc Extensions to <search.h> .......................... 634
  12.62.1 hcreate_r .................................... 634
  12.62.2 hdestroу_r .................................. 635
  12.62.3 hsearch_r ................................... 635
  12.62.4 tdestroy .................................... 636
  12.62.5 twalk_r ...................................... 636
12.63 Glibc Extensions to <selinux/selinux.h> ................. 636
  12.63.1 fgetfilecon .................................. 636
  12.63.2 getfilecon ................................... 637
  12.63.3 lgetfilecon .................................. 637
12.64 Glibc Extensions to <semaphore.h> ......................... 638
  12.64.1 sem_clockwait .................................. 638
12.65 Glibc <shadow.h>......................................... 638
  12.65.1 endspent ..................................... 638
  12.65.2 fgetspent .................................... 638
  12.65.3 fgetspent_r .................................. 638
  12.65.4 getspent ..................................... 639
  12.65.5 getspent_r ................................... 639
  12.65.6 getspnam .................................... 639
  12.65.7 getspnam_r ................................... 639
  12.65.8 lckpwdf ...................................... 640
  12.65.9 putspent ..................................... 640
  12.65.10 setspent .................................... 640
  12.65.11 sgetsрent .................................. 640
  12.65.12 sgetsрent_r .................................. 641
  12.65.13 ulckpwdf .................................... 641
12.66 Glibc Extensions to <signal.h> ............................ 641
  12.66.1 gsignal ...................................... 641
  12.66.2 sigandsеt .................................... 642
  12.66.3 sigblock ..................................... 642
  12.66.4 siggetmask ................................... 642
  12.66.5 sigismеntyset ................................ 642
  12.66.6 sigorset ..................................... 643
  12.66.7 sigreturn .................................... 643
  12.66.8 sigsetmask ................................... 643
  12.66.9 sigstack ..................................... 644
  12.66.10 sigvec ...................................... 644
  12.66.11 ssignal ..................................... 644
  12.66.12 sys_siglist .................................. 644
  12.66.13 sysv_signal .................................. 645
<table>
<thead>
<tr>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>tgkill</td>
<td>645</td>
</tr>
<tr>
<td>Glibc Extensions to <code>&lt;spawn.h&gt;</code></td>
<td>645</td>
</tr>
<tr>
<td>posix_spawn_file_actions_addchdir_np</td>
<td>645</td>
</tr>
<tr>
<td>posix_spawn_file_actions_addclosefrom_np</td>
<td>646</td>
</tr>
<tr>
<td>posix_spawn_file_actions_addfchdir_np</td>
<td>646</td>
</tr>
<tr>
<td>Glibc Extensions to <code>&lt;stdio.h&gt;</code></td>
<td>646</td>
</tr>
<tr>
<td>asprintf</td>
<td>646</td>
</tr>
<tr>
<td>cuserid</td>
<td>647</td>
</tr>
<tr>
<td>clearerr_unlocked</td>
<td>647</td>
</tr>
<tr>
<td>fcloseall</td>
<td>648</td>
</tr>
<tr>
<td>feof_unlocked</td>
<td>648</td>
</tr>
<tr>
<td>ferror_unlocked</td>
<td>648</td>
</tr>
<tr>
<td>fflush_unlocked</td>
<td>649</td>
</tr>
<tr>
<td>fgetc_unlocked</td>
<td>649</td>
</tr>
<tr>
<td>fgets_unlocked</td>
<td>649</td>
</tr>
<tr>
<td>frealloc</td>
<td>650</td>
</tr>
<tr>
<td>fworker</td>
<td>650</td>
</tr>
<tr>
<td>fputc_unlocked</td>
<td>650</td>
</tr>
<tr>
<td>fputc_unlocked</td>
<td>651</td>
</tr>
<tr>
<td>fread_unlocked</td>
<td>651</td>
</tr>
<tr>
<td>fwrite_unlocked</td>
<td>651</td>
</tr>
<tr>
<td>getw</td>
<td>652</td>
</tr>
<tr>
<td>putw</td>
<td>652</td>
</tr>
<tr>
<td>rename2</td>
<td>652</td>
</tr>
<tr>
<td>setbuffer</td>
<td>652</td>
</tr>
<tr>
<td>setlinebuf</td>
<td>653</td>
</tr>
<tr>
<td>sys_errlist</td>
<td>653</td>
</tr>
<tr>
<td>sys_nerr</td>
<td>653</td>
</tr>
<tr>
<td>tmpnam_r</td>
<td>654</td>
</tr>
<tr>
<td>vasprintf</td>
<td>654</td>
</tr>
<tr>
<td>Glibc Extensions to <code>&lt;stdlib.h&gt;</code></td>
<td>655</td>
</tr>
<tr>
<td>canonicalize_file_name</td>
<td>655</td>
</tr>
<tr>
<td>cfree</td>
<td>655</td>
</tr>
<tr>
<td>clearenv</td>
<td>655</td>
</tr>
<tr>
<td>drand48_r</td>
<td>656</td>
</tr>
<tr>
<td>ecvt_r</td>
<td>656</td>
</tr>
<tr>
<td>erand48_r</td>
<td>656</td>
</tr>
<tr>
<td>fcvt_r</td>
<td>656</td>
</tr>
<tr>
<td>fcvt_r</td>
<td>656</td>
</tr>
<tr>
<td>getloadavg</td>
<td>657</td>
</tr>
<tr>
<td>getpt</td>
<td>657</td>
</tr>
<tr>
<td>initstate_r</td>
<td>658</td>
</tr>
<tr>
<td>jrand48_r</td>
<td>658</td>
</tr>
<tr>
<td>lcong48_r</td>
<td>659</td>
</tr>
<tr>
<td>lrand48_r</td>
<td>659</td>
</tr>
<tr>
<td>mkostemp</td>
<td>659</td>
</tr>
<tr>
<td>mkostems</td>
<td>660</td>
</tr>
<tr>
<td>mkstems</td>
<td>660</td>
</tr>
<tr>
<td>mrand48_r</td>
<td>660</td>
</tr>
</tbody>
</table>
12.69.18 nrand48_r ................................................. 661
12.69.19 on_exit ................................................. 661
12.69.20 ptsname_r .............................................. 661
12.69.21 qecvt ..................................................... 662
12.69.22 qecvt_r ................................................... 662
12.69.23 qfcvt ...................................................... 663
12.69.24 qfcvt_r .................................................... 663
12.69.25 qgcvt ....................................................... 663
12.69.26 qsort_r .................................................... 664
12.69.27 random_r ............................................... 664
12.69.28 rmatch .................................................... 664
12.69.29 secure_getenv .......................................... 665
12.69.30 seed48_r .................................................. 665
12.69.31 setstate_r ............................................... 665
12.69.32 srand48_r ................................................. 666
12.69.33 srandom_r ............................................... 666
12.69.34 strtod_l .................................................. 666
12.69.35 strtof_l .................................................. 666
12.69.36 strtol_l ................................................... 667
12.69.37 strtold_l ................................................. 667
12.69.38 strtoll_l .................................................. 667
12.69.39 strtoq ..................................................... 667
12.69.40 strtu1_l ................................................... 668
12.69.41 strtu3_l ................................................... 668
12.69.42 strtuq ..................................................... 668
12.69.43 valloc .................................................... 668
12.70 Glibc Extensions to <string.h> .................................. 669
12.70.1 explicit_bzero ........................................... 669
12.70.2 ffsl ......................................................... 669
12.70.3 ffssl ....................................................... 669
12.70.4 memfrob .................................................... 670
12.70.5 memmem ..................................................... 670
12.70.6 mempcpy .................................................... 671
12.70.7 memrchr .................................................... 671
12.70.8 rawmemchr .................................................. 671
12.70.9 sigabbrev_np ............................................ 672
12.70.10 sigdescr_np ............................................. 672
12.70.11 strcasestr ............................................... 672
12.70.12 strchrnul ................................................ 673
12.70.13 strerrordesc_np ....................................... 673
12.70.14 strerrorname_np ....................................... 673
12.70.15 strfry ..................................................... 674
12.70.16 strsep ..................................................... 674
12.70.17 strverscmp .............................................. 674
12.71 Glibc <sys/auxv.h> ........................................... 675
12.71.1 getauxval ................................................ 675
12.72 Glibc <sys/capability.h> ....................................... 675
12.72.1 capget .................................................... 675
12.72.2 capset........................................... 675
12.73 Glibc <sys/epoll.h>........................................ 675
12.73.1 epoll_create........................................ 676
12.73.2 epoll_create1.................................. 676
12.73.3 epoll_ctl...................................... 676
12.73.4 epoll_pwait.................................. 676
12.73.5 epoll_wait.................................... 677
12.74 Glibc <sys/eventfd.h>........................................ 677
12.74.1 eventfd........................................ 677
12.74.2 eventfd_read.................................. 677
12.74.3 eventfd_write................................. 678
12.75 Glibc <sys/fanotify.h>........................................ 678
12.75.1 fanotify_init.................................. 678
12.75.2 fanotify_mark................................ 678
12.76 Glibc <sys/file.h>........................................ 678
12.76.1 flock........................................ 678
12.77 Glibc <sys/fsuid.h>........................................ 679
12.77.1 setfsuid...................................... 679
12.77.2 setfsuid...................................... 679
12.78 Glibc <sys/gmon.h>........................................ 679
12.78.1 monstartup.................................. 679
12.79 Glibc <sys/inotify.h>........................................ 680
12.79.1 inotify_add_watch................................. 680
12.79.2 inotify_init.................................. 680
12.79.3 inotify_init1................................ 680
12.79.4 inotify_rm_watch............................... 680
12.80 Glibc <sys/io.h>, <sys/perm.h>..................... 681
12.80.1 ioperm........................................ 681
12.80.2 iopl........................................ 681
12.81 Glibc <sys/kdaemon.h>........................................ 681
12.81.1 bdflush........................................ 681
12.82 Glibc <sys/klog.h>........................................ 682
12.82.1 klogctl........................................ 682
12.83 Glibc Extensions to <sys/mman.h>.................. 682
12.83.1 madvise........................................ 682
12.83.2 memfd_create.................................. 682
12.83.3 mincore........................................ 683
12.83.4 mlock2........................................ 683
12.83.5 mremap........................................ 683
12.83.6 pkey_alloc.................................. 683
12.83.7 pkey_free.................................... 684
12.83.8 pkey_get...................................... 684
12.83.9 pkey_mprotect................................. 684
12.83.10 pkey_set.................................... 685
12.83.11 remap_file_pages............................ 685
12.84 Glibc <sys/mount.h>........................................ 685
12.84.1 mount........................................ 685
12.84.2 umount....................................... 685
12.84.3 umount2 ........................................... 686
12.85 Glibc <sys/personality.h> .............................. 686
12.85.1 personality ........................................ 686
12.86 Glibc <sys/prctl.h> .................................... 686
12.86.1 prctl ................................................ 686
12.87 Glibc <sys/profile.h> .................................... 686
12.87.1 sprofile ........................................... 687
12.88 Glibc <sys/ptrace.h> .................................... 687
12.88.1 trace ............................................... 687
12.89 Glibc <sys/quota.h> ..................................... 687
12.89.1 quotactl ........................................... 687
12.90 Glibc <sys/random.h> .................................... 687
12.90.1 getentropy ......................................... 687
12.90.2 getrandom ......................................... 688
12.91 Glibc <sys/reboot.h> .................................... 689
12.91.1 reboot .............................................. 689
12.92 Glibc Extensions to <sys/resource.h> .................... 689
12.92.1 prlimit ............................................. 689
12.93 Glibc Extensions to <sys/sem.h> .......................... 689
12.93.1 semtimedop ......................................... 689
12.94 Glibc <sys/sendfile.h> .................................. 689
12.94.1 sendfile ............................................ 690
12.95 Glibc <sys/signalfd.h> .................................. 690
12.95.1 signalfd ........................................... 690
12.96 Glibc <sys/single threaded.h> .......................... 690
12.96.1 __libc_single_threaded .............................. 690
12.97 Glibc Extensions to <sys/socket.h> ....................... 691
12.97.1 accept4 ............................................. 691
12.97.2 isfdtype .......................................... 691
12.97.3 recvmsg .......................................... 691
12.97.4 sendmsg .......................................... 691
12.98 Glibc Extensions to <sys/stat.h> ......................... 692
12.98.1 getumask ........................................... 692
12.98.2 lchmgd ............................................. 692
12.98.3 lstatx ............................................... 692
12.99 Glibc <sys/statfs.h> .................................... 693
12.99.1 fstatfs ............................................ 693
12.99.2 statfs ............................................. 693
12.100 Glibc <sys/swap.h> .................................... 693
12.100.1 swapoff ........................................... 693
12.100.2 swapon ............................................ 694
12.101 Glibc <sys/sysctl.h> ................................... 694
12.101.1 sysctl ............................................ 694
12.102 Glibc <sys/sysinfo.h> .................................. 694
12.102.1 get_avphys_pages ................................... 694
12.102.2 get_nprocs ........................................ 694
12.102.3 get_nprocs_conf .................................... 695
12.102.4 get phys_pages .................................... 695
12.102.5 sysinfo ............................................. 695
12.103  Glibc <sys/syslog.h> .................................. 696
        vsyslog ............................................. 696
12.104  Glibc <sys/xattr.h> ................................ 696
        12.104.1 gnu_dev_major ............................... 696
        12.104.2 gnu_dev_makedev ............................ 696
        12.104.3 gnu_dev_minor ............................... 697
12.105  Glibc Extensions to <sys/time.h> ...................... 697
        12.105.1 adjtime ....................................... 697
        12.105.2 futimes ....................................... 698
        12.105.3 futimesat ..................................... 698
        12.105.4 lutimes ....................................... 698
        12.105.5 settimeofday ................................. 699
12.106  Glibc <sys/timerfd.h> ................................ 699
        12.106.1 timerfd_create ............................... 699
        12.106.2 timerfd_gettime .............................. 699
        12.106.3 timerfd_settime .............................. 699
12.107  Glibc <sys/timex.h> .................................. 700
        12.107.1 adjtimex ..................................... 700
        12.107.2 ntp_adjtime .................................. 700
        12.107.3 ntp_gettime .................................. 700
        12.107.4 ntp_gettimex ................................. 701
12.108  Glibc Extensions to <sys/uio.h> ....................... 701
        12.108.1 preadv ....................................... 701
        12.108.2 preadv2 ...................................... 701
        12.108.3 process_vm_readv ............................. 702
        12.108.4 process_vm_writev ............................ 702
        12.108.5 pwritev ...................................... 702
        12.108.6 pwritev2 .................................... 702
12.109  Glibc <sys/ustat.h> .................................. 703
        12.109.1 ustat ......................................... 703
12.110  Glibc <sys/vlimit.h> .................................. 703
        12.110.1 vlimit ....................................... 703
12.111  Glibc Extensions to <sys/wait.h> ...................... 703
        12.111.1 wait3 ........................................ 703
        12.111.2 wait4 ........................................ 704
12.112  Glibc <sys/xattr.h> .................................. 704
        12.112.1 fgetxattr .................................... 704
        12.112.2 flistxattr .................................... 704
        12.112.3 fremovexattr .................................. 705
        12.112.4 fsetxattr .................................... 705
        12.112.5 getxattr ...................................... 705
        12.112.6 lgetxattr ..................................... 705
        12.112.7 listxattr ..................................... 706
        12.112.8 llistxattr .................................... 706
        12.112.9 lremovexattr .................................. 706
        12.112.10 lsetxattr .................................... 706
        12.112.11 removexattr .................................. 707
12.112.12 setxattr ........................................ 707
12.113  Glibc Extensions to <termios.h> ..................... 707
  12.113.1 cfmakeraw .................................. 707
  12.113.2 cfsetspeed ................................ 707
12.114  Glibc Extensions to <time.h> ........................ 708
  12.114.1 clock_adjtime ................................ 708
  12.114.2 dsize ........................................ 708
  12.114.3 getdate_r .................................... 708
  12.114.4 strftime ..................................... 709
  12.114.5 strftime ..................................... 709
  12.114.6 timelm ....................................... 709
  12.114.7 timelocal .................................... 709
  12.114.8 timespec_get ................................. 710
12.115  Glibc <ttyent.h> ................................ 710
  12.115.1 endttyent .................................... 710
  12.115.2 getttyent ..................................... 710
  12.115.3 getttyname ................................... 710
  12.115.4 setttyent ..................................... 711
12.116  Glibc Extensions to <unistd.h> ....................... 711
  12.116.1 _Fork ........................................ 711
  12.116.2 acct .......................................... 711
  12.116.3 brk .......................................... 711
  12.116.4 chroot ........................................ 712
  12.116.5 closefrom .................................... 712
  12.116.6 copy_file_range ............................... 712
  12.116.7 daemon ........................................ 713
  12.116.8 dup3 .......................................... 713
  12.116.9 eaccess ...................................... 713
  12.116.10 endusershell .................................. 713
  12.116.11 euidaccess ................................... 714
  12.116.12 execveat ..................................... 714
  12.116.13 execve ....................................... 714
  12.116.14 get_current_dir_name ......................... 715
  12.116.15 getdomainname ............................... 715
  12.116.16 getdtablesize ................................ 715
  12.116.17 getpagesize .................................. 716
  12.116.18 getpass ....................................... 716
  12.116.19 getresgid .................................... 717
  12.116.20 getresuid .................................... 717
  12.116.21 gettid ........................................ 717
  12.116.22 getusershell .................................. 717
  12.116.23 group_member .................................. 718
  12.116.24 pipe2 ......................................... 718
  12.116.25 prof1 ......................................... 718
  12.116.26 revoke ........................................ 718
  12.116.27 sbrk .......................................... 719
  12.116.28 setlogin ...................................... 719
  12.116.29 setdomainname ................................ 719
12.117 Glibc <utmp.h> .................................................. 722
  12.117.1 endutent .................................................. 722
  12.117.2 getutent ................................................... 722
  12.117.3 getutent_r ................................................. 723
  12.117.4 getutid .................................................... 723
  12.117.5 getutid_r .................................................. 723
  12.117.6 getutline .................................................. 724
  12.117.7 getutline_r ................................................ 724
  12.117.8 pututline .................................................. 724
  12.117.9 setutent ................................................... 724
  12.117.10 updtmp .................................................... 725
  12.117.11 utmpname .................................................. 725
  12.117.12 login ..................................................... 725
  12.117.13 login_tty ................................................. 726
12.118 Glibc Extensions to <utmpx.h> .................................. 726
  12.118.1 getutmp .................................................... 726
  12.118.2 getutmpx ................................................... 727
  12.118.3 updtmpx .................................................... 727
  12.118.4 utmpxname .................................................. 727
12.119 Glibc Extensions to <wchar.h> ................................... 727
  12.119.1 fgetwc_unlocked .......................................... 727
  12.119.2 fgetws_unlocked .......................................... 728
  12.119.3 fputwc_unlocked .......................................... 728
  12.119.4 fputws_unlocked .......................................... 729
  12.119.5 getwc_unlocked ........................................... 729
  12.119.6 getwchar_unlocked ....................................... 729
  12.119.7 putwc_unlocked ........................................... 730
  12.119.8 putwchar_unlocked ....................................... 730
  12.119.9 wcshrnul ................................................... 731
  12.119.10 wcsftime_l .............................................. 731
  12.119.11 wcstod_l .................................................. 731
  12.119.12 wcstol_l .................................................. 731
  12.119.13 wcstold_l ................................................ 732
  12.119.14 wcstold_l ................................................ 732
  12.119.15 wcstoll_l ................................................. 732
  12.119.16 wcstq ..................................................... 732
  12.119.17 wcstoul_l ................................................ 733
  12.119.18 wcstoull_l ............................................... 733
  12.119.19 wcstouq ................................................... 733
13 Native Windows Support ..................... 735
  13.1 Libtool and Windows ....................... 735
  13.2 Large File Support ......................... 735
  13.3 Inode numbers on Windows ................... 735
  13.4 Precise file timestamps on Windows ........... 735
  13.5 Avoiding the year 2038 problem ............... 736
  13.6 Windows sockets ............................. 736
    13.6.1 Getaddrinfo and WINVER .................... 736
  13.7 Native Windows Support without MSVC Support ... 736
  13.8 Visual Studio Compatibility .................... 736

14 Multithreading ............................... 738
  14.1 The three multithreading APIs .................. 738
  14.2 Choosing the right multithreading API .......... 739
  14.3 The POSIX multithreading API ................... 739
  14.4 The ISO C multithreading API ................... 740
  14.5 The GnuLib multithreading API .................. 740
  14.6 Optimizations of multithreaded code .............. 741

15 Particular Modules ......................... 743
  15.1 alloca ........................................ 743
  15.2 alloca-opt .................................... 743
  15.3 Safe Allocation Macros ....................... 744
  15.4 Attributes .................................... 745
  15.5 Compile-time Assertions ....................... 745
  15.6 Non-returning Functions ....................... 747
  15.7 Integer Properties ............................ 747
    15.7.1 Arithmetic Type Properties ................ 748
    15.7.2 Integer Bounds ............................ 749
    15.7.3 Checking Integer Overflow .................. 749
    15.7.4 Wraparound Arithmetic with Integers .......... 751
    15.7.5 Integer Type Overflow ....................... 752
    15.7.6 Integer Range Overflow ...................... 753
  15.8 Static inline functions ....................... 755
  15.9 Extern inline functions ....................... 755
  15.10 Handling closed standard file descriptors ....... 756
  15.11 Container data types .......................... 759
    15.11.1 Ordinary container data types .............. 759
    15.11.2 Specialized container data types ............ 763
  15.12 Character and String Functions in C Locale .... 763
    15.12.1 c-type .................................... 764
    15.12.2 c-strcase ................................ 764
    15.12.3 c-strcaseeq ................................ 764
    15.12.4 c-strcasestr ................................ 765
    15.12.5 c-strstr .................................. 765
Regular expressions ........................................ 776
16.1 Overview ............................................. 776
16.2 Regular Expression Syntax ............................ 776
16.2.1 Syntax Bits ...................................... 777
16.2.2 Predefined Syntaxes .............................. 779
16.2.3 Collating Elements vs. Characters ............ 781
16.2.4 The Backslash Character ......................... 781
16.3 Common Operators ......................................
16.3.1 The Match-self Operator (ordinary character) .. 782
16.3.2 The Match-any-character Operator (.) .......... 782
16.3.3 The Concatenation Operator ....................... 782
16.3.4 Repetition Operators .............................. 783
16.3.4.1 The Match-zero-or-more Operator (*) .... 783
16.3.4.2 The Match-one-or-more Operator (+ or \+) .. 783
16.3.4.3 The Match-zero-or-one Operator (? or \?) .. 783
16.3.4.4 Interval Operators (\{ . . \} or \{ . . \}) .... 784
16.3.5 The Alternation Operator (| or \|) ............ 784
16.3.6 List Operators (\[ . . \] and \[ . . \]) .......... 785
16.3.6.1 Collating Symbol Operators (\[ . . \]) .... 786
16.3.6.2 Equivalence Class Operators (\[ . . \]) .... 786
16.3.6.3 Character Class Operators (\[ : \] ) ...... 786
16.3.6.4 The Range Operator (\( ) ................. 787
16.3.7 Grouping Operators (\( . . \)) or \( . . \) ....... 787
16.3.8 The Back-reference Operator (\digit{ }) ........ 788
16.3.9 Anchoring Operators .......................... 789
16.3.9.1 The Match-beginning-of-line Operator (\( ) .... 789
16.3.9.2 The Match-end-of-line Operator (\$) ....... 789
16.4 GNU Operators ......................................... 790
16.4.1 Word Operators .................................. 790
16.4.1.1 Non-Emacs Syntax Tables ..................... 790
16.4.1.2 The Match-word-boundary Operator (\b) .. 790
16.4.1.3 The Match-within-word Operator (\B) ....... 790
16.4.1.4 The Match-beginning-of-word Operator (\<& .... 790
16.4.1.5 The Match-end-of-word Operator (\>& ....... 790
16.4.1.6 The Match-word-constituent Operator (\w) ... 790
16.4.1.7 The Match-non-word-constituent Operator (\W) ... 790
16.4.2 Buffer Operators .............................................. 790
  16.4.2.1 The Match-beginning-of-buffer Operator (\`) ............ 791
  16.4.2.2 The Match-end-of-buffer Operator (\') .................. 791
16.5 GNU Emacs Operators .......................................... 791
  16.5.1 Syntactic Class Operators ................................. 791
    16.5.1.1 Emacs Syntax Tables .................................. 791
    16.5.1.2 The Match-syntactic-class Operator (\class) .......... 791
    16.5.1.3 The Match-not-syntactic-class Operator (\Sclass) .... 791
16.6 What Gets Matched? ........................................... 791
16.7 Programming with Regex ........................................ 792
  16.7.1 GNU Regex Functions ....................................... 792
    16.7.1.1 GNU Pattern Buffers .................................. 792
    16.7.1.2 GNU Regular Expression Compiling ...................... 792
    16.7.1.3 GNU Matching ......................................... 793
    16.7.1.4 GNU Searching ......................................... 794
    16.7.1.5 Matching and Searching with Split Data ............... 794
    16.7.1.6 Searching with Fastmaps .............................. 795
    16.7.1.7 GNU Translate Tables .................................. 796
    16.7.1.8 Using Registers ....................................... 796
    16.7.1.9 Freeing GNU Pattern Buffers ........................... 798
  16.7.2 BSD Regex Functions ....................................... 799
    16.7.2.1 BSD Regular Expression Compiling ...................... 799
    16.7.2.2 BSD Searching ......................................... 800
16.8 Regular expression syntaxes .................................. 800
  16.8.1 ‘awk’ regular expression syntax ........................... 800
  16.8.2 ‘egrep’ regular expression syntax ........................ 800
  16.8.3 ‘ed’ regular expression syntax ............................ 801
  16.8.4 ‘emacs’ regular expression syntax ........................ 802
  16.8.5 ‘gnu-awk’ regular expression syntax ........................ 803
  16.8.6 ‘grep’ regular expression syntax .......................... 804
  16.8.7 ‘posix-awk’ regular expression syntax ..................... 806
  16.8.8 ‘posix-basic’ regular expression syntax ................... 806
  16.8.9 ‘posix-egrep’ regular expression syntax ................... 806
  16.8.10 ‘posix-extended’ regular expression syntax .............. 807
  16.8.11 ‘posix-minimal-basic’ regular expression syntax ........ 808
  16.8.12 ‘sed’ regular expression syntax .......................... 808

17 Build Infrastructure Modules ....................... 809
  17.1 Searching for Libraries ................................. 809
  Simple Library Tests ........................................... 809
  Locating Libraries .............................................. 809
    Example of using AC_LIB_LINKFLAGS .......................... 810
    Dependencies ................................................... 810
  Static vs. shared .............................................. 811
  CPPFLAGS vs. LDFLAGS ........................................... 811
    Bi-arch systems ............................................... 811
  17.2 Controlling the Exported Symbols of Shared Libraries ...... 812
  17.3 LD Version Scripts .......................................... 814
17.4 configmake ........................................ 815
17.5 warnings ........................................ 815
17.6 manywarnings .................................... 816
17.7 Running self-tests under valgrind .................. 816
  17.7.1 Using valgrind without developer intervention ..... 817
  17.7.2 Valgrind options ............................... 817
  17.7.3 Using valgrind at the developer's discretion ...... 818
  17.7.4 How to use Valgrind with shell scripts ............ 818
17.8 VCS To ChangeLog .................................. 818

18 Build Infrastructure Files ............................. 820
  18.1 Recognizing platforms ............................. 820
  18.2 Utilities for Makefiles ............................. 820
  18.3 Programs for developing in Git checkouts .......... 821
  18.4 Utilities for building documentation ............... 822
  18.5 Utilities for building libraries ................... 822
  18.6 Utilities for running test suites .................. 822

19 Release Management Files ............................. 823
  19.1 Tools for releasing packages with shared libraries ... 823
  19.2 Tools for uploading release tarballs ............... 823

Appendix A GNU Free Documentation License ... 824

Index .................................................. 832
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 advise 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):

```lisp
;; In Gnulib, indent with spaces everywhere (not TABs).
```

""
Chapter 1: Brief Overview

### Exceptions: Makefile and ChangeLog modes.

```lisp
(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” checkbox.
  2. Under “C/C++ | Code Style”, select a code style profile that has the “Indentation | 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 documentation 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](https://www.gnu.org/prep/standards).
• 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 9.

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>, <stdbool.h>, <stddef.h>, and <stdint.h> unconditionally. 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 declarations after a statement, or as the first clause in a `for` statement.
- `long long int`.
- `<stdbool.h>`, assuming the `stdbool` module is used. See Section 8.46 [stdbool.h], page 62.
- `<stdint.h>`, assuming the `stdint` module is used. See Section 8.48 [stdint.h], page 63.
- Compound literals and designated initializers.
- Variadic macros.
- `static inline` functions.
- `__func__`, assuming the `func` module is used. See Section 15.20 [func], page 774.
- 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 15.9 [extern inline], page 755.
- 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 15.7 [Integer Properties], page 747.

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 + I * sizeof *P).` Similar arithmetic can be done with `intptr_t`, although more care must be taken in case of integer overflow or negative integers.
Chapter 1: Brief Overview

- A pointer $P$ has alignment $A$ if and only if $(\text{uintptr}_t)P \% A$ is zero, and similarly for $\text{intptr}_t$.
- 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, $0 + (\text{char } *) \text{NULL} == (\text{char } *) \text{NULL}$.

Some system platforms violate these assumptions and are therefore not Gnulib porting targets. See Section 2.4.3 [Unsupported Platforms], page 10.

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. All experimental work should be done on branches to help promote this.

When compiling and testing Gnulib and Gnulib-using programs, certain compiler options can help improve reliability. The manywarnings module enables several forms of static checking in GCC and related compilers (see Section 17.6 [manywarnings], page 816). For dynamic checking, you can run configure with CFLAGS options appropriate for your compiler. For example:

```
./configure \n  CFLAGS='\-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.
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 \texttt{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 2020, 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.
- Mac OS X. In versions 10.13, it’s occasionally tested. In version 10.5, it’s rarely tested.
- FreeBSD 11.0 or newer is occasionally tested.
- OpenBSD 6.1 or newer is occasionally tested.
- NetBSD 7.0 or newer is occasionally tested.
- AIX 7.1 is occasionally tested.
- Solaris 10 and 11 are occasionally tested. Solaris 9 is rarely tested and low priority.
- Cygwin 2.9 is occasionally tested. Cygwin 1.7.x is rarely tested.
- mingw is occasionally tested. But note that some modules are currently unsupported on mingw: \texttt{mgetgroups}, \texttt{getugroups}, \texttt{idcache}, \texttt{userspec}, \texttt{openpty}, \texttt{login_tty}, \texttt{forkpty}, \texttt{pt_chown}, \texttt{grantpt}, \texttt{pty}, \texttt{savewd}, \texttt{mkancesdirs}, \texttt{mkdir-p}, \texttt{euidaccess}, \texttt{faccessat}. The versions of Windows that are supported are Windows XP and newer. Only the latest version of mingw is tested; older versions are not supported.
• GNU Hurd 0.7 is rarely tested.
• Native Windows, with MSVC as compiler, is rarely tested and low priority. The versions of MSVC that are supported are MSVC 14 (Visual Studio 2015) or newer. Furthermore only “release” builds (compiler option ‘-MD’) are supported, not “debug” builds (compiler option ‘-MDd’).
• musl libc is rarely tested.
• Minix 3.3.0 is rarely tested.
• IRIX 6.5 is very rarely 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 4 and older.
• HP-UX 11.31.
• 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.
Chapter 2: Philosophy

- 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 ones’-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; `gnumlib-tool` copies these files. It contains the module’s dependencies; `gnumlib-tool` installs them as well. It also contains the autoconf macro invocation (usually a single line or nothing at all); `gnumlib-tool` ensures this is invoked from the package’s `configure.ac` file. And also a `Makefile.am` snippet; `gnumlib-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

```c
#if !HAVE_WORKING_FOO
#define foo rpl_foo
#endif
```

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 stdbool.h or 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:

Copyright © 2004–20YY Free Software Foundation, Inc.

Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.3 or any later version published by the Free Software Foundation; with no Invariant Sections, no Front-Cover Texts, and no Back-Cover Texts. A copy of the license is at https://www.gnu.org/licenses/fdl-1.3.en.html.

If you want to use some Gnulib modules under LGPL, you can do so by passing the option ‘--lgpl’ to gnulib-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 gnulib-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 \texttt{gnulib-tool}.

This is achieved by the `--local-dir` option of \texttt{gnulib-tool} (see Chapter 5 [Extending Gnulib], page 39).
3 Invoking gnulib-tool

The gnulib-tool command is the recommended way to import Gnilib modules. It is possible to borrow Gnilib 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.ams and configure.ac in packages incorporating Gnilib 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 Gnilib 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 Gnilib 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 Gnilib 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 22.
• If you are looking for a particular POSIX header or function replacement, look in the chapters Chapter 8 [Header File Substitutes], page 47, and Chapter 9 [Function Substitutes], page 78. For headers and functions that are provided by Glibc but not standardized by POSIX, look in the chapters Chapter 11 [Glibc Header File Substitutes], page 475, and Chapter 12 [Glibc Function Substitutes], page 487.
• If you have already found the source file in Gnilib and are looking for the module that contains this source file, you can use the command ‘gnulib-tool --find filename’.

3.2 Initial import

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

Gnilib 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 21).

Unless you use gnulib-tool’s --gnu-make option, Gnilib also assumes that your project uses Automake at least in a subdirectory of your project. While the use of Automake in
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/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 pre-existing 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 Gnulib’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:

```plaintext
... # 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:

```plaintext
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:

```plaintext
SUBDIRS = lib
```

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

```plaintext
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:

```plaintext
... 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
Chapter 3: Invoking gnulib-tool

lib/libgnu.a. This is because your AC_LIBOBJ and AC_REPLACE_FUNCS invocations from configure.ac augment a variable @LIBOBJ@ (and/or @LTLIBOBJS@ if using Libtool), whereas lib/libgnu.a is built from the contents of a different variable, usually @gl_LIBOBJ@ (or @gl_LTLIBOBJ@ 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.
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 16, 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 9 [Function Substitutes], page 78. 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 Gnulib module ‘posixcheck’ from the Gnulib imports, and run `make distclean`.

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

In some cases, you may want to set additional compiler options for use within the Gnulib 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

```
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 Gnulib], page 39.
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 29). 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 \
```
Chapter 3: Invoking gnulib-tool

```
--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 29, 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 16, 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 16, 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$(top_builddir)/gnulib -I$(top_srcdir)/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/. 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 bootstrap 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).
2. Invoke `gnulib-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 (`gnulib`'s `bootstrap` script follows these rules):

1. When a script of yours runs `autopoint`, invoke `gnulib-tool` afterwards.
2. When you invoke `autoreconf` after `gnulib-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 Gnulib’s own message translations

Gnulib provides some functions that emit translatable messages using GNU `gettext`. The ‘gnulib’ domain at the Translation Project ([https://translationproject.org/](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 Gnulib 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 Gnulib 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 Gnulib 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 `--po-base=directory` and `--po-domain=domain` options to `gnulib-tool`, then `gnulib-tool` will create a separate directory with its own `POTFILES.in`, and fetch current translations directly from the Translation Project (using `rsync` or `wget`, whichever is available). The POT file in this directory will be called `domain-gnulib.pot`, depending on the `domain` you gave to the `--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 Gnulib. When you use these options, the functions in Gnulib 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 Gnulib code—add an extra line to the part of the program that initializes locale-dependent behavior. Where you would normally write something like:

```c
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:

```c
bindtextdomain (PACKAGE "-gnulib", 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 20, 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 Gnlib is used. Also it does not report in the ChangeLogs the files that it had to add because they were missing.

Gnulib includes the file build-aux/bootstrap to aid a developer in using this setup. You would copy this file and add it to your project’s VCS. It can be customized using bootstrap.conf which is also put under VCS in your project. Read the script for further information, and look at how other projects are using it (see links in [https://git.savannah.gnu.org/gitweb/?p=gnulib.git;a=blob;f=users.txt;hb=HEAD](https://git.savannah.gnu.org/gitweb/?p=gnulib.git;a=blob;f=users.txt;hb=HEAD)).

In projects that use git for version control, it is possible to use a git submodule containing the precise commit of the gnulib repository, so that each developer running bootstrap will get the same version of all gnulib-provided files. The location of the
Chapter 3: Invoking gnulib-tool

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, `bootstrap` 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
```

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 39), 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:

```
#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:

```
#ifdef __cplusplus
extern "C"
```
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.’
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

\[
\text{lib_SOURCES += foo.c}
\]

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 gnuib-tool can remove duplicates when presenting a summary to the user. Example:

\[
\text{$(POW_LIBM)}
\]

\[
\text{$(LTLIBICONV) when linking with libtool, $(LIBICONV) otherwise}
\]

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 14, 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

```makefile
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
- 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 gnu libtool 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.in.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. Gнулib 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);
```

Gнулib 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:

```
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 GnuLib’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 gnu-lib-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. gnu-lib-tool has support for these techniques in the situation of --create-testdir --single-configure, which basically has two gnu-lib-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 glib?”

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 glib.

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 glib.

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 GnuLib 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 gnu-lib

The function definitions provided by GnuLib (.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 GnuLib or by the system are declared as `extern "C"'.

It is also possible to indicate to GnuLib 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

```c
#define GNULIB_NAMESPACE gnulib
```
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/`). 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:

@node GNU Free Documentation License
@appendix GNU Free Documentation License
@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 Gnu Lib’s DEPENDENCIES file.

2. Obtain Gnulib

See https://www.gnu.org/software/gnulib/ for how to get the current Gnu Lib 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 \
--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 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>.

8.1 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.

8.2 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.

8.3 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 platforms static_assert and _Static_assert do 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 C2x and C++17.

• Even-older platforms do not support static_assert or _Static_assert at all. For example, GCC versions before 4.6 do not support _Static_assert, and G++ versions before 4.3 do not support static_assert, which was standardized by C11 and C++11.
Portability problems not fixed by Gnulib:

- C _Static_assert and C++ static_assert are keywords that can be used without including <assert.h>. The Gnulib substitutes are macros that require including <assert.h>.
- The C static_assert and _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 C99 and later, assert can be applied to any scalar expression. In C89, the argument to assert is of type int.

8.4 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.

8.5 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.

8.6 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:

8.7 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.

8.8 `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.

8.9 `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 `ENOMEM`, `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`, `EADDRINUSE`, `EADDRNOTAVAIL`, `ENETDOWN`, `ENETUNREACH`, `ECONNRESET`, `ENOBUFFS`, `EISCONN`, `ENOTCONN`, `ETIMEDOUT`, `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:

### 8.10 `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. 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 chmod 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.
• `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.
• ‘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:

8.11 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.

8.12 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 in incorrect on some platforms: glibc 2.7 on Linux/SPARC64.
• The values of DBL_* 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.

### 8.13 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.

### 8.14 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:

### 8.15 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.

### 8.16 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.

Portability problems not fixed by Gnulib:
8.17 grp.h  
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/grp.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.

8.18 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.

8.19 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:

8.20 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.
8.21 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:

8.22 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.

8.23 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 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.

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.
- The macro `SSIZE_MAX` is not defined on some platforms: MSVC 14.

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.

### 8.24 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:

### 8.25 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` in 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 2017.
• The macros \texttt{NAN}, \texttt{HUGE\_VALL}, and \texttt{INFINITY} are not defined on some platforms: OpenVMS.

Portability problems not fixed by Gnulib:

• \texttt{NAN} is not a compile time constant with some compilers: OpenVMS.

• The macro or variable \texttt{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.

8.26 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.

8.27 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.

8.28 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.
8.29 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 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:
- This header file is missing on some platforms: mingw, MSVC 14.

8.30 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:

8.31 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:

8.32 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.
8.33 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.

8.34 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:

8.35 pthread.h

POSIX specification:
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.

8.36 pwd.h

POSIX specification:
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.
8.37 regex.h

POSIX specification:
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.

8.38 sched.h

POSIX specification:
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:

8.39 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.

8.40 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.
8.41 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:

8.42 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.

8.43 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:
8.44 stdalign.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 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: stdalign

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, mingw, MSVC 14, Android 9.0.
- Clang 3.0’s <stdalign.h> does not define alignof/_Alignof.
- The alignof and _Alignof macros return too large values for the types double and long long in GCC 4.7.0.

Portability problems not fixed by Gnulib:
- In ISO C11, the operand of alignof/_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/_Alignof cannot be a structure type containing a flexible array member.
- _Alignas and alignas are not always supported; on platforms lacking support, the macro __alignas_is_defined is not defined. Supported compilers include GCC, IBM C, Sun C 5.9 and later, and MSVC 7.0 and later.
- Some compilers do not support alignment via alignas/_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/alignas that are greater than 8: mingw.
- Some compilers require the operand of _Alignas/alignas to be a single integer constant, not an expression: MSVC 7.0 through at least 10.0.
- The Sun C 5.13 compiler sometimes mishandles the alignment of multiple external variables that are declared close together with _Alignas/alignas. The Sun Studio Developer Bug Report Review Team assigned the internal review ID 2125432 (dated 2011-11-01) to this issue. The bug appears to be fixed in Sun C 5.15, also known as Oracle Developer Studio 12.6.
- <stdalign.h> must be #included before _Alignas and _Alignof can be used.
- You cannot assume that _Alignas and _Alignof are reserved words; they might be macros.

8.45 stdarg.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/standarg.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:

### 8.46 stdbool.h

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

**Gnulib module:** stdbool

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.
- You cannot assume that `_Bool` is a typedef; it might 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.

### 8.47 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 `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 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 `[]`.

8.48 stdint.h

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/stdint.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 `WINT_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 \texttt{LONG\_MAX < LLONG\_MAX} at \texttt{configure\_time} rather than at \texttt{#if\_time}.

The \texttt{stdint} module uses \texttt{#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 \n    sed -e s/include\_next/include/ gl/stdint\_h > idn\_int\_h; \n  else \n    echo '#include <stdint\_h>' > idn\_int\_h; \n  fi
```

### 8.49 stdio.h

POSIX specification: 

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

Gnulib module: stdio

Portability problems fixed by Gnulib:

- The type \texttt{off\_t} is missing on some platforms: glibc 2.8, eglibc 2.11.2 and others.
- The type \texttt{ssize\_t} is missing on some platforms: glibc 2.8, Mac OS X 10.5, Solaris 10, MSVC 14, and others.
- The type \texttt{va\_list} is missing on some platforms: glibc 2.8, OpenBSD 4.0, Solaris 11.4, and others.
- Some platforms provide a \texttt{NULL} macro that cannot be used in arbitrary expressions: 
  NetBSD 5.0

Portability problems not fixed by Gnulib:

### 8.50 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 \texttt{EXIT\_SUCCESS} and \texttt{EXIT\_FAILURE} are not defined on some platforms.
- Some platforms provide a \texttt{NULL} macro that cannot be used in arbitrary expressions: 
  NetBSD 5.0

Portability problems fixed by the Gnulib module system-posix:

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

- System status macros such as `WEXITSTATUS` require an lvalue argument on some platforms. macOS 11.1.

### 8.51 stdnoretur.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](http://www.open-std.org/jtc1/sc22/wg14/www/docs/n1570.pdf)) sections 7.23.

Gnulib module: stdnoretur

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:

- `<stdnoretur.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 `noretur`) 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, `noretur` expands to the empty token sequence, to avoid problems with standard headers that use `noretur` in combination with `__attribute__` or `__declspec`. Although the resulting code operates correctly, the compiler is not informed whether `noretur` 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 `noretur` before the returned type in a declaration, and therefore rejects valid but unusually-worded declarations such as `void _Noreturn foo (void);`.

### 8.52 string.h

POSIX specification:
[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/string.h.html](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:
8.53 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.

8.54 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.

8.55 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.

8.56 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.
8.57 sys/msg.h

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

8.58 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.

8.59 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:
8.60 sys/sem.h

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

8.61 sys/shm.h

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

8.62 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.
8.63 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 S_ISDOOR, that are not defined on other platforms.
- The functions lstat and mkdir are not declared on some platforms: mingw, MSVC 14.
- The macros UTIME_NOW and UTIME_OMIT are missing on some platforms.
- On some platforms, struct stat does not include st_atim, st_mtim, or st_ctim members. Use the gnulib module 'stat-time' for accessors to portably get at subsecond resolution.

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

Portability problems not fixed by Gnulib:
- See Section 8.78 [time.h], page 74, for general portability problems with the time_t components of struct stat.
- The macro S_IFBLK is missing on some platforms: MSVC 14.
- On OpenVMS, st_ino is an array of three ino_t values, not a single value.
- To partially work around the previous two problems, you can test for nonzero st_ino and use the Gnulib same-inode module to compare nonzero values. For example, 
  SAME_INODE (a, b) is true if the struct stat values a and b are known to represent the same file,  
  (a.st_ino && !SAME_INODE (a, b)) is true if they are known to represent different files, and
  !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 st_dev and st_ino values, even when st_ino is nonzero:
  - GNU/Linux NFS servers that export all local file systems as a single NFS file system, if a local st_dev exceeds 255, or if a local 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 st_mode and 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, `st_size` contains bogus information for symlinks; use the GnuLib module `areadlink-with-size` for a better way to get symlink contents.

8.64 sys/statvfs.h

POSIX specification:
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.

8.65 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.

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.

8.66 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.
8.67 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:

8.68 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.

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.

8.69 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:
8.70 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.

8.71 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:

Portability problems not 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.

8.72 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:

Portability problems not fixed by Gnulib:
- System status macros such as <code>WEXITSTATUS</code> require an lvalue argument on some platforms. macOS 11.1.

8.73 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.
8.74 *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.

8.75 *termios.h*

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

Gnulib module: termios

Portability problems fixed by Gnulib:

Portability problems not 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.

8.76 *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.

8.77 *threads.h*

Defines the multithreading facility of ISO C11.

Gnulib module: threads-h

Portability problems fixed by Gnulib:

Portability problems not 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.
8.78 time.h

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

Gnulib module: time

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.

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.
- On some platforms the tv_nsec member of struct timespec is not of type long, but is of type long long instead: glibc x32

8.79 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.
8.80 uchar.h

Defines the types char16_t, char32_t and declares the functions mbtowc16, wcrtomb, mbtowc32, wcrtomb.

Gnulib module: uchar

Portability problems fixed by Gnulib:
• 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.

Portability problems not fixed by Gnulib:

8.81 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.

8.82 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.

8.83 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:
8.84 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:

8.85 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.

8.86 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’.

8.87 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:

8.88 `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.
9 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>.

9.1 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:

9.2 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:

9.3 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:

9.4 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:
9.5 _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:

9.6 _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:

9.7 _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).

9.8 _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).

### 9.9 `_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.

### 9.10 `_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.

### 9.11 `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.

### 9.12 `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.
9.13 abs

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

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:
• This function is missing on some platforms: Android 4.3.

9.14 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.

9.15 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.

### 9.16 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:

### 9.17 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:

### 9.18 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.
9.19 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.

9.20 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.

9.21 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:

9.22 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:

• 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.

• 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.
9.23 **aio_error**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_error.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, AIX 5.1, 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 files larger than 2 GB. The fix is to use the `AC_SYS_LARGEFILE` macro.

9.24 **aio_fsync**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_fsync.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 6.7, Minix 3.1.8, AIX 5.1, 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 files larger than 2 GB. The fix is to use the `AC_SYS_LARGEFILE` macro.

9.25 **aio_read**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_read.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 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 files larger than 2 GB. The fix is to use the `AC_SYS_LARGEFILE` macro.

9.26 **aio_return**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_return.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, AIX 5.1, 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 files larger than 2 GB. The fix is to use the AC_SYS_LARGEFILE macro.

9.27 aio_suspend

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_suspend.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 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 files larger than 2 GB. The fix is to use the AC_SYS_LARGEFILE macro.

9.28 aio_write

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_write.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 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 files larger than 2 GB. The fix is to use the AC_SYS_LARGEFILE macro.

9.29 alarm

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

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not 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).
9.30 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 sizeof (void *) on some platforms: macOS 11.1, AIX 7.2.

Portability problems not fixed by Gnulib:
• On some platforms, 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 aligned_alloc that do not crash even if the AddressSanitizer bug is present:
• The Gnulib module alignalloc provides a portable function alignalloc that is a near-substitute for glibc aligned_alloc, except that the result must be freed with alignfree rather than plain free.
• 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.

9.31 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 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 void * on some platforms: AIX 5.1.

9.32 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 may overflow its internal buffer if an invalid year is passed.
9.33 asctime_r

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/asctime_r.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: mingw, MSVC 14.
• This function may put more than 26 bytes into the argument buffer if an invalid year
  is passed.

9.34 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:

9.35 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:

9.36 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.
9.37 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.

9.38 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.

9.39 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:

9.40 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’.
9.41 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:

9.42 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:

9.43 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:

9.44 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.
9.45 atanf

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

Gnulib module: atanf

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:

9.46 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.

9.47 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.

9.48 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.
9.49 atanl

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

Gnulib module: atanl

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:

9.50 atexit

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

Gnulib module: atexit

Portability problems fixed by Gnulib:
- This function is missing on some old platforms.

Portability problems not fixed by Gnulib:

9.51 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.

9.52 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:

9.53 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:

9.54 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:

9.55 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.

### 9.56 bind

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

- Gnulib module: bind
- 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:

### 9.57 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:

### 9.58 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.

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 `btoc32`, provided by Gnulib module `btoc32`, operates on 32-bit wide characters and therefore does not have this limitation.
- In the C or POSIX locales, this function is not consistent with Gnulib’s `mbtowc` and can return WEOF: glibc 2.23, MirOS BSD #10.
9.59 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.

9.60 c32rtomb

Gnulib module: c32rtomb

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.

- 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.

9.61 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.

9.62 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.
9.63 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.

9.64 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.

9.65 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.

9.66 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.
9.67 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.

9.68 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.

9.69 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.

9.70 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.

9.71 call_once

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:

9.72 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.

9.73 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.

9.74 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.

9.75 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.

9.76 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.

9.77 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.

9.78 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.

### 9.79 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.

### 9.80 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.

### 9.81 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.
9.82 casinh1

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/casinh1.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.

9.83 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.

9.84 catan

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

9.85 catanf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/catanf.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.
9.86 `catanh`

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

9.87 `catanhf`

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

9.88 `catanhl`

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.

9.89 `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.
Chapter 9: ISO C and POSIX Function Substitutes

9.90 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.

9.91 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.

9.92 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.

9.93 cbart

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

Gnulib module: cbart

Portability problems fixed by Gnulib:

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

Portability problems not fixed by Gnulib:
9.94 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:

9.95 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:

9.96 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.

9.97 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.

9.98 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.

9.99 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.

9.100 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.

9.101 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.

9.102 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:

9.103 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 ceilf-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:

9.104 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 Gnuilb module ceill-ieee:
  Portability problems not fixed by Gnuilb:

9.105 cexp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cexp.html
  Gnuilb module: —
  Portability problems fixed by Gnuilb:
  Portability problems not fixed by Gnuilb:
• 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.

9.106 cexpf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cexpf.html
  Gnuilb module: —
  Portability problems fixed by Gnuilb:
  Portability problems not fixed by Gnuilb:
• 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.

9.107 cexpl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cexpl.html
  Gnuilb module: —
  Portability problems fixed by Gnuilb:
  Portability problems not fixed by Gnuilb:
• 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.

9.108 cfgetispeed

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/cfgetispeed.html
  Gnuilb module: —
  Portability problems fixed by Gnuilb:
  Portability problems not fixed by Gnuilb:
• This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
9.109 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.

9.110 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.

9.111 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.

9.112 chdir

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/chdir.html
Gnulib module: chdir
Portability problems fixed by Gnulib:
• This function is declared in different header files (namely, <io.h> or <direct.h>) on some platforms: mingw, MSVC 14.
Portability problems not fixed by Gnulib:

9.113 chmod

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/chmod.html
Gnulib module: —
Portability problems fixed by Gnulib:
Portability problems not fixed by Gnulib:
9.114 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:

9.115 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.

9.116 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.
Chapter 9: ISO C and POSIX Function Substitutes

9.117 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.

9.118 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:

9.119 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:

9.120 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.
9.121 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.

9.122 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.

9.123 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.
9.124 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.

9.125 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.

9.126 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.

9.127 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.
9.128 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:

9.129 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:

9.130 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.

9.131 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:
9.132 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:

9.133 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:

9.134 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:

9.135 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:

9.136 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:

9.137 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.

9.138 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.

9.139 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.
9.140 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.

9.141 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:

9.142 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:

9.143 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:
9.144 **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:

9.145 **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:

9.146 **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:

9.147 **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:

9.148 **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:

9.149 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.

9.150 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.

Portability problems not fixed by Gnulib:

9.151 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.
Chapter 9: ISO C and POSIX Function Substitutes

9.152 `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.

9.153 `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.

9.154 `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.

9.155 `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.
9.156 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.

9.157 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.

9.158 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.

9.159 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.
9.160 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 larger than 2 GB. (Cf. AC_SYS_LARGEFILE.)
- 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 11.31, Solaris 9.

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.

9.161 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 platforms: glibc (at least 2.11–2.13).

9.162 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.
9.163 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.

9.164 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.

9.165 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.

9.166 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.
9.167 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.

9.168 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.

9.169 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.

9.170 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.
9.171 `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.

9.172 `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.

9.173 `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.

9.174 `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.
9.175 ctanh1

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctanh1.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.

9.176 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.

9.177 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.

9.178 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 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 re-entrant interface `ctime_r`.

• Native Windows platforms (mingw, MSVC) support only a subset of time zones supported by GNU or specified by POSIX. See Section 9.1188 [tzset], page 430.

A more flexible function is `strftime`. However, note that it is locale dependent.

9.179 `ctime_r`

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

9.180 `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.
9.181 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 9.1188 [tzset], page 430.

A more portable way of getting the UTC offset is to use strftime with the %z format. See Section 9.1079 [strftime], page 398.

9.182 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.

9.183 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.

9.184 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.

9.185 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.

9.186 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.

9.187 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.

9.188 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.
9.189 `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.

9.190 `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.

9.191 `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.

9.192 `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:
9.193 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.

With the dirfd module, this functions always sets errno when it fails. (POSIX does not require that dirfd sets errno when it fails.)

9.194 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.

9.195 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:

9.196 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.
9.197 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.

9.198 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.

9.199 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.

9.200 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.

9.201 dprintf

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

Gnulib module: dprintf or dprintf-posix

Portability problems fixed by either Gnulib module dprintf or dprintf-posix:

- 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 Gnulib module dprintf-posix:

- 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 ‘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.

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.
- 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 errno or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

9.202 drand48

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/drand48.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.

9.203 `dsubl`

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.

9.204 `dup`

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

Gnulib module: dup

Portability problems fixed by Gnulib:

Portability problems not 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.

9.205 `dup2`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/dup2.html

Gnulib module: dup2

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is declared in a different header file (namely, `<io.h>`) on some platforms: MSVC 14.
- This function always returns 0 for success on some platforms: mingw, MSVC 14.
- 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:

### 9.206 `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.

### 9.207 `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).
9.208 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.

9.209 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.

9.210 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.

9.211 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.

9.212 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.
9.213 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.

9.214 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.

9.215 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 <crtExterns.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

  -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 environ to clear all variables is not portable; better is to assign environ to one-element array containing a NULL pointer. That said, an empty environment is not portable either, as some systems may require particular environment variables (such as PATH) to be present in order to operate consistently.
9.216 erand48

POSIX specification:
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.

9.217 erf

POSIX specification:
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.

9.218 erfc

POSIX specification:
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.

9.219 erfcf

POSIX specification:
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.
9.220 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.

9.221 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.

9.222 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.

9.223 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.
9.224 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.

9.225 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.

9.226 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.

9.227 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.

9.228 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.

### **9.229 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.

### **9.230 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 8.50 [stdlib.h], page 64.

Portability problems not fixed by GnuLib:

### **9.231 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:
9.232 \texttt{exp2}

POSIX specification:
\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/exp2.html}
Gnulib module: \texttt{exp2}
Portability problems fixed by Gnulib:
\begin{itemize}
\item 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.
\item This function is not declared on some platforms: IRIX 6.5.
\item This function returns grossly wrong results on some platforms: OpenBSD 4.9.
\end{itemize}
Portability problems not fixed by Gnulib:

9.233 \texttt{exp2f}

POSIX specification:
\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/exp2f.html}
Gnulib module: \texttt{exp2f}
Portability problems fixed by Gnulib:
\begin{itemize}
\item 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.
\item This function is not declared on some platforms: IRIX 6.5.
\end{itemize}
Portability problems not fixed by Gnulib:

9.234 \texttt{exp2l}

POSIX specification:
\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/exp2l.html}
Gnulib module: \texttt{exp2l} or \texttt{exp2l-ieee}
Portability problems fixed by either Gnulib module \texttt{exp2l} or \texttt{exp2l-ieee}:
\begin{itemize}
\item 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.
\item This function is not declared on some platforms: IRIX 6.5.
\item This function produces results which are accurate to only 16 digits on some platforms: NetBSD 9.0.
\end{itemize}
Portability problems fixed by Gnulib module \texttt{exp2l-ieee}:
\begin{itemize}
\item This function returns a wrong value for a NaN argument on some platforms: OpenBSD 4.9.
\item This function returns a wrong value for a negative infinity argument on some platforms: IRIX 6.5.
\end{itemize}
Portability problems not fixed by Gnulib:
9.235 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:

9.236 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:

9.237 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:
9.238 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:

9.239 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 1.2.3/4, musl libc 1.2.2/s390x, Mac OS X 10.5, NetBSD 8.0.

Portability problems not fixed by Gnulib:

9.240 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:

9.241 fabsf

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

Gnulib module: fabs

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:

**9.242 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:

**9.243 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.
9.244 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.

9.245 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.

9.246 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.

9.247 fchdir

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

Gnulib module: fchdir

Portability problems fixed by Gnulib:

Portability problems not 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.
9.248 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.

9.249 fchmodat

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

Gnulib module: fchmodat

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.

• 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.

9.250 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.
9.251 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:

9.252 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.

9.253 fcntl

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

LSB specification:
https://refsspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fcntl-3.html
Gnulib module: fcntl

Portability problems fixed by Gnulib:
- This function is missing on some platforms: mingw, MSVC 14.
- This function does not support \texttt{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 \texttt{F\_DUPFD\_CLOEXEC} action of this function does not set the \texttt{FD\_CLOEXEC} flag on some platforms: NetBSD 9.0.
- The \texttt{F\_DUPFD\_CLOEXEC} action of this function sets the \texttt{FD\_CLOEXEC} flag on the wrong file descriptor on some platforms: Haiku.
- The \texttt{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 \texttt{F\_DUPFD} action of this function mistakenly clears \texttt{FD\_CLOEXEC} on the source descriptor on some platforms: Haiku.

Portability problems not fixed by Gnulib:
- The replacement function does not support \texttt{F\_SETFD}, \texttt{F\_GETFL}, \texttt{F\_SETFL}, \texttt{F\_GETOWN}, \texttt{F\_SETOWN}, \texttt{F\_GETLK}, \texttt{F\_SETLK}, and \texttt{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 \texttt{F\_SETLK} and \texttt{F\_SETLKW} fail with \texttt{errno} set to different values on different systems: \texttt{EINVAL} on OpenIndiana (as suggested by the POSIX 1003.1-2017 fcntl specification), \texttt{ENOLCK} on GNU/Linux, and \texttt{EOPNOTSUPP} on FreeBSD.

\subsection*{9.254 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:

\subsection*{9.255 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.
9.256  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.

9.257  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.

9.258  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.

9.259  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.
9.260  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.

9.261  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 errno upon failure.

Portability problems not fixed by Gnulib:

9.262  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:
9.263 feclearexcept

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

9.264 fegetenv

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

9.265 fegetexceptflag

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

9.266 fegetmode

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.
9.267 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.

9.268 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.

9.269 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:

9.270 feraisexcept

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.
9.271 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:

9.272 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.

9.273 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.

9.274 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.
9.275 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.

9.276 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.

9.277 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.

9.278 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.
9.279 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.

9.280 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.

9.281 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.

### 9.282 **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:

### 9.283 **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.

### 9.284 **fgetpos**

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

Gnulib module: —

Portability problems fixed by Gnulib:

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 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.
9.285 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.

9.286 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.

9.287 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.

9.288 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:
9.289 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.

9.290 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:

9.291 floorf

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

Gnulib module: floor 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:

9.292 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:
9.293 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:

9.294 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.

9.295 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 2.11, macOS 10.13, FreeBSD 6.4/x86, mingw.

Portability problems not fixed by Gnulib:
9.296  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.

9.297  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.

9.298  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.

9.299  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.
9.300 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.

9.301 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.

9.302 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.

9.303 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.
9.304 \texttt{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.

9.305 \texttt{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.

9.306 \texttt{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.

9.307 \texttt{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.
9.308 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.

9.309 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 not fixed by Gnulib:

• This function has problems when the first argument is minus zero on some platforms: mingw, MSVC 14.

9.310 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:

9.311 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:

9.312 `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.

9.313 `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.

9.314 `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.
Chapter 9: ISO C and POSIX Function Substitutes

9.315 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:

9.316 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
  larger than 2 GB. (Cf. AC_SYS_LARGEFILE.)
- 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`.

### 9.317 `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, execlp, 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.

### 9.318 `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.

### 9.319 `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.

### 9.320 `fprintf`

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

Gnulib module: fprintf-posix or stdio, nonblocking, sigpipe
Portability problems fixed by GnuLib module `fprintf-posix`:

- 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` “%e”, “%E”, “%g” on 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 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 ‘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 can crash in out-of-memory conditions on some platforms: FreeBSD 13.0, NetBSD 5.0.

Portability problems fixed by GnuLib module `stdio` or `fprintf-posix`, 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`, 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.

9.321 `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.

9.322 `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 `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.

### 9.323 `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, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 9.324 `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, `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.

### 9.325 `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.

### 9.326 `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:

### 9.327 `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:

### 9.328 `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.
9.329 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 larger than 2 GB. (Cf. AC_SYS_LARGEFILE.)
- 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.

9.330 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:

9.331 frexpf

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

Gnulib module: frexpf
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:

9.332 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:

9.333 fromfp

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-gnu 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.

9.334 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.

9.335 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.

9.336 fromfpx

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.

9.337 fromfpzf

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.
9.338 fromfpxl

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.

9.339 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, ll, j, t, z size specifiers.

9.340 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 larger than 2 GB, even when the AC_SYS_LARGEFILE macro is used. The fix is to use fseeko instead.
9.341 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 larger than 2 GB. (Cf. AC_SYS_LARGEFILE.)

Portability problems not fixed by Gnulib:

9.342 fsetpos

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fsetpos.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 larger than 2 GB. The fix is to use the AC_SYS_LARGEFILE macro.

9.343 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 larger than 2 GB. (Cf. AC_SYS_LARGEFILE.)
- 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. (Cf. AC_SYS_LARGEFILE.)
- 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 8.63 [sys/stat.h], page 69, 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.

9.344 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. (Cf. `AC_SYS_LARGEFILE`.)
- 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 8.63 [sys/stat.h], page 69, for general portability problems with `struct stat`.

9.345 fstatvfs

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

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: OpenBSD 3.8, mingw, MSVC 14, Android 4.3.
- 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. The fix is to use the `AC_SYS_LARGEFILE` macro. This affects glibc/Hurd, HP-UX 11, Solaris.
9.346  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.

9.347  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.

9.348  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 EBADF on some platforms: AIX 7.2, Cygwin 2.9.

9.349  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.
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 larger than 2 GB, even when the `AC_SYS_LARGEFILE` macro is used. The fix is to use `ftello` instead.

### 9.350 ftello

**POSIX specification:**

https://pubs.opengroup.org/onlinepubs/9699919799/functions/ftello.html

Gnulib module: ftello

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.
- On platforms where `off_t` is a 32-bit type, `ftello` does not work correctly with files larger than 2 GB. (Cf. `AC_SYS_LARGEFILE`.)

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.

### 9.351 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.
9.352 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 is not applicable to arbitrary lengths for files larger than 2 GB. The fix is to use the AC_SYS_LARGEFILE macro.

Portability problems not fixed by Gnulib:

9.353 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.

9.354 ftw

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/ftw.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, Minix 3.1.8, mingw, MSVC 14, Android 4.1.
- 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. The fix is to use the AC_SYS_LARGEFILE macro.

9.355 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.
9.356 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.

9.357 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.
Chapter 9: ISO C and POSIX Function Substitutes

9.358 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:
- The %a directive is not portable, use %s mapped to an argument of strerror(errno) (or a version of strerror_r) instead.
- 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.
- 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.

9.359 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.

9.360 fwscanf

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/fwscanf.html
LSB specification:
https://refs specs.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.

9.361 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:

9.362 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.
9.363 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.

9.364 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.

9.365 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.
9.366 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.

9.367 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.
9.368 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.

9.369 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.

9.370 getdelim

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

Gnulib module: getdelim

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 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 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.

9.371 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.

### 9.372 getenv

POSIX specification:
[https://pubs.opengroup.org/onlinepubs/9699919799/functions/getenv.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/getenv.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 9.373 geteuid

POSIX specification:
[https://pubs.opengroup.org/onlinepubs/9699919799/functions/geteuid.html](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.

### 9.374 getgid

POSIX specification:
[https://pubs.opengroup.org/onlinepubs/9699919799/functions/getgid.html](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.

### 9.375 getgrent

POSIX specification:
[https://pubs.opengroup.org/onlinepubs/9699919799/functions/getgrent.html](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.
9.376 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.

9.377 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.

9.378 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.

9.379 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.
9.380 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.

9.381 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.

9.382 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.
9.383 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.

9.384 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.

9.385 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.
9.386 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.

9.387 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.

9.388 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.
9.389 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:

9.390 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.

9.391 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.

9.392 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.
9.393 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.

9.394 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.

9.395 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.

9.396 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.

9.397 getpeername

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

Gnulib module: getpeername
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 *’.

9.398 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.

9.399 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.

9.400 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:

9.401 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.
9.402 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.

9.403 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.

9.404 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.

9.405 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.
9.406 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.

9.407 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.

9.408 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.

9.409 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.
9.410 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.

9.411 getpwuid_r

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

Gnulib module: extensions

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function has an incompatible declaration on some platforms: Solaris 11.3 (when _POSIX_PTHREAD_SEMANTICS is not defined).
- 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.

9.412 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:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- On platforms where rlim_t is a 32-bit type, this function does not allow to retrieve limits larger than 4 GB, such as for RLIMITFSIZE. The fix is to use the AC_SYS_LARGEFILE macro.
9.413 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.

9.414 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.

9.415 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.

9.416 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.
9.417 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.

9.418 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.

9.419 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 *’.

9.420 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.

### 9.421 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:

### 9.422 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 redefine 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`. 

9.423 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.

9.424 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.

9.425 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.

9.426 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.
9.427 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.

9.428 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.

9.429 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 larger than 2 GB. (Cf. AC_SYS_LARGEFILE.)

Portability problems not fixed by Gnulib:
• Some platforms may store additional flags in the gl_flags field.

9.430 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:
9.431 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.

9.432 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.

9.433 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.

9.434 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.
9.435 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.

9.436 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.

9.437 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.

9.438 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.
9.439 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:

9.440 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 hypotf-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:

9.441 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:
9.442 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.

9.443 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.

9.444 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 `striconveh` (a wrapper around `iconv`) that deals with this problem.
- The set of supported encodings and conversions is system dependent.

9.445 **if_freenameindex**

POSIX specification:

https://pubs.opengroup.org/onlinepubs/9699919799/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.

9.446 **if_indextoname**

POSIX specification:

https://pubs.opengroup.org/onlinepubs/9699919799/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.
9.447 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.

9.448 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.

9.449 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:
9.450 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:

9.451 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 denormalized arguments on some platforms: AIX 7.1 64-bit, Haiku 2017.

Portability problems not fixed by Gnulib:

9.452 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:

9.453 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:

9.454 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’.

9.455 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.

9.456 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.

### 9.457 `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:

### 9.458 `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:

- 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.

### 9.459 `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.
9.460 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.

9.461 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 four 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’.

**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’.

9.462 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.

9.463 isalpha
POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isalpha.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_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 mbrtowc function. It is provided by the Gnulib module ‘wctype’.

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’. 
9.464 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.

9.465 isascii

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isascii.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 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'.

9.466 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.
9.467 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 NUL.
- 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:

9.468 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 \texttt{MB\_CUR\_MAX} > 1 (this includes all the common UTF-8 locales). There are four alternative APIs:

\texttt{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'.

\texttt{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 \texttt{mbstowc} function. It is provided by the Gnulib module `wctype'.

\texttt{mb\_isblank}  
This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module `mbchar'.

\texttt{uc\_is\_blank}  
This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module `unictype/ctype-blank'.
9.469 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.

9.470 iscntrl

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iscntrl.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 four 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’.

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’.

9.471 iscntrl_l

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

9.472 `isdigit`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/isdigit.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_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’.

- `iswisdigit`  
  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’.

- `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’.

9.473 `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.
9.474 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.

9.475 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 four 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’.

* 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/cctype-graph’.
9.476 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.

9.477 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.

9.478 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.

9.479 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.
9.480 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.

9.481 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.

9.482 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.

9.483 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.

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 four 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
mbrtowc function. It is provided by the Gnulib module ‘wctype’.

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’.

9.484 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.

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

Gnulib module: isnan

Portability problems 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.
9.486 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.

9.487 isprint

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

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 four 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’.

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’.

9.488 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.

9.489 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 \texttt{MB\_CUR\_MAX > 1} (this includes all the common UTF-8 locales). There are four 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 \texttt{mbtowc} function. It is provided by the Gnulib module ‘wctype’.

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’.

9.490 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.
9.491 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 four alternative APIs:

c_isisspace
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 mbtowc function. It is provided by the Gnulib module ‘wctype’.

mb_isisspace
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’.

9.492 isspace_l

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

9.493 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.

9.494 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 four 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 mbtowc function. It is provided by the Gnulib module ‘wctype’.

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’.

9.495 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.
9.496 *iswalnum*

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

Gnulib module: wchar-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 c32isalnum, provided by Gnulib module c32isalnum, operates on 32-bit wide characters and therefore does not have this limitation.

9.497 *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.

9.498 *iswalpha*

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

Gnulib module: wchar-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.
9.499 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, 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.

9.500 iswblank

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

Gnulib module: iswblank

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 9, mingw, MSVC 9, Android 4.4.
- This function is declared but not defined on some platforms: IRIX 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.

9.501 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.
9.502 iswcntrl

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

9.503 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.

9.504 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.
9.505 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.

9.506 iswdigit

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswdigit.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, 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.

9.507 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.
9.508 iswgraph

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswgraph.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 c32isgraph, provided by Gnulib module c32isgraph, operates on 32-bit wide characters and therefore does not have this limitation.

9.509 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.

9.510 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.
9.511 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.

9.512 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.

9.513 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.
9.514 iswpunct

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswpunct.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 c32ispunct, provided by Gnulib module c32ispunct, operates on 32-bit wide characters and therefore does not have this limitation.

9.515 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.

9.516 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.
9.517 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.

9.518 iswupper

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

Gnulib module: wchar.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 c32isupper, provided by Gnulib module c32isupper, operates on 32-bit wide characters and therefore does not have this limitation.

9.519 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.
9.520 iswxdigit

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswxdigit.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, 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.

9.521 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.

9.522 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 four 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'.

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'.

9.523 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.

9.524 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.

9.525 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.
9.526 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.

9.527 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.

9.528 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.

9.529 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.
9.530 **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.

9.531 **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.

9.532 **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:

9.533 **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.
9.534 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:

9.535 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:

9.536 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:

9.537 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:
9.538  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.

9.539  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.

9.540  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.

9.541  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.
9.542 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.

9.543 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:

9.544 lio_listio

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/lio_listio.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 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 files larger than 2 GB. The fix is to use the `AC_SYS_LARGEFILE` macro.

9.545 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:

9.546 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.

9.547 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.

9.548 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.
9.549 **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.

9.550 **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.

9.551 **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.

9.552 **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.
9.553 **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.

9.554 **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.

9.555 **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.

9.556 **llroundl**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/llroundl.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.
9.557 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.

Portability problems not fixed by Gnulib:

9.558 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 $-2^{31}$): Mac OS X 10.6. You can use the time_tz 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 9.1188 [tzset], page 430.

9.559 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 \(-2 \ast 31\)) Mac OS X 10.6. You can use the \texttt{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.

9.560 \texttt{lockf}

POSIX specification: \url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/lockf.html}

GnuLib module: —

Portability problems not 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 6.0.
- On platforms where \texttt{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 \texttt{AC_SYS_LARGEFILE} macro.

9.561 \texttt{log}

POSIX specification: \url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/log.html}

GnuLib module: log or log-ieee

Portability problems fixed by either GnuLib module \texttt{log} or \texttt{log-ieee}:

Portability problems fixed by GnuLib module \texttt{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:

9.562 \texttt{log10}

POSIX specification: \url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/log10.html}

GnuLib module: log10 or log10-ieee

Portability problems fixed by either GnuLib module \texttt{log10} or \texttt{log10-ieee}:

Portability problems fixed by GnuLib module \texttt{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:
9.563 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:

9.564 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:

9.565 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:
9.566 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:

9.567 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:

9.568 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:

### 9.569 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:

### 9.570 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:
9.571 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/ppc, glibc 2.7/sparc, glibc 2.7/hppa, Solaris 11.4, Cygwin 1.5.x.

Portability problems not fixed by Gnulib:

9.572 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/ppc, glibc 2.7/sparc, glibc 2.7/hppa, Solaris 11.4.

Portability problems not fixed by Gnulib:

9.573 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:

9.574 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 \texttt{logf-ieee}:

This function returns a wrong value for a negative argument on some platforms: NetBSD 5.1.

Portability problems not fixed by Gnulib:

9.575 \texttt{logl}

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

Gnulib module: \texttt{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 returns wrong results on some platforms: glibc 2.7 on Linux/SPARC64.
- 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:

9.576 \texttt{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 \texttt{sigaltstack}), on FreeBSD, NetBSD, OpenBSD, you need to clear the \texttt{SS_ONSTACK} flag in the \texttt{stack_t} structure managed by the kernel.

9.577 \texttt{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.
9.578 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.

9.579 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.

9.580 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.

9.581 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.
9.582 lroundfd

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.

9.583 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.

9.584 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.

9.585 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 larger than 2 GB. (Cf. AC_SYS_LARGEFILE.)
- 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.

### 9.586 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 larger than 2 GB. (Cf. *AC_SYS_LARGEFILE*.)
- 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. (Cf. *AC_SYS_LARGEFILE*.)
- 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*.
- On Windows platforms (excluding Cygwin), symlinks are not supported, so *lstat* does not exist.

Portability problems not fixed by Gnulib:

- See Section 8.63 [sys/stat.h], page 69, for general portability problems with *struct stat*.

### 9.587 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.

9.588 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.

9.589 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 2.23.
   • 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:

9.590 mbrtoc16

   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.

9.591 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 2.23.
- This function returns 0 instead of (size_t) -2 when the input is empty: glibc 2.19.
- This function does not recognize multibyte sequences that mbtowc recognizes on some platforms: FreeBSD 13.0, 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.

9.592 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: 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 2.23.
- 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 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 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, possibly 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, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the ISO C11 function \texttt{mbrtoc32}, provided by Gnulib module \texttt{mbrtoc32}, operates on 32-bit wide characters and therefore does not have this limitation.

\subsection*{9.593 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:

\subsection*{9.594 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.

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{mbsnrtoc32s}, provided by Gnulib module \texttt{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.
9.595 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.
- 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.

9.596 mbstowcs

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mbstowcs.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 mbstoc32s, provided by Gnulib module mbstoc32s, operates on 32-bit wide characters and therefore does not have this limitation.

9.597 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 0x00010FFFF) 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.

9.598 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:

9.599 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:

9.600 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.

9.601 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:

9.602 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:

9.603 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:

9.604 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 (*)(())) _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:
9.605 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:

9.606 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:

9.607 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.

9.608 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.

9.609 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 super-user 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.

9.610 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.
9.611 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 larger than 2 GB. (Cf. AC_SYS_LARGEFILE.)
• 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.

9.612 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 9.1188 [tzset], page 430.

9.613 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.
9.6.14 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.

9.6.15 mmap

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/mmap.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 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.
- To get anonymous memory, on some platforms, you can use the flags MAP_ANONYMOUS | MAP_PRIVATE and -1 instead of a file descriptor; on others you have to use a read-only file descriptor of /dev/zero.
- On HP-UX, passing a non-NULL first argument, as a hint for the address (even without MAP_FIXED, often causes mmap to fail. Better pass NULL in this case.
- On HP-UX, MAP_FIXED basically never works. On other platforms, it depends on the circumstances whether memory can be returned at a given address.

9.6.16 modf

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

Gnulib module: modf or modf-ieee

Portability problems fixed by either Gnulib module modf or modf-ieee:

Portability problems fixed by Gnulib module 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:
9.617 modff

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

Gnulib module: modff or modff-ieee

Portability problems fixed by either Gnulib module modff or 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 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:

9.618 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:

9.619 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.
9.620 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.

9.621 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.

9.622 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.

9.623 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.
9.624 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.

9.625 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.

9.626 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.

9.627 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.
9.628 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.

9.629 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.

9.630 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.

9.631 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.
9.632 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.

9.633 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.

9.634 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.

9.635 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.
9.636 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:

9.637 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:

9.638 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:

9.639 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:
9.640 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:

9.641 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:

9.642 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.

9.643 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.
9.644 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.

9.645 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.

9.646 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.

9.647 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.
9.648 **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.

Portability problems not fixed by Gnulib:

9.649 **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.

9.650 **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.

9.651 **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.
9.652 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.

9.653 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.

9.654 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.

9.655 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.
9.656 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.

9.657 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.

9.658 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.
9.659 `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.

9.660 `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.

9.661 `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.

9.662 `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.
9.663 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.

9.664 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.

9.665 nftw

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/nftw.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, Minix 3.1.8, mingw, MSVC 14, Android 4.1.
- 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. The fix is to use the AC_SYS_LARGEFILE macro.
9.666 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.

9.667 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 ERA, ERA_D_FMT, ERA_D_T_FMT, ERA_T_FMT, ALT_DIGITS are not supported on some platforms: OpenBSD 6.7.
- The constants YESEXPR and 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, 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, nl_langinfo(CRNCYSTR) returns the empty string, although the local currency symbol, as returned by localeconv()->currency_symbol, is non-empty.
- On NetBSD 5.1, in the "C" locale, the results of nl_langinfo(ABMON_1) ... nl_langinfo(ABMON_12) are full month names, not abbreviated month names.

9.668 nl_langinfo_l

POSIX specification:
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.

9.669 nrand48

POSIX specification:
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.

9.670 ntohl

POSIX specification:
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.

9.671 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.

9.672 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 larger than 2 GB. (Cf. AC_SYS_LARGEFILE.)
• 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 gnuBfib 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 GnuBfib module `fchdir`:
• On Windows platforms (excluding Cygwin), this function fails to open a read-only descriptor for directories.

Portability problems not fixed by GnuBfib:
• The GnuBfib replacement for `O_CLOEXEC` is not atomic, and so is not safe in the presence of multiple threads or signal handlers.
• `open ("symlink", O_NOFOLLOW ...)` fails with `errno` set to ENMLINK 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 `
` to CR/LF by default. Use the `O_BINARY` flag if you need reliable binary I/O.

9.673 `openat`

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

GnuBfib module: openat

Portability problems fixed by GnuBfib:
• 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 larger than 2 GB. (Cf. AC_SYS_LARGEFILE.)
• 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 GnuBfib:
• The GnuBfib 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.

### 9.674 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 larger than 2 GB. Also, on platforms where `ino_t` is a 32-bit type, this function may report inode numbers incorrectly. (Cf. `AC_SYS_LARGEFILE`.)

Portability problems not fixed by Gnulib:

### 9.675 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.

### 9.676 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`. 
9.677 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.

9.678 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.

9.679 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.

9.680 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.
9.681 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.

9.682 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.

9.683 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.

9.684 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:

9.685 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.
• 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.

9.686 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.

9.687 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: 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.

9.688 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 functions 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.

9.689 `posix_fadvise`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_fadvise.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 11.23, IRIX 6.5, Solaris 10, Cygwin 1.5.x, 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.

9.690 `posix_fallocate`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_fallocate.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, 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.
• 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.
9.691 **posix_madvise**

POSIX specification: [https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_madvise.html](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.

9.692 **posix_mem_offset**

POSIX specification: [https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_mem_offset.html](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.

9.693 **posix_memalign**

POSIX specification: [https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_memalign.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_memalign.html)

Gnulib module: posix_memalign

Portability problems fixed by Gnulib:

- This function produces misaligned results on some platforms: OpenBSD 6.1.

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, 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.
9.694 posix_openpt

POSIX specification:
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.

9.695 posix_spawn

POSIX specification:
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.

9.696 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:

9.697 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:

9.698 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:

9.699 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:

9.700 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:

9.701 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:

9.702 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:

9.703 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:

9.704 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:

9.705 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:

9.706 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:
9.707 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:

9.708 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:

9.709 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:

9.710 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:

**9.711 posix_spawnattr_setschedparam**

POSSIX 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:

**9.712 posix_spawnattr_setschedpolicy**

POSSIX 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:

**9.713 posix_spawnattr_setsigdefault**

POSSIX 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:

**9.714 posix_spawnattr_setsigmask**

POSSIX 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:

9.715 posix_spawn

POSIX specification:
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: glibc 2.14, GNU/Hurd, macOS 11.1, FreeBSD 12.0, OpenBSD 6.7, AIX 7.2, Solaris 11.4, Cygwin 2.9.

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.

9.716 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.
9.717 **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.

9.718 **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.

9.719 **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.

9.720 **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.

### 9.721 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.

### 9.722 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.

### 9.723 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.
9.724 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.

9.725 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.

9.726 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.

9.727 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.

9.728 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.

9.729 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.

9.730 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.
9.731 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.

9.732 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.

9.733 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.

9.734 posix_trace_attr_setname

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

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

- 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.

9.735 posix_trace_attr_setstreamfullpolicy

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

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

- 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.

9.736 posix_trace_attr_setstreamsize

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

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

- 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.

9.737 posix_trace_clear

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

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

- 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.
9.738 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.

9.739 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.

9.740 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.

9.741 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.

### 9.742 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.

### 9.743 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.

### 9.744 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.
9.745  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.

9.746  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.

9.747  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.

9.748  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.

9.749 **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.

9.750 **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.

9.751 **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.
9.752 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.

9.753 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.

9.754 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.

9.755 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.

9.756 \texttt{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.

9.757 \texttt{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.

9.758 \texttt{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.
9.759 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.

9.760 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.

9.761 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.

9.762 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.

9.763 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.

9.764 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.

9.765 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.
9.766 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.

9.767 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.

9.768 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:

9.769 powf

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

Gnulib module: powf

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:
9.770 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.

9.771 pread

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

Gnulib module: pread

Portability problems fixed by Gnulib:

Portability problems not 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 larger than 2 GB. (Cf. AC_SYS_LARGEFILE.)
- 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.

9.772 printf

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

Gnulib module: printf-posix or stdio, nonblocking, sigpipe

Portability problems fixed by Gnulib module printf-posix:

Portability problems not fixed by Gnulib module printf-posix:
- 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 11.4, 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 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 ‘a’ 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 can crash in out-of-memory conditions on some platforms: FreeBSD 13.0, NetBSD 5.0.

Portability problems fixed by GnuLib module stdio or printf-posix, 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, 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.
9.773 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.

9.774 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.

9.775 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.

9.776 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.

9.777 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:

• 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:

9.778 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:

• 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:

9.779 pthread_attr_getguardsize

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_getguardsize.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.
9.780  pthread_attr_getinheritsched

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

9.781  pthread_attr_getschedparam

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

9.782  pthread_attr_getschedpolicy

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

9.783  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.
Chapter 9: ISO C and POSIX Function Substitutes

9.784 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.

9.785 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.

9.786 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:

9.787 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:
9.788 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.

9.789 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 9.0.

9.790 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.

9.791 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.
9.792 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.

9.793 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.

9.794 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.

9.795 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.
9.796 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.

9.797 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.

9.798 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.

9.799 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.

9.800 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.

9.801 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.

9.802 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.
9.803 `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.

9.804 `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.

9.805 `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:

9.806 `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:
9.807 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:

9.808 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:

9.809 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:

9.810 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:
9.811 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:

9.812 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.

9.813 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.

9.814 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:
9.815 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.

9.816 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.

9.817 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.

9.818 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:

9.819 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:

9.820 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:

9.821 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.
9.822 **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.

9.823 **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.

9.824 **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:

9.825 **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:
9.826 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:

9.827 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:

9.828 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.

9.829 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.
9.830 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:

• 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:

9.831 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.

9.832 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:

• 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:

9.833 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:
9.834 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.

9.835 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:
Portability problems not 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:

9.836 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:
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.

Portability problems not fixed by Gnulib:

9.837 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:
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.

Portability problems not fixed by Gnulib:
9.838 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:

9.839 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.

9.840 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.

9.841 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.
9.842 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:

9.843 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:

9.844 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:

9.845 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.
9.846 `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.

9.847 `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.

9.848 `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:

9.849 `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:
9.850  `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:

9.851  `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:

9.852  `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:

9.853  `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’.

9.854 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.

9.855 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:

9.856 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: glibc 2.28.

9.857 `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:

9.858 `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:

9.859 `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:
9.860 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:

9.861 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.

9.862 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:

9.863 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.
9.864 pthread_self

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

9.865 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.

9.866 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.

9.867 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.
9.868 `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.

9.869 `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.

9.870 `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:

9.871 `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.
• This function may not fail when the first argument is invalid on some platforms: NetBSD 8.0.

### 9.872 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:

### 9.873 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 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:

### 9.874 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:

9.875 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:

9.876 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:

9.877 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.
9.878 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.

9.879 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.

9.880 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.

### 9.881 `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.

### 9.882 `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.

### 9.883 `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.

9.884 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.

9.885 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.

9.886 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.
9.887 `pututxline`

- POSIX specification: https://pubs.opengroup.org/onlinepubs/9699919799/functions/pututxline.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.

9.888 `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.

9.889 `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.

9.890 `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 larger than 2 GB. (Cf. `AC_SYS_LARGEFILE`.)
• 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:

9.891 `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:

9.892 `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.

9.893 `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:

9.894 `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.
9.895 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.

9.896 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.

9.897 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.
Chapter 9: ISO C and POSIX Function Substitutes

9.898 readdir

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/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 larger than 2 GB. 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. (Cf. AC_SYS_LARGEFILE.)

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.

9.899 readdir_r

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/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).

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- On platforms where off_t is a 32-bit type, this function 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. This can occur with file systems such as XFS (typically on large disks) and NFS. The fix is to use the AC_SYS_LARGEFILE macro.

9.900 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.

### 9.901 readlinkat

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/readlinkat.html](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.
- 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.

9.902 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.

9.903 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` to `ENOMEM` 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
erro, or might not return NULL.

9.904 `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.

9.905 `recv`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/recv.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 WSALastError must be used instead.

Portability problems not fixed by GnuLib:
9.906 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 *’.

9.907 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.

9.908 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:

9.909 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:
9.910 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:

9.911 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:

9.912 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:

9.913 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:
9.914 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:

9.915 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:

9.916 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.
9.917 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.

9.918 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.

9.919 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.

9.920 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 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.

### 9.921 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.

9.922 `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.

9.923 `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 larger than 2 GB. (Cf. `AC_SYS_LARGEFILE`.)

Portability problems not fixed by Gnulib:
9.924 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:

9.925 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:

9.926 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:

9.927 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 <direct.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

### 9.928 round

POSIX specification:
- [https://pubs.opengroup.org/onlinepubs/9699919799/functions/round.html](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:

### 9.929 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.

### 9.930 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.

9.931 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.

9.932 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 function 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:

9.933 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:

### 9.934 `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.

### 9.935 `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.

### 9.936 `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.

### 9.937 `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.
9.938 **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.

9.939 **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.

9.940 **scandir**

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

Gnulib module: scandir

Portability problems fixed by Gnulib:

Portability problems not 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 larger than 2 GB. Also, on platforms where ino_t is a 32-bit type, this function may report inode numbers incorrectly. (Cf. AC_SYS_LARGEFILE.)

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.

9.941 **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.

9.942 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.

9.943 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.

9.944 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.
9.945 sched_getscheduler

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.

9.946 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.

9.947 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.

9.948 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.

9.949 schedyield

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:

9.950 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.

9.951 seekdir

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

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: MSVC 14, Android 5.1.
- On platforms where long int 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 (only on Mac OS X systems).

9.952 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.

9.953 **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.

9.954 **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.

9.955 **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.
9.956  **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.

9.957  **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.

9.958  **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.

9.959  **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.
9.960 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.

9.961 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.

9.962 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.

9.963 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.

9.964 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.
9.965 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.

9.966 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 errno, and WSAGetLastError must be used instead.

Portability problems not fixed by Gnulib:

9.967 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.

9.968 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 errno, and WSAGetLastError must be used instead.

Portability problems not fixed by Gnulib:

9.969 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:
9.970 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.

9.971 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 ‘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 setenv(NULL,"",0) gracefully fail with EINVAL, but not all implementations guarantee this, and the requirement was removed.

9.972 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.

9.973 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.
9.974 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.

9.975 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.

9.976 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.

9.977 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.
9.978 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).

9.979 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 4.3, which 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.
9.980 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.

9.981 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.

9.982 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.

9.983 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.
9.984 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.

9.985 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.

9.986 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.

9.987 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.
9.988  **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.

9.989  **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.

9.990  **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.

9.991  **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.

9.992  **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.
9.993 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.

9.994 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.

9.995 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:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

• On platforms where rlim_t is a 32-bit type, this function does not allow to set limits larger than 4 GB, such as for RLIMIT_FSIZE. The fix is to use the AC_SYS_LARGEFILE macro.

9.996 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.
9.997 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.

9.998 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:

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.

• Many socket options are not available on all platforms.

9.999 setstate

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/setstate.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, 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 OpenIndiana.

9.1000 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.
9.1001 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.

9.1002 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.

9.1003 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.

9.1004 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.
9.1005 **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.

9.1006 **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.

9.1007 **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.

9.1008 **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.


9.1009 **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:

9.1010 **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 sigchld)
  {
    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.

9.1011 **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:

9.1012 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

9.1013 sigdelset

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

Gnulib module: sigprocmask

Portability problems fixed by Gnulib:

Portability problems not 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:

9.1014 sigemptyset

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

Gnulib module: sigprocmask

Portability problems fixed by Gnulib:

Portability problems not 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:
9.1015 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:

9.1016 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.

9.1017 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.

9.1018 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).
9.1019 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:

9.1020 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.

9.1021 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.

9.1022 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:

### 9.1023 siggam

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

### 9.1024 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.

### 9.1025 sigpending

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

GnuLib module: sigprocmask

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

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

### 9.1026 sigprocmask

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

GnuLib module: sigprocmask

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

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

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.

### 9.1027 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.

### 9.1028 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.

### 9.1029 sigset

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

### 9.1030 sigsetjmp

POSIX specification: https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigsetjmp.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.
9.1031 sigsuspend

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

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

9.1032 sigtimedwait

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigtimedwait.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, 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.

9.1033 sigwait

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

Gnulib module: extensions
Portability problems fixed by Gnulib:
Portability problems not 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.

9.1034 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.
9.1035 **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:

9.1036 **sinf**

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

Gnulib module: sinf

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:

9.1037 **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:

9.1038 **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:
9.1039 **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.

9.1040 **sinl**

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

Gnulib module: sinl

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:

9.1041 **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.

9.1042 **snprintf**

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

Gnulib module: snprintf or snprintf-posix

Portability problems fixed by either Gnulib module `snprintf` or `snprintf-posix`:

- 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 Gnulib module `snprintf-posix`:
• 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 11.4, 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 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 "\%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 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 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.

9.1043 socketatmark

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.

9.1044 socket

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

Gnulib module: socket

Portability problems fixed by Gnulib:

Portability problems not 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:

9.1045 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.

9.1046 sprintf

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

Gnulib module: sprintf-posix
Portability problems fixed by Gnulib:

- 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` 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 `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` 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 can crash in out-of-memory conditions on some platforms: FreeBSD 13.0, NetBSD 5.0.

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.
9.1047  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:

9.1048  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:

9.1049  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:

9.1050  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.
9.1051 `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.

9.1052 `srandom`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/srandom.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 ‘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.

9.1053 `sscanf`

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/sscanf.html
LSB specification:
https://refspecs.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.

9.1054 `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 larger than 2 GB. (Cf. `AC_SYS_LARGEFILE`.)
• 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. (Cf. AC_SYS_LARGEFILE.)

• 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 8.63 [sys/stat.h], page 69, 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).

9.1055 statvfs

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

Gnulib module: —

Portability problems fixed by Gnulib:

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.

• 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. The fix is to use the AC_SYS_LARGEFILE macro. This affects glibc/Hurd, HP-UX 11, Solaris.

Gnulib provides a module fsusage that provides similar information as statvfs.
9.1056 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.

9.1057 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.

9.1058 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.

9.1059 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 cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

9.1060 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 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:

9.1061 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.
9.1062 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.

9.1063 strcat

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

Gnulib module: string

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.

9.1064 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.

9.1065 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:
9.1066 **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.

9.1067 **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.

9.1068 **strcpy**

POSIX specification:

https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcpy.html

Gnulib module: string

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.

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**.

9.1069 **strcspn**

POSIX specification:

https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcspn.html

Gnulib module: strcspn

Portability problems fixed by Gnulib:

Portability problems not 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.
9.1070 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:

9.1071 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:

9.1072 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.
9.1073 **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:**
9.1074 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.

9.1075 strfmon_l

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

Gnulib module: strfmon_l

Portability problems 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.

9.1076 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.

9.1077 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.

9.1078 *strfroml*

Documentation:

- **man strfroml**.

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.

9.1079 *strftime*

POSIX specification:
[https://pubs.opengroup.org/onlinepubs/9699919799/functions/strftime.html](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 9.1188 [tzset], page 430.

Extension: Gnulib offers a module `nstrftime` that provides an `nstrftime` function with various GNU extensions.
9.1080 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.

9.1081 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:

9.1082 strncasecmp

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

Gnulib module: strcase

Portability problems fixed by Gnulib:

Portability problems not 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.

9.1083 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.
9.1084 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 10 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:

9.1085 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:

9.1086 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/.

9.1087 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:

9.1088 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:

9.1089 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.

9.1090 strftime

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

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-strftime-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:
9.1091 **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.

9.1092 **strsignal**

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

Gnulib module: strsignal

Portability problems 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.

9.1093 **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 `mbsspn` that works on character strings in all locales.

9.1094 **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 `strstr`:
- This function has quadratic instead of linear worst-case complexity on some platforms: glibc 2.8, macOS 11.1, FreeBSD 6.2, NetBSD 9.0, OpenBSD 4.0, 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:
- 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.

9.1095 `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 `strtodObsolete`:

- 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.

**9.1096 `strtof`**

POSIX specification:

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.

**9.1097 `strtoimax`**

POSIX specification:

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.

**9.1098 `strtok`**

POSIX specification:

https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtok.html

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:
9.1099 `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.

9.1100 `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.

Portability problems not fixed by Gnulib:

9.1101 `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, IRX 6.5.
• This function fails to parse ‘\texttt{NaN()}’ on some platforms: glibc-2.3.2, IRIX 6.5, mingw, Haiku.
• This function fails to parse ‘\texttt{NaN(n-char-sequence)}’ on some platforms: IRIX 6.5.
• This function parses ‘\texttt{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 ‘\texttt{p}’ and the exponent on some platforms: HP-UX 11.31/ia64.
• This function fails to set \texttt{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.

9.1102 \texttt{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.

Portability problems not fixed by Gnulib:

9.1103 \texttt{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.

Portability problems not fixed by Gnulib:

9.1104 \texttt{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.

Portability problems not fixed by Gnulib:

9.1105 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.

9.1106 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:

9.1107 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.

9.1108 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.
Chapter 9: ISO C and POSIX Function Substitutes

9.1109 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:
- The `%m` directive is not portable, use `%s` mapped to an argument of `stderr(errno)` (or a version of `strerror_r`) instead.
- 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.
- 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.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.

9.1110 sscanf

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.

9.1111 symlink

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

Gnulib module: symlink
Portability problems fixed by Gnulib:

• 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.

### 9.1112 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.

### 9.1113 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.

### 9.1114 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/bselib-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.
9.1115 **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.

9.1116 **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/baselib-system-3.html

Gnulib module: system-posix
Portability problems fixed by Gnulib:
- The macros \texttt{WIFSIGNALED}, \texttt{WIFEXITED}, \texttt{WIFSTOPPED}, \texttt{WTERMSIG}, \texttt{WEXITSTATUS}, \texttt{WNOHANG}, \texttt{WUNTRACED}, \texttt{WSTROPSIG} are not defined in \texttt{<stdlib.h>} (only in \texttt{<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 \texttt{system} function is \texttt{cmd.exe}, not \texttt{/bin/sh}. Accordingly, the rules for quoting shell arguments containing spaces, quote or other special characters are different.

9.1117 **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:

9.1118 **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:
9.1119  **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:

9.1120  **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:

9.1121  **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.

9.1122  **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:


9.1123 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 toEINVAL or, on Mac OS X, also EOPNOTSUPP or ENODEV, rather than ENOTTY.

9.1124 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.

9.1125 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 TCIFlush on a non-tty fails with errno set toEINVAL rather thanENOTTY.
- On some platforms, tcflush of TCOFlush on a non-tty fails with errno set toEINVAL or, on IRIX, alsoENOSYS, or, on Mac OS X, alsoEOPNOTSUPP or ENODEV, rather than ENOTTY.

9.1126 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.
9.1127 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.

9.1128 tcgetsid

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

Gnulib module: tcgetsid

Portability problems fixed by Gnulib:

Portability problems not 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.

9.1129 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.

9.1130 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.
9.1131 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.

9.1132 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:

9.1133 telldir

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

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

• This function is missing on some platforms: MSVC 14, Android 5.1.

• On platforms where long int 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 (only on Mac OS X systems).

9.1134 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.
9.1135 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:

9.1136 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.

9.1137 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.

9.1138 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.
9.1139 thrd_create


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:

9.1140 thrd_current


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:

9.1141 thrd_detach


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:

9.1142 thrd_equal


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:

9.1143 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:

9.1144 thrd_join

Documentation:

Gnulib module: thrd
Portability problems fixed by Gnulib:
  • 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:

9.1145 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:
9.1146 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:

9.1147 time

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

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

9.1148 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.

9.1149 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.
9.1150 timer_getovrun

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

GnuCib module: —
Portability problems fixed by GnuCib:
Portability problems not fixed by GnuCib:
• 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.

9.1151 timer_gettime

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

GnuCib module: timer-time
Portability problems fixed by GnuCib:
Portability problems not fixed by GnuCib:
• 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.

9.1152 timer_settime

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

GnuCib module: timer-time
Portability problems fixed by GnuCib:
Portability problems not fixed by GnuCib:
• 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.

9.1153 times

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

GnuCib module: times
Portability problems fixed by GnuCib:
• This function is missing on some platforms: mingw, MSVC 14.
Portability problems not fixed by GnuCib:
• 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.
9.1154 timespec_getres

ISO C2x specification:
http://www.open-std.org/jtc1/sc22/wg14/www/docs/n2596.pdf section 7.27.2.6

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.

9.1155 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 9.1188 [tzset], page 430.

A more portable way of getting the UTC offset is to use strftime with the %z format. See Section 9.1079 [strftime], page 398.

9.1156 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 larger than 2 GB. (Cf. AC_SYS_LARGEFILE.)

Portability problems not fixed by Gnulib:
9.1157 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.

9.1158 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:

9.1159 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:

• On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

9.1160 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.
9.1161 totalorder

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.

9.1162 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.

9.1163 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.
9.1164 totalordermag


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.

9.1165 totalordermagf


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.

9.1166 totalordermagl


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.
9.1167 toupper

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

- On Windows and 32-bit AIX platforms, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

9.1168 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.

9.1169 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.

9.1170 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.

9.1171 **tolower**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/towlower.html
Gnulib module: wchar-t

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.

9.1172 **tolower_l**

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

9.1173 **toupper**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/towupper.html
Gnulib module: wchar-t

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.
9.1174 `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, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

9.1175 `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 `trunc` or `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 `-D_GNU_SOURCE`) on some platforms: glibc 2.8.

Portability problems fixed by Gnulib module `trunc-ieee`:

Portability problems not fixed by Gnulib:

9.1176 `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 AC_SYS_LARGEFILE in effect.
- On platforms where `off_t` is a 32-bit type, this function is not applicable to arbitrary lengths for files larger than 2 GB. The fix is to use the AC_SYS_LARGEFILE macro.
- 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:
9.1177  trunct

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

Gnulib module: trunctf or trunctf-ieee

Portability problems fixed by either Gnulib module trunctf or trunctf-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 trunctf-ieee:

Portability problems not fixed by Gnulib:

9.1178  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:

9.1179  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:

9.1180  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:

### 9.1181 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:

### 9.1182 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:

### 9.1183 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:

### 9.1184 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.

9.1185 ttynamer

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

Gnulib module: ttynamer

Portability problems 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:

9.1186 twalk

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

Gnulib module: tsearch

Portability problems fixed by Gnulib:

• This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.4.

Portability problems not fixed by Gnulib:

9.1187 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 9.1188 [tzset], page 430.

A more portable way of getting the time zone abbreviation is to use strftime with the %Z format. See Section 9.1079 [strftime], page 398.

9.1188 tzset

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

Gnulib module: tzset

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:
- 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.

9.1189 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.

9.1190 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.

9.1191 \texttt{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.

9.1192 \texttt{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.

9.1193 \texttt{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.

9.1194 \texttt{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.

9.1195 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.

9.1196 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:

9.1197 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:

9.1198 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.
9.1199 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.

9.1200 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.
- 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 counterintuitive. 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.

9.1201 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.

### 9.1202 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.
9.1203 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.

9.1204 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.

9.1205 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.

### 9.1206 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.
9.1207 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).

9.1208 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  
  mode = va_arg (ap, mode_t);
you have to write

\[
\text{mode} = (\text{sizeof (mode_t)} < \text{sizeof (int)}
\quad ? \text{va_arg (ap, int)} \\
\quad : \text{va_arg (ap, mode_t))};
\]

9.1209 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:

9.1210 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:

9.1211 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:

9.1212 vdprintf

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

Gnulib module: vdprintf or vdprintf-posix
Portability problems fixed by either Gnulib module vdprintf or vdprintf-posix:
• 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.x, mingw, MSVC 14.

Portability problems fixed by Gnulib module vdprintf-posix:
• 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 ‘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.

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 errno or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

9.1213 vfprintf

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

GnuLib module: vfprintf-posix or stdio, nonblocking, sigpipe

Portability problems fixed by GnuLib module vfprintf-posix:
• 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 11.4, 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 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 ' 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 can crash in out-of-memory conditions on some platforms: FreeBSD 13.0, NetBSD 5.0.

Portability problems fixed by Gnulib module stdio or vfprintf-posix, 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, 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.

9.1214 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: 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, ll, j, t, z size specifiers.

### 9.1215 `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:

- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- 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.
- 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.

### 9.1216 `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.
9.1217 vprintf

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

Gnulib module: vprintf-posix or stdio, nonblocking, sigpipe

Portability problems fixed by Gnulib module vprintf-posix:

- 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 11.4, 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 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 ‘’ 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 "%.0f" 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 can crash in out-of-memory conditions on some platforms: FreeBSD 13.0, NetBSD 5.0.

Portability problems fixed by Gnulib module stdio or vprintf-posix, 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`, 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.

### 9.1218 `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.

### 9.1219 `vsnprintf`

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

GnuLib module: `vsnprintf` or `vsnprintf-posix`

Portability problems fixed by either GnuLib module `vsnprintf` or `vsnprintf-posix`:

- 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 GnuC lib module `vsnprintf-posix`:

- 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` of `"%e", "%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 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: 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` of `"%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 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: glibc when used with `_FORTIFY_SOURCE >= 2` (set by default on Ubuntu), macOS 11.1, HP-UX 11, mingw, MSVC 14.
- This function overwrites memory even when a zero size argument is passed on some platforms: HP-UX 11.

Portability problems not fixed by GnuClib:

- 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.

9.1220 vsprintf

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

Gnulib module: vsprintf-posix

Portability problems fixed by Gnulib:

- 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 11.4, 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 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 can crash in out-of-memory conditions on some platforms: FreeBSD 13.0, NetBSD 5.0.
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.
- 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.

### 9.1221 `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, ll, j, t, z size specifiers.

### 9.1222 `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:

- The `%a` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- 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.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.
9.1223 **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.

9.1224 **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:

- The %m directive is not portable, use %s mapped to an argument of **strerror(errno)** (or a version of **strerror_r**) instead.
- 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.
- 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.

9.1225 **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.

**9.1226 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.

**9.1227 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.

**9.1228 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:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
9.1229 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.

9.1230 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.

9.1231 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.

9.1232 wcscasecmp

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

Gnulib module: wcscasecmp

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, 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.

9.1233 wcscasecmp

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcscasecmp.1.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.

9.1234 wcscat

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

Gnulib module: wscat

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.
9.1235 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.

9.1236 wcscmp

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

Gnulib module: wcscmp

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.

9.1237 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.

9.1238 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.
9.1239 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.

9.1240 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.

9.1241 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.

9.1242 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, \texttt{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 9.1188 [tzset], page 430.

\subsection*{9.1243 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, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

\subsection*{9.1244 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.

- On Windows and 32-bit AIX platforms, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

\subsection*{9.1245 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, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.
9.1246 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.

9.1247 wcsncmp

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

Gnulib module: wcsncmp

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.

9.1248 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.
9.1249 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.

9.1250 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 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 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, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function c32snrtombs, provided by Gnulib module c32snrtombs, operates on 32-bit wide characters and therefore does not have this limitation.

9.1251 wcspbrk

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

Gnulib module: wcspbrk

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.
9.1252 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, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

9.1253 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, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function c32srtombs, provided by Gnulib module c32srtombs, operates on 32-bit wide characters and therefore does not have this limitation.

9.1254 wcspn

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcspn.html
Gnulib module: wcspn
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.

9.1255 wcsstr

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsstr.html
Gnulib module: wcsstr
Portability problems fixed by Gnulib:
• This function is missing 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.

**9.1256 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.

**9.1257 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, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.

**9.1258 wcstoimax**

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstoimax.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, wchar_t is a 16-bit type and therefore cannot accommodate all Unicode characters.
9.1259 **wcstok**

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

Gnulib module: wcstok

Portability problems 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 `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, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

9.1260 **wcstol**

POSIX specification:
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, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

9.1261 **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.
9.1262 `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.

9.1263 `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.

9.1264 `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, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

9.1265 `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.

9.1266 \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.

9.1267 \texttt{wcswidth}

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

Gnulib module: wcswidth

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, 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.

9.1268 \texttt{wcsxfrm}

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

Gnulib module: wcsxfrm

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.

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.

9.1269 \texttt{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.

9.1270 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.

9.1271 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.

9.1272 wctrans

POSIX specification:
https://pubs.opengroup.org/onlinepubs/9699919799/functions/wctrans.html
GnuLib module: wctrans

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, \texttt{wchar_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

\section*{9.1273 \texttt{wctrans\_l}}

POSIX specification:
\url{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, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

\section*{9.1274 \texttt{wctype}}

POSIX specification:
\url{https://pubs.opengroup.org/onlinepubs/9699919799/functions/wctype.html}

Gnulib module: \texttt{wctype}

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, MSVC 9.
- This function is declared in \texttt{<wchar.h>}, not in \texttt{<wctype.h>}, on some platforms: HP-UX 11.00.

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.

\section*{9.1275 \texttt{wctype\_l}}

POSIX specification:
\url{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, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.
9.1276 \texttt{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 \texttt{-D\_GNU\_SOURCE}) on some platforms: glibc 2.8.
- This function handles combining characters in UTF-8 locales incorrectly on some platforms: 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, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.
- This function treats zero-width spaces like control characters on some platforms: AIX 7.2.

9.1277 \texttt{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, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

9.1278 \texttt{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.

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.
9.1279 **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.

9.1280 **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.

9.1281 **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.

9.1282 **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.
9.1283 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.

9.1284 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:
- The %m directive is not portable, use %s mapped to an argument of strerror(errno) (or a version of strerror_r) instead.
- 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.
- 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.

9.1285 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 errorEINVAL, instead of obeying the current SIGPIPE handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by GnuLib:

• This function may fail with errorEINTR, even in programs that don’t install any signal handlers, on some platforms: macOS 11.1.

For handlingEINTR, GnuLib provides a module ‘safe-write’ with a function safe_write.

9.1286 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.

9.1287 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.
9.1288 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.

9.1289 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.

9.1290 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.
10 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>.

10.1 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.

10.2 bcopy

POSIX specification: https://pubs.opengroup.org/onlinepubs/009695399/functions/bcopy.html

Gnulib module: bcopy

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 memcpy or memmove instead.

10.3 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.
10.4 `bzero`

POSIX specification:  [functions/bzero.html](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.

10.5 `ecvt`

POSIX specification:  [functions/ecvt.html](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.

10.6 `fcvt`

POSIX specification:  [functions/fcvt.html](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.

10.7 `ftime`

POSIX specification:  [functions/ftime.html](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.
- 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.

### 10.8 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.

### 10.9 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.

### 10.10 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.

### 10.11 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.
10.12 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.

10.13 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.

10.14 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 marked as “legacy” in POSIX. Better use strchr instead.

10.15 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.
10.16 mktemp

**POSIX specification:** [https://pubs.opengroup.org/onlinepubs/009695399/functions/mktemp.html](https://pubs.opengroup.org/onlinepubs/009695399/functions/mktemp.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.) Therefore it is marked as “legacy” in POSIX. Better use **mkstemp** instead.

10.17 pthread_attr_getstackaddr

**POSIX specification:**
[https://pubs.opengroup.org/onlinepubs/009695399/functions/pthread_attr_getstackaddr.html](https://pubs.opengroup.org/onlinepubs/009695399/functions/pthread_attr_getstackaddr.html)

**Gnulib module:** —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, Cygwin 1.7.9, mingw, MSVC 14, Android 9.0.

10.18 pthread_attr_setstackaddr

**POSIX specification:**
[https://pubs.opengroup.org/onlinepubs/009695399/functions/pthread_attr_setstackaddr.html](https://pubs.opengroup.org/onlinepubs/009695399/functions/pthread_attr_setstackaddr.html)

**Gnulib module:** —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, Cygwin 1.7.9, mingw, MSVC 14, Android 9.0.

10.19 rindex

**POSIX specification:** [https://pubs.opengroup.org/onlinepubs/009695399/functions/rindex.html](https://pubs.opengroup.org/onlinepubs/009695399/functions/rindex.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 **strrchr** instead.
10.20 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:

10.21 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.

10.22 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.

10.23 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.
10.24 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.

10.25 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.

10.26 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.
- 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.
11 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>.

11.1 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.

11.2 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.

11.3 alloca.h

Declares the alloca function of function-like macro.

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Variable-Size-Automatic.html,

• 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:

11.4 ar.h

Describes the structure of files produced by the ‘ar’ program. Defines the type struct ar_hdr and the macros ARMAG, 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.

11.5 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:

11.6 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:
11.7 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:

11.8 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.

11.9 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.
11.10 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.

11.11 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.

11.12 error.h

Declares the functions error, error_at_line and the variables error_print_progname, error_message_count, error_one_per_line.

Documentation:

- man error.

Gnulib module: error

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:
11.13 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.

11.14 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.

11.15 fstab.h

Defines the type struct fstab, the macros FSTAB_*, _PATH_FSTAB, and declares the functions setfsent, endfsent, getfsent, getfsspec, getfsfile.

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/fstab.html,
• 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.
11.16 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: —

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.

11.17 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 5.1, 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:

11.18 gshadow.h

Defines the type struct sgrp and declares the functions setsgent, endsgent, getsgent, getsrgam, sgetsgent, fgetsgent, putsgent, getsrgent_r, getsrgam_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.
11.19 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: 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.

11.20 ifaddrs.h

Defines the type struct ifaddr 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.

11.21 libintl.h

Defines the macros __USE_GNU_GETTEXT, __GNU_GETTEXT_SUPPORTED_REVISION, and declares the functions gettext, dgettext, dcgettext, ngettext, dgettext, dcgettext, 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:
11.22 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.

11.23 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:

11.24 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.

11.25 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:
• https://www.gnu.org/software/libc/manual/html_node/mtab.html,
• 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.

### 11.26 obstack.h

Documentation:


Gnulib module: obstack

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.

### 11.27 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.

### 11.28 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.

**11.29 pty.h**

Declares the functions `openpty` and `forkpty`.

Documentation:

- `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.

**11.30 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:

Portability problems not 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.
11.31 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.

11.32 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, Solaris 11.4, Haiku 2017.

Portability problems not fixed by Gnulib:

11.33 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:
11.34 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:

11.35 ttyent.h

Defines the type struct ttyent and declares the functions settyent, endttyent, getttyent, getttynam.

Documentation:
• man settyent.

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 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.

12.1 Glibc Extensions to <aio.h>

12.1.1 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.

12.2 Glibc <aliases.h>

12.2.1 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.
12.2.2 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.

12.2.3 getaliasbyname_r

Documentation:
man getaliasbyname_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.

12.2.4 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.

12.2.5 getaliasent_r

Documentation:
man getaliasent_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.
12.2.6 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.

12.3 Glibc <argp.h>

12.3.1 argp_err_exit_status


Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not 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.

12.3.2 argp_error


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.

12.3.3 argp_failure


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.

12.3.4 argp_help

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.

12.3.5 argp_parse

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.

12.3.6 argp_program_bug_address

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not 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.

12.3.7 argp_program_version

Documentation:

Gnulib module: —
Portability problems fixed by Gnulib:

Portability problems not 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.

12.3.8 argp_program_version_hook

Documentation:

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not 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.

12.3.9 argp_state_help

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.

12.3.10 argp_usage

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.
Chapter 12: Glibc Function Substitutes

12.4 Glibc <argz.h>

12.4.1 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:

12.4.2 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:

12.4.3 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:

12.4.4 argz_count

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-argz-add.html

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html,
• 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:

12.4.5 argz_create

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/ 
baselib-argz-add.html

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html,
• 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.
12.4.6 argz_create_sep

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html,
- 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:

12.4.7 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:

12.4.8 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:

12.4.9 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:

12.4.10 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:

12.4.11 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:

12.4.12 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:

12.5 Glibc Extensions to <arpa/inet.h>

12.5.1 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.
12.5.2 *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.

12.5.3 *inet_makeaddr*

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Host-Address-Functions.html,
- 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.

12.5.4 *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.

12.5.5 *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.
12.5.6 inet_netof

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Host-Address-Functions.html,
- 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.

12.5.7 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.

12.5.8 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.

12.5.9 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.
12.6 Glibc <byteswap.h>

12.6.1 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.

12.6.2 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.

12.6.3 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.

12.7 Glibc Extensions to <complex.h>

12.7.1 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.

12.7.2 clog10f

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib---clog10f.html

Documentation:

- man clog10f.

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.

12.7.3 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.
12.8 Glibc Extensions to <ctype.h>

### 12.8.1 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.

12.9 Glibc Extensions to <dirent.h>

### 12.9.1 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.

### 12.9.2 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.

### 12.9.3 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.

12.10 Glibc Extensions to <dlfcn.h>

12.10.1 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.

12.10.2 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.

12.10.3 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.
12.10.4 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.

12.10.5 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.

12.11 Glibc <envz.h>

12.11.1 envz_add

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-envz-add.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Envz-Functions.html,
• 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.
12.11.2 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:
- 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.

12.11.3 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:
- 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.

12.11.4 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:
- 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.
12.11.5 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.

12.11.6 envz_strip

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-envz-add.html

Documentation:
- 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.

12.12 Glibc <err.h>

12.12.1 err

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-err-3.html

Documentation:
- 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.
12.12.2 errx

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-errx-3.html

Documentation:
- 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.

12.12.3 verr

Documentation:
- man verr.

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.

12.12.4 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:

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.
12.12.5 vwarn

Documentation:
- man vwarn.

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.

12.12.6 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.

12.12.7 warn

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-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.

12.12.8 warnx

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-warnx-3.html

Documentation:
- man warnx.
12.13 Glibc Extensions to <errno.h>

12.13.1 program_invocation_name

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html,
• man program_invocation_name.

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.

12.13.2 program_invocation_short_name

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html,
• man program_invocation_short_name.

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.

12.14 Glibc <error.h>

12.14.1 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.

Portability problems not fixed by Gnulib:

12.14.2 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:

12.14.3 error_message_count
Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html,
• 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:

12.14.4 error_one_per_line
Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html,
• 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:
12.14.5 **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:

12.15 **Glibc <execinfo.h>**

12.15.1 **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.

12.15.2 **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.
12.15.3 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.

12.16 Glibc Extensions to <fcntl.h>

12.16.1 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.

12.16.2 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.
12.16.3 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.

12.16.4 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.

12.16.5 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.

12.17 Glibc Extensions to <fenv.h>

12.17.1 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.

12.17.2 feenableexcept

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-feenableexcept.html

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.

12.17.3 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.
12.18 Glibc Extensions to `<fmtmsg.h>`

12.18.1 `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.

12.19 Glibc `<fstab.h>`

12.19.1 `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.

12.19.2 `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.
12.19.3 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.

12.19.4 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.

12.19.5 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.

12.20 Glibc <fts.h>

12.20.1 fts_children

Documentation:
man fts_children

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.
Chapter 12: Glibc Function Substitutes

- 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).

**12.20.2 fts_close**

Documentation:

```
man fts_close
```

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.

**12.20.3 fts_open**

Documentation:

```
man fts_open
```

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.

**12.20.4 fts_read**

Documentation:

```
man fts_read
```

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.
- 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).

**12.20.5 fts_set**

Documentation:

```
man fts_set
```

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.

12.21 Glibc <getopt.h>

12.21.1 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 -W 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:

12.21.2 getopt_long_only

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getopt-long-only-3.html
Chapter 12: Glibc Function Substitutes

Documentation:
- 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 ‘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 `getopt_long_only` in new programs.

### 12.22 Glibc Extensions to `<glob.h>`

#### 12.22.1 `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.
12.23 Glibc Extensions to <gnu/libc-version.h>

12.23.1 gnu_get_libc_release

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gnu-get-libc-version-1.html

Documentation:
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.

12.23.2 gnu_get_libc_version

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gnu-get-libc-version-1.html

Documentation:
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.

12.24 Glibc Extensions to <grp.h>

12.24.1 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.
12.24.2 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.

12.24.3 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.

12.24.4 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.
12.24.5 initgroups

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-initgroups-3.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Setting-Groups.html,
• 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.

12.24.6 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.

12.24.7 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).
12.25 Glibc <gshadow.h>

12.25.1 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.

12.25.2 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.

12.25.3 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.

12.25.4 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.

12.25.5 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.
12.25.6 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.

12.25.7 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.

12.25.8 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.

12.25.9 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.

12.25.10 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.
12.25.11  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.

12.26  Glibc <ifaddrs.h>

12.26.1  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.

12.26.2  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.

12.27  Glibc <libintl.h>

12.27.1  bind_textdomain_codeset

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-bind-textdomain-codeset.html

Documentation:


- 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.

12.27.2 bindtextdomain
LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-bindtextdomain.html
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.

12.27.3 dcgettext
LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dcgettext.html
Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Translation-with-gettext.html,
• man dcgettext.

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.

12.27.4 dcngettext
LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dcngettext.html
Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Advanced-gettext-functions.html,
• man dcngettext.
  Gnu;lib module: —
  Portability problems fixed by Gnu;lib:
  Portability problems not fixed by Gnu;lib:
  • 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.

12.27.5 dgettext

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dgettext.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Translation-with-gettext.html,
  • man dgettext.

Gnu;lib module: —
Portability problems fixed by Gnu;lib:
Portability problems not fixed by Gnu;lib:
• 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.

12.27.6 dngettext

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dngettext.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Advanced-gettext-functions.html,
  • man dngettext.

Gnu;lib module: —
Portability problems fixed by Gnu;lib:
Portability problems not fixed by Gnu;lib:
• 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.

12.27.7 gettext

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gettext.html

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.

12.27.8 ngettext

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ngettext.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Advanced-gettext-functions.html,
• 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.

12.27.9 textdomain

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-textdomain.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Locating-gettext-catalog.html,
• 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.

12.28 Glibc <link.h>
12.28.1 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.

12.29 Glibc <malloc.h>

12.29.1 mallinfo

Documentation:

  html,

• 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.

12.29.2 mallinfo2

Documentation:

  html,

• 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.
12.29.3 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.

12.29.4 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.

12.29.5 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.

12.29.6 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.
12.29.7 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.

12.29.8 memalign

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Aligned-Memory-Blocks.html,
- 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.

12.29.9 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.
12.30 Glibc Extensions to <math.h>

12.30.1 drem

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-drem.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Remainder-Functions.html,
• 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.

12.30.2 dremf

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dremf.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Remainder-Functions.html,
• 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.

12.30.3 dreml

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dreml.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Remainder-Functions.html,
• 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.

12.30.4 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.

12.30.5 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.

12.30.6 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.

12.30.7 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.
  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, MSVC 14.

12.30.8 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.
  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.

12.30.9 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.

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.

12.30.10 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,
  • 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.

12.30.11 gammaf

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-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.

12.30.12 gammal

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-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.

12.30.13 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.

12.30.14 isnfl

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Floating-Point-Classes.html,
• man isnfl.

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.

12.30.15 isnanf

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Floating-Point-Classes.html,
• man isnanf.
Gnulib module: isnanf
Portability problems 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.
Portability problems not fixed by Gnulib:

12.30.16 isnanl

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Floating-Point-Classes.html,
• man isnanl.

Gnulib module: isnanl
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, 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:

12.30.17 j0f

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-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.

12.30.18 j0l

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-j0l.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html,
• man j0l.
Chapter 12: Glibc Function Substitutes

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.

12.30.19 j1f

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-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.

12.30.20 j1l

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.

12.30.21 jnf

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-jnf.html
12.30.22  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,
• 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.

12.30.23  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.
12.30.24 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.

12.30.25 lgammal_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-lgammal-r.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html,
- man lgammal_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, 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.

12.30.26 matherr

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-matherr-1.html

Documentation:
man matherr

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.
12.30.27 pow10

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-pow10.html

Documentation:
man pow10

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.

12.30.28 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.

12.30.29 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.
12.30.30 scalbf

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-scalbf.html

Documentation:
- man scalbf.

Gnulib module: —

Portability problems 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.

12.30.31 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:
- 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.

12.30.32 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:
- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.
12.30.33 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.

12.30.34 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.

12.30.35 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.
12.30.36 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 sincosf.

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.

12.30.37 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.

12.30.38 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.
12.30.39  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, IRIDX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

12.30.40  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, IRIDX 6.5, mingw, MSVC 14.

12.30.41  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.

**12.30.42 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.

**12.30.43 ynl**

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ynl.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html,
- 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.

**12.31 Glibc <mcheck.h>**

**12.31.1 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.

12.31.2 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.

12.31.3 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.

12.31.4 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.
12.31.5 mtrace

Documentation:

- 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.

12.31.6 muntrace

Documentation:

- 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.

12.32 Glibc <mntent.h>

12.32.1 addmntent

Documentation:

- 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.

12.32.2 endmntent

Documentation:

- man endmntent.
**Chapter 12: Glibc Function Substitutes**

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.

### 12.32.3 `getmntent`

Documentation:

- `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.

### 12.32.4 `getmntent_r`

Documentation:

- `man getmntent_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 1.7.x, mingw, MSVC 14, Android 4.4.

### 12.32.5 `hasmntopt`

Documentation:

- `man hasmntopt`.

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 7.1.
12.32.6 setmntent

Documentation:
- man setmntent.

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.

12.33 Glibc Extensions to <netdb.h>

12.33.1 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.

12.33.2 gethostbyaddr_r

LSB specification:
https://www.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.
12.33.3 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.

12.33.4 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.

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.

12.33.5 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.
12.33.6 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.

12.33.7 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.

12.33.8 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.

12.33.9 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.

12.33.10 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.

12.33.11 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.

12.33.12 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.

12.33.13 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.
12.33.14 **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:
- 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.

12.33.15 **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:
- 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.

12.33.16 **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:
- 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.

12.33.17 **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.

12.33.18 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.

12.33.19 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.

12.33.20 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.

12.33.21 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.
12.33.22 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.

12.33.23 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.

12.33.24 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.

12.33.25 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.
12.33.26 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.

12.33.27 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.

12.33.28 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.

12.33.29 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.
12.34 Glibc <netinet/ether.h>

12.34.1 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.

12.34.2 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.

12.34.3 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.

12.34.4 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.
12.34.5 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.

12.34.6 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.

12.34.7 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.

12.35 Glibc Extensions to <netinet/in.h>

12.35.1 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.
12.35.2 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.

12.35.3 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.

12.35.4 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.

12.35.5 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.

12.35.6 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.
12.35.7 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.

12.35.8 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.

12.35.9 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.

12.35.10 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.

12.35.11 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.

12.35.12 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.
12.35.13 **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.

12.35.14 **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.

12.35.15 **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.

12.35.16 **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.

12.35.17 **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.
12.35.18 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.

12.35.19 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.

12.35.20 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.

12.35.21 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.

12.35.22 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.
12.35.23 **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.

12.35.24 **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.

12.35.25 **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.

12.35.26 **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.

12.36 **Glibc <obstack.h>**

12.36.1 **obstack_alloc_failed_handler**


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.

12.36.2 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.

12.36.3 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.

12.36.4 obstack_printf

Documentation:

Gnulib module: obstack-printf or obstack-printf-posix

Portability problems fixed by either Gnulib module obstack-printf or obstack-printf-posix:

• 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 Gnulib module obstack-printf-posix:

• 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 ‘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 ‘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 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 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 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.

12.36.5 obstack_vprintf

Documentation:

Gnulib module: obstack-printf or obstack-printf-posix

Portability problems fixed by either Gnulib module obstack-printf or obstack-printf-posix:
• 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 Gnulib module obstack-printf-posix:
• 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.
Chapter 12: Glibc Function Substitutes

- 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 ‘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 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 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.

12.37 Glibc Extensions to <poll.h>

12.37.1 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.
12.38 Glibc `<printf.h>`

12.38.1 `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.

12.38.2 `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.

12.38.3 `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.

12.38.4 `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.

12.38.5 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.

12.38.6 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.

12.38.7 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.

12.39 Glibc Extensions to <pthread.h>

12.39.1 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.
12.39.2 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.

12.39.3 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.

12.39.4 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.

12.39.5 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.
12.39.6 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.

12.39.7 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.

12.39.8 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.

12.39.9 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
Chapter 12: Glibc Function Substitutes

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.

12.39.10 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.

12.39.11 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.

12.39.12 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.
12.39.13  pthread_rwlock_clockrdlock

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.

12.39.14  pthread_rwlock_clockwrlock

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.

12.39.15  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.

12.39.16  pthread_rwlockattr_setkind_np

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pthread_rwlockattr-setkind-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.

12.39.17 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.

12.39.18 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.

12.39.19 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.

12.39.20 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.

12.39.21 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.

12.39.22 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.

12.40 Glibc `<pty.h>`

12.40.1 forkpty

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Pseudo_002dTerminal-Pairs.html,
• 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.

12.40.2 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.

12.41 Glibc Extensions to <pwd.h>
### 12.41.1 `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.

### 12.41.2 `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.

### 12.41.3 `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.

### 12.41.4 `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.

12.41.5 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.

12.42 Glibc Extensions to <regex.h>

12.42.1 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.

12.42.2 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.
12.42.3 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.

12.42.4 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.

12.42.5 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.

12.42.6 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.

12.42.7 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.
12.42.8 re_search_2

Glibc module: —

Portability problems fixed by GnuClib:

Portability problems not fixed by GnuClib:

• 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.

12.42.9 re_set_registers

Glibc module: —

Portability problems fixed by GnuClib:

Portability problems not fixed by GnuClib:

• 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.

12.42.10 re_set_syntax

Glibc module: —

Portability problems fixed by GnuClib:

Portability problems not fixed by GnuClib:

• 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.

12.42.11 re_syntax_options

Glibc module: —

Portability problems fixed by GnuClib:

Portability problems not fixed by GnuClib:

• 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.

12.43 Glibc <regexp.h>

12.43.1 advance

Glibc module: —

Portability problems fixed by GnuClib:

Portability problems not fixed by GnuClib:

• 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.
12.43.2 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.

12.43.3 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.

12.43.4 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.

12.43.5 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.

12.44 Glibc <resolv.h>

12.44.1 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.
12.44.2 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.

12.44.3 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.

12.44.4 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.

12.44.5 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.

12.44.6 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.
12.44.7 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.

12.44.8 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.

12.44.9 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.

12.44.10 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.
12.44.11 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.

12.44.12 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.

12.44.13 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.

12.44.14 res_ownok

Documentation:
man res_owned

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.
12.44.15 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.

12.44.16 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.

12.44.17 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.

12.44.18 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.

12.45 Glibc <rpc/auth.h>

12.45.1 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.
12.45.2 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.

12.45.3 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.

12.45.4 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.

12.45.5 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.

12.45.6 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.
12.45.7 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.

12.45.8 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.

12.45.9 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.

12.45.10 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.

12.45.11 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.
12.45.12 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.

12.45.13 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.

12.45.14 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.

12.45.15 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.

12.45.16 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.
12.45.17 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.

12.45.18 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.

12.45.19 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.

12.45.20 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.

12.46 Glibc <rpc/auth_des.h>

12.46.1 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.
12.46.2 `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.

12.46.3 `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.

12.46.4 `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.

12.47 Glibc `<rpc/auth_unix.h>`

12.47.1 `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.

12.48 Glibc `<rpc/clnt.h>`
12.48.1 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.

12.48.2 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.

12.48.3 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.

12.48.4 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.

12.48.5 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.

### 12.48.6 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.

### 12.48.7 clnt_sperrno

Documentation:
man clnt_sperrno

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.

### 12.48.8 clnt_sperror

Documentation:
man clnt_sperror

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.

### 12.48.9 clntraw_create

Documentation:
man clntraw_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.
12.48.10 clnttcp_create

Documentation:
man clnttcp_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.

12.48.11 clntudp_bufcreate

Documentation:
man clntudp_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.

12.48.12 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.

12.48.13 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.

12.48.14 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.

12.48.15 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.

12.48.16 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.

12.49 Glibc <rpc/key_prot.h>

12.49.1 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.

12.49.2 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.
12.49.3 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.

12.49.4 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.

12.49.5 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.

12.49.6 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.

12.49.7 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.

12.49.8 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.
12.49.9 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.

12.49.10 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.

12.50 Glibc <rpc/netdb.h>

12.50.1 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.

12.50.2 getrpcbynamel

Documentation:
man getrpcbynamel
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.

12.50.3 getrpcbynamel_r

Documentation:
man getrpcbynamel_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.
12.50.4 getrpcbypnumber

Documentation:
man getrpcbypnumber

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.

12.50.5 getrpcbypnumber_r

Documentation:
man getrpcbypnumber_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.

12.50.6 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.

12.50.7 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.

12.50.8 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.

12.51 Glibc <rpc/pmap_clnt.h>

12.51.1 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.

12.51.2 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.

12.51.3 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.
12.51.4 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.

12.51.5 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.

12.51.6 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.

12.52 Glibc <rpc/pmap_prot.h>

12.52.1 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.

12.52.2 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.

12.53 Glibc <rpc/pmap_rmt.h>

12.53.1 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.

12.53.2 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.

12.54 Glibc <rpc/rpc_msg.h>

12.54.1 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.
12.54.2 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.

12.54.3 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.

12.55 Glibc <rpc/svc.h>

12.55.1 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.

12.55.2 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.

12.55.3 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.
12.55.4 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.

12.55.5 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.

12.55.6 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.

12.55.7 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.

12.55.8 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.
12.55.9 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.

12.55.10 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.

12.55.11 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.

12.55.12 svc_unregister

Documentation:
man svc_unregister

Gnulib module: —
Portability problems fixed by Gnumib:

Portability problems not fixed by Gnumib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

12.55.13 svcerr_auth

Documentation:
man svcerr_auth

Gnumib module: —

Portability problems fixed by Gnumib:

Portability problems not fixed by Gnumib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

12.55.14 svcerr_decode

Documentation:
man svcerr_decode

Gnumib module: —

Portability problems fixed by Gnumib:

Portability problems not fixed by Gnumib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

12.55.15 svcerr_noproc

Documentation:
man svcerr_noproc

Gnumib module: —

Portability problems fixed by Gnumib:

Portability problems not fixed by Gnumib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

12.55.16 svcerr_noprog

Documentation:
man svcerr_noprog

Gnumib module: —

Portability problems fixed by Gnumib:

Portability problems not fixed by Gnumib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
12.55.17 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.

12.55.18 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.

12.55.19 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.

12.55.20 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.

12.55.21 svtcp_create

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-svctp-create-3.html
Documentation:
man svtcp_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.

12.55.22 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.

12.55.23 svcudp_create

LSB specification:
https://refsspecs.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.

12.55.24 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.

12.55.25 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.
12.55.26 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.

12.56 Glibc <rpc/xdr.h>

12.56.1 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.

12.56.2 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.

12.56.3 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.
12.56.4 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.

12.56.5 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.

12.56.6 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.

12.56.7 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.

12.56.8 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.

12.56.9 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.

12.56.10 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.

12.56.11 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.

12.56.12 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.

12.56.13 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.
12.56.14  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.

12.56.15  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.

12.56.16  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.

12.56.17  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.

12.56.18  xdr_opaque

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.
12.56.19 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.

12.56.20 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.

12.56.21 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.

12.56.22 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.

12.56.23 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.
12.56.24 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.

12.56.25 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.

12.56.26 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.

12.56.27 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.
12.56.28 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.

12.56.29 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.

12.56.30 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.

12.56.31 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.

12.56.32 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.
12.56.33 xdr_uint32_t
GnuC module: —

Portability problems fixed by GnuC:

Portability problems not fixed by GnuC:

- 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.

12.56.34 xdr_uint64_t
GnuC module: —

Portability problems fixed by GnuC:

Portability problems not fixed by GnuC:

- 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.

12.56.35 xdr_uint8_t
GnuC module: —

Portability problems fixed by GnuC:

Portability problems not fixed by GnuC:

- 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.

12.56.36 xdr_union
Documentation:
man xdr_union

GnuC module: —

Portability problems fixed by GnuC:

Portability problems not fixed by GnuC:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

12.56.37 xdr_vector
Documentation:
man xdr_vector

GnuC 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.

12.56.38 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.

12.56.39 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.

12.56.40 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.

12.56.41 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.
12.56.42  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.

12.56.43  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.

12.56.44  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.

12.56.45  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.
12.57 Glibc <rpcsvc/nislib.h>

12.57.1 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.

12.57.2 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.

12.57.3 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.

12.57.4 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.

12.57.5 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.
12.57.6 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.

12.57.7 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.

12.57.8 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.

12.57.9 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.

12.57.10 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.
12.57.11 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.

12.57.12 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.

12.57.13 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.

12.57.14 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.

12.57.15 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.
12.57.16 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.

12.57.17 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.

12.57.18 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.

12.57.19 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.

12.57.20 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.
12.57.21 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.

12.57.22 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.

12.57.23 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.

12.57.24 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.

12.57.25 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.
12.57.26 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.

12.57.27 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.

12.57.28 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.

12.57.29 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.

12.57.30 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.
12.57.31 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.

12.57.32 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.

12.57.33 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.

12.57.34 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.

12.57.35 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.
12.57.36 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.

12.57.37 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.

12.57.38 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.

12.57.39 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.

12.57.40 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.
12.57.41 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.

12.57.42 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.

12.57.43 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.

12.57.44 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.

12.57.45 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.
12.57.46 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.

12.57.47 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.

12.57.48 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.

12.57.49 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.

12.57.50 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.
12.57.51 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.

12.57.52 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.

12.57.53 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.

12.57.54 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.

12.57.55 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.
12.58  Glibc <rpcsvc/nis_callback.h>

12.58.1  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.

12.58.2  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.

12.59  Glibc <rpcsvc/yp.h>

12.59.1  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.

12.59.2  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.

12.59.3  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.
12.59.4 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.

12.59.5 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.

12.59.6 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.

12.59.7 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.

12.59.8 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.

12.59.9 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.
12.59.10 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.

12.59.11 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.

12.59.12 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.

12.59.13 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.

12.59.14 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.

12.59.15 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.
12.59.16  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.

12.59.17  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.

12.59.18  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.

12.59.19  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.

12.60  Glibc <rpcsvc/ypclnt.h>

12.60.1  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.
12.60.2 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.

12.60.3 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.

12.60.4 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.

12.60.5 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.

12.60.6 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.

12.60.7 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.
12.60.8 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.

12.60.9 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.

12.60.10 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.

12.60.11 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.

12.60.12 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.
12.61 Glibc Extensions to `<sched.h>`

12.61.1 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.

12.61.2 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.

12.61.3 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.
### 12.61.4 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.

### 12.61.5 sched_setaffinity

LSB specification:

[https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/ baselib-sched-setaffinity.html](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.

### 12.61.6 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.

### 12.62 Glibc Extensions to `<search.h>`

#### 12.62.1 hcreate_r

LSB specification:

[https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-hcreate-r.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-hcreate-r.html)
Chapter 12: Glibc Function Substitutes

Documentation:

- 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.

12.62.2 hdestroy_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-hdestroy-r.html

Documentation:

- 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.

12.62.3 hsearch_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-hsearch-r.html

Documentation:

- 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.
12.62.4 tdestroy

Documentation:

- 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.

12.62.5 twalk_r

Documentation:

- man twalk_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.

12.63 Glibc Extensions to <selinux/selinux.h>

12.63.1 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:

12.63.2 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:

12.63.3 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, 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 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:
12.64 Glibc Extensions to <semaphore.h>

12.64.1 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, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

12.65 Glibc <shadow.h>

12.65.1 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.

12.65.2 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.

12.65.3 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.

### 12.65.4 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.

### 12.65.5 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.

### 12.65.6 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.

### 12.65.7 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.

12.65.8 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.

12.65.9 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.

12.65.10 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.

12.65.11 sgetspent

Documentation:
man sgetspent

Gnulib module: —
Chapter 12: Glibc Function Substitutes

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.

12.65.12 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.

12.65.13 ulckpwdf

Documentation:

man ulckpwdf

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.

12.66 Glibc Extensions to <signal.h>

12.66.1 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.
12.66.2 sigandset

LSB specification:
https://refspecs.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.

12.66.3 sigblock

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/BSD-Signal-Handling.html,
• man sigblock.

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.

12.66.4 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.

12.66.5 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.

12.66.6 sigorset

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-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.

12.66.7 sigreturn

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-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.

12.66.8 sigsetmask

Documentation:

- 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.
12.66.9 sigstack

Documentation:
- 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.

12.66.10 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.

12.66.11 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.

12.66.12 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.
12.66.13 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.

12.66.14 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.

12.67 Glibc Extensions to <spawn.h>

12.67.1 posix_spawn_file_actions_addchdir_np

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.28, 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 2.9, 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.
12.67.2 posix_spread_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.

12.67.3 posix_spread_file_actions_addfchdir_np

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.28, 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 2.9, mingw, MSVC 14, Android 9.0.

Note: Gnulib has a module posix_spread_file_actions_addfchdir that provides equivalent functionality, just without the suffix _np.

12.68 Glibc Extensions to <stdio.h>

12.68.1 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

Portability problems fixed by either Gnulib module vasprintf or vasprintf-posix:

- 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 Gnulib module vasprintf-posix:

- 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 ‘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 ' 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 can crash in out-of-memory conditions on some platforms: FreeBSD 13.0, NetBSD 5.0.

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.

12.68.2 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.

12.68.3 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.
12.68.4 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.

12.68.5 feof_unlocked

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/ baselib-feof-unlocked-1.html

Documentation:
- 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.

12.68.6 ferror_unlocked

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/ baselib-ferror-unlocked-1.html

Documentation:
- 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.
12.68.7 fflush_unlocked

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fflush-unlocked-1.html

Documentation:
- 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.

12.68.8 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.

12.68.9 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.
12.68.10 fileno_unlocked

LSB specification:
https://refsspecs.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:
- 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.

12.68.11 fopencookie

Documentation:
  html,
- man fopencookie.

Gnulib module: —

Portability problems 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.

12.68.12 fputc_unlocked

LSB specification:
https://refsspecs.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:
- 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.
12.68.13 fputs_unlocked

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-fputs-unlocked-1.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Simple-Output.html,
• man fputs_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.

12.68.14 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\_Output.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.

12.68.15 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\_Output.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.

**12.68.16 getw**

Documentation:


GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Android 9.0.

**12.68.17 putw**

Documentation:


GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

**12.68.18 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.

**12.68.19 setbuffer**

LSB specification:

[https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-setbuffer-3.html](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.

12.68.20 setlinebuf

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Controlling-Buffering.html,
• 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.

12.68.21 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.

12.68.22 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.
12.68.23 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.

12.68.24 vasprintf

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/ baselib-vasprintf.html

Documentation:
- man vasprintf.

Gnulib module: vasprintf or vasprintf-posix

Portability problems fixed by either Gnulib module vasprintf or vasprintf-posix:
- 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 Gnulib module vasprintf-posix:
- 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 ‘F’ directive on some platforms: NetBSD 3.0, Cygwin 1.5.x.
- This function does not support the ‘1s’ directive on some platforms: OpenBSD 4.0, 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.
- 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 can crash in out-of-memory conditions on some platforms: FreeBSD 13.0, NetBSD 5.0.

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.

12.69 Glibc Extensions to <stdlib.h>

12.69.1 canonicalize_file_name

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Symbolic-Links.html,
• 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:

12.69.2 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.

12.69.3 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.

12.69.4 `drand48_r`

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-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.

12.69.5 `ecvt_r`

Documentation:
- 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.

12.69.6 `erand48_r`

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-erand48-r-1.html

Documentation:
- 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.

12.69.7 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 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

12.69.8 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:

12.69.9 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.

12.69.10 initstate_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-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 has a slightly different (but compatible) declaration on some platforms: Haiku 2017.

12.69.11 jrand48_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-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.
12.69.12 `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.

12.69.13 `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.

12.69.14 `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.

**12.69.15 mkostemps**

Documentation:

man mkostemps

Gnulib module: mkostemps

Portability problems 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 gnulib module clean-temp can create temporary files that will not be left behind after signals such as SIGINT.

**12.69.16 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 gnulib module clean-temp can create temporary files that will not be left behind after signals such as SIGINT.

**12.69.17 mrand48_r**

LSB specification:

https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-mrand48-r-1.html

Documentation:

• 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.

12.69.18 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.

12.69.19 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.

12.69.20 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.

12.69.21 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.

12.69.22 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.
12.69.23 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.

12.69.24 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.

12.69.25 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.
12.69.26 *qsort_r*

Documentation:

man qsort_r

Gnulib module: —

Portability problems 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:

12.69.27 *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.

12.69.28 *rpmatch*

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/Yes_or_No-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:
12.69.29 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:

12.69.30 seed48_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-seed48-r-1.html

Documentation:
- 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.

12.69.31 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.
12.69.32 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.

12.69.33 srandom_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-srandom-r-1.html

Documentation:
- man srandom_r.

Gnulib module: random_r
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.

12.69.34 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.

12.69.35 strtof_l

Gnulib module: —
Chapter 12: Glibc Function Substitutes

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.

12.69.36 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.

12.69.37 strtold_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.

12.69.38 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.

12.69.39 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.

12.69.40  **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.

12.69.41  **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.

12.69.42  **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.

12.69.43  **valloc**

Documentation:


• 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.
12.70 Glibc Extensions to <string.h>

12.70.1 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.

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.

12.70.2 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.

Portability problems not fixed by Gnulib:

12.70.3 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.
• This function returns completely wrong values on some platforms: AIX 7.2 in 32-bit mode.

Portability problems not fixed by GnuLib:

12.70.4 memfrob

Documentation:
• `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.

12.70.5 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, Solaris 11.4, 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, FreeBSD 6.2, NetBSD 9.0, AIX 5.1, Solaris 11.4, Cygwin 1.5.x. Note for small needles the replacement may be slower.
Portability problems not fixed by Gnulib:

12.70.6 mempcpy

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Copying-Strings-and-Arrays.html,
• 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:

12.70.7 memrchr

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-memrchr.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Search-Functions.html,
• 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:

12.70.8 rawmemchr

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Search-Functions.html,
• 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:
12.70.9 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.

12.70.10 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:

Note: This function is hardly useful, because it returns English strings, not internationalized strings. Better use the function strsignal, which returns internationalized strings.

12.70.11 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 5.1, 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, FreeBSD 6.2, NetBSD 9.0, OpenBSD 4.0, Solaris 11.4.

Portability problems not fixed by GnuLib:

### 12.70.12 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:

### 12.70.13 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.

### 12.70.14 strerrormame_np

Documentation:


GnuLib module: `strerrormame_np`

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.
- This function returns wrong values on some platforms: glibc 2.32.

Portability problems not fixed by GnuLib:
12.70.15 strfry

Documentation:
- man strfry.

Gnulib module: —

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.

12.70.16 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:
- This function is missing on some platforms: HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

12.70.17 strverscmp

Documentation:
- man strverscmp.

Gnulib module: strverscmp

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:
- On older glibc platforms, this function does not always properly treat digit strings with leading zeros as fractions (for example, strverscmp ("B0075022800016.gbp.corp.com", "B007502357019.GBP.CORP.COM") does not yield a negative number as it should): glibc 2.9
12.71 Glibc <sys/auxv.h>

12.71.1 getauxval

Documentation:

- 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.

12.72 Glibc <sys/capability.h>

12.72.1 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.

12.72.2 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.

12.73 Glibc <sys/epoll.h>
12.73.1 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.

12.73.2 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.

12.73.3 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.

12.73.4 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.

12.73.5 epoll_wait

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-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.

12.74 Glibc <sys/eventfd.h>

12.74.1 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.

12.74.2 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.
12.74.3 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.

12.75 Glibc <sys/fanotify.h>

12.75.1 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.

12.75.2 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.

12.76 Glibc <sys/file.h>

12.76.1 flock

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-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:

12.77 Glibc <sys/fsuid.h>

12.77.1 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.

12.77.2 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.

12.78 Glibc <sys/gmon.h>

12.78.1 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.
12.79 Glibc <sys/inotify.h>

12.79.1 `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.

12.79.2 `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.

12.79.3 `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.

12.79.4 `inotify_rm_watch`

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/
baselib-inotify-rm-watch.html
Documentation:
man inotify_rm_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.

12.80 Glibc <sys/io.h>, <sys/perm.h>

12.80.1 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.

12.80.2 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.

12.81 Glibc <sys/kdaemon.h>

12.81.1 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.
12.82 Glibc <sys/klog.h>

12.82.1 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.

12.83 Glibc Extensions to <sys/mman.h>

12.83.1 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.

12.83.2 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.
12.83.3 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.

12.83.4 mlock2

Documentation:

- 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.

12.83.5 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.

12.83.6 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:
  

12.83.7 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:
  

12.83.8 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:
  

12.83.9 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:
  
12.83.10 \textbf{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: 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.

12.83.11 \textbf{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.

12.84 Glibc <sys/mount.h>

12.84.1 \textbf{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.

12.84.2 \textbf{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.
12.84.3 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.

12.85 Glibc <sys/personality.h>

12.85.1 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.

12.86 Glibc <sys/prctl.h>

12.86.1 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.

12.87 Glibc <sys/profil.h>
12.87.1 sprofil
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.

12.88 Glibc <sys/ptrace.h>

12.88.1 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.

12.89 Glibc <sys/quota.h>

12.89.1 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.

12.90 Glibc <sys/random.h>

12.90.1 getentropy
Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Unpredictable-Bytes.html,
• man getentropy.
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 9.0.
- 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.

12.90.2 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 9.0.
- 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.

12.91 Glibc <sys/reboot.h>

12.91.1 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.

12.92 Glibc Extensions to <sys/resource.h>

12.92.1 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.

12.93 Glibc Extensions to <sys/sem.h>

12.93.1 semtimedop

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Semaphores.html,
• 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.

12.94 Glibc <sys/sendfile.h>
12.94.1 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.

12.95 Glibc <sys/signalfd.h>

12.95.1 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.

12.96 Glibc <sys/single_threaded.h>

12.96.1 __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.
12.97 Glibc Extensions to <sys/socket.h>

12.97.1 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.

12.97.2 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.

12.97.3 recvmmsg

Documentation:
man recvmmsg

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.

12.97.4 sendmmsg

Documentation:
man sendmmsg

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.

12.98 Glibc Extensions to <sys/stat.h>

12.98.1 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:

12.98.2 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.

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.

12.98.3 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.
12.99 Glibc <sys/statfs.h>

12.99.1 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.

12.99.2 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.

12.100 Glibc <sys/swap.h>

12.100.1 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.
12.100.2 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.

12.101 Glibc <sys/sysctl.h>

12.101.1 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.

12.102 Glibc <sys/sysinfo.h>

12.102.1 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.

12.102.2 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.

12.102.3 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.

12.102.4 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.

12.102.5 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.

12.103 Glibc <sys/syslog.h>

12.103.1 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.

12.104 Glibc <sys/sysmacros.h>

12.104.1 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 pro- voces 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.

12.104.2 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.

12.104.3 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 some non-glibc platforms: Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

12.105 Glibc Extensions to <sys/time.h>

12.105.1 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.
12.105.2 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.

12.105.3 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
```
file ? utimensat(fd, file, times, 0)
: futimens(fd, times)
```

or the gnulib module `fdutimensat`, instead.

12.105.4 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.

12.105.5 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.

12.106 Glibc <sys/timerfd.h>

12.106.1 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.

12.106.2 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.

12.106.3 timerfd_settime

Documentation:
man timerfd_settime

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.

12.107 Glibc <sys/timex.h>

12.107.1 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.

12.107.2 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.

12.107.3 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.
12.107.4 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.

12.108 Glibc Extensions to <sys/uio.h>

12.108.1 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.

12.108.2 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.
12.108.3 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.

12.108.4 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.

12.108.5 pwritev

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Scatter_002dGather.html,

• 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.

12.108.6 pwritev2

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Scatter_002dGather.html,

• man pwritev2.
Chapter 12: Glibc Function Substitutes

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.

12.109 Glibc <sys/ustat.h>

12.109.1 ustat

Documentation:

man ustat

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.

12.110 Glibc <sys/vlimit.h>

12.110.1 vlimit

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/Limits-on-Resources.html,
- man vlimit.

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.

12.111 Glibc Extensions to <sys/wait.h>

12.111.1 wait3

Documentation:

- 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.

12.111.2 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.

12.112 GnuC <sys/xattr.h>

12.112.1 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.

12.112.2 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.
12.112.3 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.

12.112.4 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.

12.112.5 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.

12.112.6 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.
12.112.7 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.

12.112.8 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: 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.

12.112.9 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.

12.112.10 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.
12.112.11 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.

12.112.12 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.

12.113 Glibc Extensions to <termios.h>

12.113.1 cfmakeraw

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-cfmakeraw-3.html
Documentation:
- 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.

12.113.2 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.

12.114 Glibc Extensions to <time.h>

12.114.1 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.

12.114.2 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.

12.114.3 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.
12.114.4 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.

12.114.5 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.

12.114.6 timegm

Documentation:
- man timegm.

Gnulib module: timegm

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.

12.114.7 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.

12.114.8 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:

12.115 Glibc <ttyent.h>

12.115.1 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.

12.115.2 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.

12.115.3 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.
12.115.4 `settyent`

Documentation:
man settyent

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.

12.116 Glibc Extensions to `<unistd.h>`

12.116.1 `_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.

12.116.2 `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.

12.116.3 `brk`

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Resizing-the-Data-Segment.html,
- man brk.

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, Cygwin 2.9, mingw, MSVC 14.

12.116.4 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.

12.116.5 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.”

12.116.6 copy_file_range

Documentation:
- 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:

12.116.7 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.

12.116.8 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:

12.116.9 eaccess

Documentation:
man eaccess

This function is an alias of euidaccess. See Section 12.116.11 [euidaccess], page 714.

12.116.10 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:
12.116.11  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.

12.116.12  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.

12.116.13  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:

12.116.14 get_current_dir_name

Documentation:

• `man get_current_dir_name`.

Gnulib module: —

Portability problems not fixed by Gnulib:

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 1.7.9, mingw, MSVC 14, Android 9.0.

12.116.15 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:

Portability problems not 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:

12.116.16 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 LP32.
• This function does not represent the true RLIMIT_NOFILE soft limit on some platforms: Android 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.

12.116.17 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:

12.116.18 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.

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:
12.116.19 getresgid

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.

12.116.20 getresuid

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.

12.116.21 gettid

Documentation:

- 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.

12.116.22 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:
12.116.23 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:

12.116.24 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 gnulib module nonblocking is also used.

12.116.25 profil

Documentation:
man profil

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.

12.116.26 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.
12.116.27  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.

12.116.28  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.

12.116.29  setdomainname

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Host-Identification.html,
• 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.

12.116.30  sethostid

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Host-Identification.html,
• 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.
12.116.31 sethostname

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/ baselib-sethostname-2.html

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Host-Identification. html,
• 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.

12.116.32 setresgid

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.

12.116.33 setresuid

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.
12.116.34 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:

12.116.35 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.

12.116.36 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.

12.116.37 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.
12.116.38 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.

12.117 Glibc <utmp.h>

12.117.1 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.

12.117.2 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.
12.117.3 getutent_r

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/bselib-getutent-r-3.html

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html,
- 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.

12.117.4 getutid

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html,
- 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.

12.117.5 getutid_r

Documentation:
- https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html,
- 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.
12.117.6 getutline

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html,
- 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.

12.117.7 getutline_r

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html,
- 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.

12.117.8 pututline

Documentation:

- https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html,
- 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.

12.117.9 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.

Gnumlib module: —

Portability problems fixed by Gnumlib:

Portability problems not fixed by Gnumlib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

12.117.10 updwtmp

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html,
• man updwtmp.

Gnumlib module: —

Portability problems fixed by Gnumlib:

Portability problems not fixed by Gnumlib:
• 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.

12.117.11 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.

Gnumlib module: —

Portability problems fixed by Gnumlib:

Portability problems not fixed by Gnumlib:
• This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

12.117.12 login

Documentation:
• https://www.gnu.org/software/libc/manual/html_node/Logging-In-and-Out.html,
• man login.

Gnumlib 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.

12.117.13 login_tty

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Logging-In-and-Out.html,
• man login_tty.

GnuLib module: login_tty

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.
• 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.
• This function is declared in <utmp.h> on glibc, Cygwin, in <util.h> on macOS 11.1, NetBSD 5.0, OpenBSD 3.8, and in <libutil.h> on FreeBSD 13.0, Haiku. Also note that <sys/types.h> is a prerequisite of <utmp.h> on FreeBSD 8.0, OpenBSD 4.6 and of <libutil.h> on FreeBSD 8.0.

12.118 Glibc Extensions to <utmpx.h>

12.118.1 getutmp

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/XPG-Functions.html,
• 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.
12.118.2 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.

12.118.3 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.

12.118.4 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.

12.119 Glibc Extensions to <wchar.h>

12.119.1 fgetwc_unlocked

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fgetwc-unlocked-1.html

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, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

12.119.2 \texttt{fgetws\_unlocked}

LSB specification:
https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fgetws-unlocked-1.html

Documentation:
- man \texttt{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, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

12.119.3 \texttt{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 \texttt{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, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.
12.119.4 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:

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.

12.119.5 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:

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.

12.119.6 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.
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.

12.119.7 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.

12.119.8 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.
12.119.9 wcharnul


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, IRX 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.

12.119.10 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, IRX 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.

12.119.11 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, IRX 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.

12.119.12 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, IRX 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.
12.119.13 \texttt{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, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

12.119.14 \texttt{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, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

12.119.15 \texttt{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, \texttt{wchar\_t} is a 16-bit type and therefore cannot accommodate all Unicode characters.

12.119.16 \texttt{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, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

12.119.17 \textit{wcstoul}$_1$

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.

12.119.18 \textit{wcstoull}$_1$

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.

12.119.19 \textit{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:

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.

12.119.20 \textit{wmempcpy}

Documentation:

• https://www.gnu.org/software/libc/manual/html_node/Copying-Strings-and-Arrays.html,
• 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.
13 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.

13.1 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:

\begin{verbatim}
LT_INIT([win32-dll])
\end{verbatim}

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:

\begin{verbatim}
libgsasl_la_LDFLAGS += -no-undefined
\end{verbatim}

13.2 Large File Support

The module provides support for files larger than 2 GB, or with device or inode numbers or timestamps exceeding 32 bits. To this effect, it ensures that types like off_t and time_t are 64-bit when possible, at least on the following platforms: glibc, Mac OS X, FreeBSD, NetBSD, OpenBSD, AIX, HP-UX, IRIX, Solaris, Cygwin, mingw, MSVC.

13.3 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.

13.4 Precise file timestamps on Windows

The module `windows-stat-timespec` ensures that, on native Windows platforms, struct stat contains st_atim, st_mtim, st_ctim fields of type 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, st_mtim only has a resolution of 2 seconds. For more details, see https://docs.microsoft.com/en-us/windows/desktop/SysInfo/file-times.
13.5 Avoiding the year 2038 problem

The “year 2038 problem” denotes unpredictable behaviour of programs that will likely occur in the year 2038, for programs that use a 32-bit ‘time_t’ type. See https://en.wikipedia.org/wiki/Year_2038_problem for details.

The Gnulib module ‘year2038’ attempts to avoid this problem, by ensuring that time_t is a 64-bit type and by causing configure to fail otherwise.

The Gnulib module ‘largefile’ also attempts to avoid this problem when possible, because ‘largefile’ enables the widest file-related types supported by the system and time_t is one of those types. However, largefile does not cause configure to fail when the year 2038 problem is not avoidable.

The Gnulib ‘largefile’ and ‘year2038’ modules are recommended for any package that might be used after the year 2038 on 32-bit platforms. However, if you build such a package you can disable its use of 64-bit time_t by giving the --disable-year2038 option to configure. This may be useful if the package links to other libraries whose user-facing ABIs still require time_t to be 32-bit on your platform.

13.6 Windows sockets

One of the portability problems for native Windows are sockets and networking functions.

13.6.1 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.

13.7 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.

13.8 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 \texttt{--output-def} during the build process. The variants we have considered include:

- Use DUMPBIN /EXPORTS. This is explained in \url{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:

  \begin{verbatim}
  $ { echo EXPORTS; \  
dumpbin /EXPORTS libfoo-0.dll | tail -n+20 | awk '{ print $4 }'; \  
  ) > libfoo-0.def
  $ lib /def:libfoo-0.def
  \end{verbatim}

- 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 \texttt{lib-msvc-compat} to your project, and then add the following lines to the \texttt{Makefile.am} that builds the library:

\begin{verbatim}
if HAVE_LD_OUTPUT_DEF
  libfoo_la_LDFLAGS += -Wl,--output-def,libfoo-$(DLL_VERSION).def
  libfoo-$(DLL_VERSION).def: libfoo.la
defexecdir = $(libdir)
defexec_DATA = libfoo-$(DLL_VERSION).def
DISTCLEANFILES += $(defexec_DATA)
endif
\end{verbatim}

The \texttt{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 \texttt{-version-info}. Assuming you have variables \texttt{LT_CURRENT} and \texttt{LT_AGE} defined for the \texttt{CURRENT} and \texttt{AGE} libtool version integers, you compute \texttt{DLL_VERSION} as follows:

\begin{verbatim}
DLL_VERSION=`expr ${LT_CURRENT} - ${LT_AGE}`
AC_SUBST(DLL_VERSION)
\end{verbatim}
14 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.

14.1 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 \texttt{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.

### 14.2 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 (\texttt{pthread_detach}), signal blocking (\texttt{pthread_sigmask}), priorities (\texttt{pthread_setschedparam}), processor affinity (\texttt{pthread_setaffinity_np}), it is best to use the POSIX API. This is because you cannot convert an ISO C \texttt{thrd_t} or a Gnulib \texttt{gl_thread_t} to a POSIX \texttt{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).

### 14.3 The POSIX multithreading API

The POSIX multithreading API is documented in POSIX 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>\texttt{pthread-thread}</td>
</tr>
<tr>
<td>For simple and recursive locks:</td>
<td>\texttt{pthread-mutex}</td>
</tr>
<tr>
<td>For read-write locks:</td>
<td>\texttt{pthread-rwlock}</td>
</tr>
<tr>
<td>For once-only execution:</td>
<td>\texttt{pthread-once}</td>
</tr>
<tr>
<td>For “condition variables” (wait queues):</td>
<td>\texttt{pthread-cond}</td>
</tr>
<tr>
<td>For thread-local storage:</td>
<td>\texttt{pthread-tss}</td>
</tr>
<tr>
<td>For relinquishing control:</td>
<td>\texttt{sched_yield}</td>
</tr>
<tr>
<td>For spin locks:</td>
<td>\texttt{pthread-spin}</td>
</tr>
</tbody>
</table>

There is also a convenience module named \texttt{pthread} which depends on all of these (except \texttt{sched_yield}); so you don’t need to enumerate these modules one by one.
14.4 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.

14.5 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.
14.6 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.org/wiki/Compare-and-swap), over futexes (https://en.wikipedia.org/wiki/Futex) and restartable sequences (https://www.efficios.com/blog/2019/02/08/linux-restartable-sequences/) in the Linux kernel, to lock elision [1] (https://lwn.net/Articles/534758/) — single-threaded programs can still profit performance-wise from the assertion that they are single-threaded.

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:

```c
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_MBRTOWC_SINGLE_THREAD`, if all the programs in your package invoke the functions `mbrtoc32`, and the functions of the regex module only from a single thread. (The regex module uses `mbrtowc` 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 (`mbrtowc`, `wcwidth`, etc.) before the locale has been initialized.

This macro optimizes the functions `mbrtowc`, `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.
15 Particular Modules

15.1 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.

15.2 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
```
15.3 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.

**Variables**

- **ptr**: Pointer to allocate memory.
- **count**: Number of elements to allocate.

**Macros**

```c
int ALLOC (ptr) [Macro]
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.

int ALLOC_N (ptr, count) [Macro]
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.

int ALLOC_N_UNINITIALIZED (ptr, count) [Macro]
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.

int REALLOC_N (ptr, count) [Macro]
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.

void FREE (ptr) [Macro]
Free the memory stored in ptr and set ptr to NULL.
```
15.4 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_NOTHROW ATTRIBUTE_LEAF ATTRIBUTE_NONNULL ((1, 2));
```

NODISCARD expands to `[[nodiscard]]` if the compiler supports this C2x syntax, otherwise to `__attribute__((warn_unused_result__))` if the compiler is a recent-enough GCC or GCC-like compiler, and to nothing otherwise. `ATTRIBUTE_NOTHROW` expands to `__attribute__((nothrow))` if the compiler is a 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 C2x 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 C2x platforms. Also, these exceptional macros should be placed at the start of function declarations, whereas the `ATTRIBUTE_*` macros can be placed at the end.

15.5 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 `verify \( V \)`; even when \( V \) is nonzero.

Although the standard `assert` macro is a runtime test, C2x specifies a builtin `_Static_assert` \( (V) \), its `assert.h` header has a similar macro named `static_assert`, and C++17 has a similar `static_assert` builtin. These builtins and macros differ from `verify` in two major ways. First, they can also be used within a `struct` or `union` specifier, in place of an ordinary member declaration. Second, they allow 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 C2x or C++17 `static_assert`, the only advantage of `verify` is that its name is a bit shorter.

The `verify.h` header defines one more macro, `assume` \( (E) \), which expands to an expression of type `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 `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 `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 \( \text{CHAR\_MAX} \) 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);
}

### 15.6 Non-returning Functions

A "non-returning" function is a function which cannot return normally. It can transfer control only through `longjmp()`, `throw` (in C++), or similar mechanisms. The most prominent function of this class is the `abort` function. 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.

To decorate function declarations and function definitions, you can use the `_Noreturn` keyword. No modules are needed, as GnuLib arranges for `<config.h>` to define `_Noreturn` to an appropriate replacement on platforms lacking it.

GnuLib has two modules that support such a declaration:

- 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>`.

- The `stdnoreturn` module. This can improve readability by letting you use `noreturn` instead of `_Noreturn`; unfortunately, `noreturn` is a no-op on some platforms even though `_Noreturn` works on them. The include file is `<stdnoreturn.h>`.

  Which of the two modules to use? If the non-returning functions you have to declare are unlikely to be accessed through function pointers, you should use module `stdnoreturn`; otherwise the module `noreturn` provides for better data-flow analysis and thus for better warnings.

  For a detailed description of the `stdnoreturn` module, see Section 8.51 [stdnoreturn.h], page 65.

### 15.7 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.

15.7.1 Arithmetic Type Properties

TYPE_IS_INTEGER (t) is an arithmetic constant expression that is 1 if the arithmetic type t is an integer type. _Bool counts as an integer type.

TYPE_SIGNED (t) is an arithmetic constant expression that is 1 if the real type t is a signed integer type or a floating type. If t is an integer type, TYPE_SIGNED (t) is an integer constant expression.

EXPR_SIGNED (e) is 1 if the real expression e has a signed integer type or a floating type. 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);
}
```
15.7.2 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 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 <stdbool.h>
#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);
}
```

15.7.3 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 returning 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 returns true, whereas INT_ADD_OK (INT_MAX, 1, &i) returns false.

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 integer types 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 return true. Otherwise return false, 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 return true. Otherwise return false, 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 return true. Otherwise return false, 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 15.7.4 [Wraparound Arithmetic], page 751), or if you need to check for overflow in operations other than addition, subtraction, and multiplication (see Section 15.7.5 [Integer Type Overflow], page 752).
15.7.4 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 \texttt{int} the expression \texttt{INT_MAX + 1} does not necessarily yield \texttt{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 returning an overflow indication. For example, if \texttt{i} is of type \texttt{int}, \texttt{INT_ADD_WRAPV (INT_MAX, 1, \&i)} sets \texttt{i} to \texttt{INT_MIN} and returns 1 on a two’s complement machine. See Section 15.7.5 [Integer Type Overflow], page 752.

Example usage:

```c
#include <intprops.h>
#include <stdio.h>

/* Print the low order bits of A * 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 \texttt{a} and \texttt{b} into \texttt{*r}. Return true if overflow occurred, false if the low-order bits are the mathematically-correct sum. See above for restrictions.
INT_SUBTRACT_WRAPV \((a, b, r)\)

Store the low-order bits of the difference between \(a\) and \(b\) into \(*r\). Return true if overflow occurred, false if the low-order bits are the mathematically-correct difference. See above for restrictions.

INT_MULTIPLY_WRAPV \((a, b, r)\)

Store the low-order bits of the product of \(a\) and \(b\) into \(*r\). Return true if overflow occurred, false if the low-order bits are the mathematically-correct product. See above for restrictions.

Other macros are available if you do not need wrapped-around results when overflow occurs (see Section 15.7.3 [Checking Integer Overflow], page 749), or if you need to check for overflow in operations other than addition, subtraction, and multiplication (see Section 15.7.5 [Integer Type Overflow], page 752).

15.7.5 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 might not yield numerically correct answers due to arithmetic overflow of an integer type. 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 15.7.6 [Integer Range Overflow], page 753), and they support more operations and evaluation contexts than the wraparound macros (see Section 15.7.4 [Wraparound Arithmetic], page 751).

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. See above for restrictions.

INT_SUBTRACT_OVERFLOW (a, b)
Yield 1 if \(a - b\) would overflow. See above for restrictions.

INT_NEGATE_OVERFLOW (a)
Yields 1 if \(-a\) would overflow. See above for restrictions.

INT_MULTIPLY_OVERFLOW (a, b)
Yield 1 if \(a \times b\) would overflow. See above for restrictions.

INT_DIVIDE_OVERFLOW (a, b)
Yields 1 if \(a / b\) would overflow. 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. 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. 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.

15.7.6 Integer Range Overflow

These macros yield 1 if the corresponding C operators might not yield numerically correct answers due to arithmetic 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 15.7.5 [Integer Type Overflow], page 752.
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” and “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 min and max arguments) must be of the same integer type after the usual arithmetic conversions, and the type must have minimum value min and maximum max. Unsigned values should use a zero min of the proper type, for example, (unsigned int) 0.

These macros are tuned for constant min and max. For commutative operations such as a + b, they are also tuned for constant b.

`INT_ADD_RANGE_OVERFLOW (a, b, min, max)`

Yield 1 if a + b would overflow in [min,max] integer arithmetic. See above for restrictions.
INT_SUBTRACT_RANGE_OVERFLOW (a, b, min, max)
Yield 1 if \( a - b \) would overflow in \([\text{min}, \text{max}]\) integer arithmetic. See above for restrictions.

INT_NEGATE_RANGE_OVERFLOW (a, min, max)
Yield 1 if \(-a\) would overflow in \([\text{min}, \text{max}]\) integer arithmetic. See above for restrictions.

INT_MULTIPLY_RANGE_OVERFLOW (a, b, min, max)
Yield 1 if \(a \times b\) would overflow in \([\text{min}, \text{max}]\) integer arithmetic. See above for restrictions.

INT_DIVIDE_RANGE_OVERFLOW (a, b, min, max)
Yield 1 if \(a / b\) would overflow in \([\text{min}, \text{max}]\) integer arithmetic. 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 \([\text{min}, \text{max}]\) integer arithmetic. 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 \([\text{min}, \text{max}]\) integer arithmetic. See above for restrictions. Here, \(\text{min}\) and \(\text{max}\) are for \(a\) only, and \(b\) 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 \(a\)’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.

15.8 Static inline functions

In order to mark functions as static inline, the only prerequisite you need is an AC_REQUIRE([AC_C_INLINE]). No Gnulib module is needed.

15.9 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 aaa.h defines the function aaa_fun, and aaa.c, bbb.c and ccc.c all include aaa.h. If code is intended to portable to non-C99 compilers, aaa_fun cannot be declared with the C99 inline keyword. This problem cannot be worked around by making aaa_fun an ordinary function, as it would
be defined three times with external linkage and the definitions would clash. Although 
\texttt{aaa\_fun} could be a static function, with separate compilation if \texttt{aaa\_fun} is not inlined its 
code will appear in the executable three times.

To avoid this code bloat, \texttt{aaa\_h} can do this:
\begin{verbatim}
/* 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
\end{verbatim}
and \texttt{aaa\_c} can do this:
\begin{verbatim}
/* aaa.c */
#include <config.h>
#define AAA_INLINE _GL_EXTERN_INLINE
#include <aaa.h>
\end{verbatim}
whereas \texttt{bbb\_c} and \texttt{ccc\_c} can include \texttt{aaa\_h} in the usual way. C99 compilers expand \texttt{AAA\_INLINE} to C99-style \texttt{inline} usage, where \texttt{aaa\_fun} is declared \texttt{extern inline} in \texttt{aaa\_c} and 
\texttt{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 \texttt{static inline} so they suffer from code bloat, but they are not mainline platforms and will die out 
eventually.

\texttt{_GL_INLINE} is a portable alternative to C99 \texttt{plain inline}.
\texttt{_GL_EXTERN_INLINE} is a portable alternative to C99 \texttt{extern inline}.

Invoke \texttt{_GL_INLINE\_HEADER\_BEGIN} before all uses of \texttt{_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 \texttt{_GL_INLINE\_HEADER\_END} after all uses of \texttt{_GL_INLINE} in an include file.

\subsection*{15.10 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

\begin{itemize}
\item The invoking process invokes \texttt{close()} on the file descriptor before \texttt{exec}, or
\end{itemize}
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 calls 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:

   /* 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>open()</td>
<td>fcntl-safer</td>
<td>&quot;fcntl--.h&quot;</td>
</tr>
<tr>
<td>openat()</td>
<td>openat-safer</td>
<td>&quot;fcntl--.h&quot;</td>
</tr>
<tr>
<td>creat()</td>
<td>fcntl-safer</td>
<td>&quot;fcntl--.h&quot;</td>
</tr>
<tr>
<td>dup()</td>
<td>unistd-safer</td>
<td>&quot;unistd--.h&quot;</td>
</tr>
<tr>
<td>fopen()</td>
<td>fopen-safer</td>
<td>&quot;stdio--.h&quot;</td>
</tr>
<tr>
<td>freopen()</td>
<td>freopen-safer</td>
<td>&quot;stdio--.h&quot;</td>
</tr>
<tr>
<td>pipe()</td>
<td>unistd-safer</td>
<td>&quot;unistd--.h&quot;</td>
</tr>
<tr>
<td>pipe2()</td>
<td>pipe2-safer</td>
<td>&quot;unistd--.h&quot;</td>
</tr>
<tr>
<td>popen()</td>
<td>fopen-safer</td>
<td>&quot;stdio--.h&quot;</td>
</tr>
</tbody>
</table>
15.11 Container data types

Gnulib provides several generic container data types. They can be used to organize collections of application-defined objects.

15.11.1 Ordinary container data types

<table>
<thead>
<tr>
<th>Data type</th>
<th>Details</th>
<th>Module</th>
<th>Main include file</th>
<th>Include file for operations with out-of-memory checking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequential</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_list.h&quot;</td>
<td>xlist.h</td>
</tr>
<tr>
<td>list</td>
<td></td>
<td></td>
<td></td>
<td></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_set.h&quot;</td>
<td>xset.h</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_oset.h&quot;</td>
<td>xooset.h</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_map.h&quot;</td>
<td>xmap.h</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 omap.h&quot;</td>
<td>xomap.h</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”.

opendir() dirent-safer "dirent-.h"

tmpfile() tmpfile-safer "stdio-.h"

mkstemp() stdlib-safer "stdlib-.h"
mkstems() stdlib-safer "stdlib-.h"
mkostemp() stdlib-safer "stdlib-.h"
mkostemps() stdlib-safer "stdlib-.h"
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>HASH</th>
<th>TREEHASH</th>
</tr>
</thead>
<tbody>
<tr>
<td></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><code>gl_list_size</code></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><code>gl_list_node_value</code></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><code>gl_list_node_set_value</code></td>
<td>$O(1)$</td>
<td>$O(1)$</td>
<td>$O(1)$</td>
<td>$O(1)$</td>
<td>$O(1)$</td>
<td>$O((\log n)^2)(1)$</td>
</tr>
<tr>
<td><code>gl_list_next_node</code></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><code>gl_list_previous_node</code></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><code>gl_list_first_node</code></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><code>gl_list_last_node</code></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><code>gl_list_get_at</code></td>
<td>$O(1)$</td>
<td>$O(1)$</td>
<td>$O(n)$</td>
<td>$O(\log n) O(n)$</td>
<td>$O(n)$</td>
<td>$O(\log n) O(\log n)$</td>
</tr>
<tr>
<td><code>gl_list_get_first</code></td>
<td>$O(1)$</td>
<td>$O(1)$</td>
<td>$O(1)$</td>
<td>$O(\log n) O(1)$</td>
<td>$O(1)$</td>
<td>$O(\log n) O(\log n)$</td>
</tr>
<tr>
<td><code>gl_list_get_last</code></td>
<td>$O(1)$</td>
<td>$O(1)$</td>
<td>$O(1)$</td>
<td>$O(\log n) O(1)$</td>
<td>$O(1)$</td>
<td>$O(\log n) O(\log n)$</td>
</tr>
<tr>
<td><code>gl_list_set_at</code></td>
<td>$O(1)$</td>
<td>$O(1)$</td>
<td>$O(n)$</td>
<td>$O(\log n) O(n)$</td>
<td>$O(n)$</td>
<td>$O(\log n) O(\log n)$</td>
</tr>
<tr>
<td><code>gl_list_set_first</code></td>
<td>$O(1)$</td>
<td>$O(1)$</td>
<td>$O(n)$</td>
<td>$O(\log n) O(n)$</td>
<td>$O(n)$</td>
<td>$O(\log n) O(\log n)$</td>
</tr>
<tr>
<td><code>gl_list_set_last</code></td>
<td>$O(1)$</td>
<td>$O(1)$</td>
<td>$O(n)$</td>
<td>$O(\log n) O(n)$</td>
<td>$O(n)$</td>
<td>$O(\log n) O(\log n)$</td>
</tr>
<tr>
<td><code>gl_list_search</code></td>
<td>$O(n)$</td>
<td>$O(n)$</td>
<td>$O(n)$</td>
<td>$O(n)$</td>
<td>$O(n)$</td>
<td>$O((\log n)^2)(\log n)$</td>
</tr>
<tr>
<td><code>gl_list_search_from</code></td>
<td>$O(n)$</td>
<td>$O(n)$</td>
<td>$O(n)$</td>
<td>$O(n)$</td>
<td>$O(n)$</td>
<td>$O((\log n)^2)(\log n)$</td>
</tr>
<tr>
<td><code>gl_list_search_from_to</code></td>
<td>$O(n)$</td>
<td>$O(n)$</td>
<td>$O(n)$</td>
<td>$O(n)$</td>
<td>$O(n)$</td>
<td>$O((\log n)^2)(\log n)$</td>
</tr>
<tr>
<td><code>gl_list_indexof</code></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>
</tr>
<tr>
<td><code>gl_list_indexof_from</code></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>
</tr>
</tbody>
</table>
gl_list_indexof_from_to  
\( O(n) \quad O(n) \quad O(n) \quad O(n) \quad O(n) \quad O(n) \quad O((\log n)^2 \log n) \)

gl_list_add_first  
\( O(n) \quad O(1) \quad O(1) \quad O(\log n) \quad O(1) \quad O(1) \quad O((\log n)^2 \log n) \)

gl_list_add_last  
\( O(1) \quad O(1) \quad O(1) \quad O(\log n) \quad O(1) \quad O(1) \quad O((\log n)^2 \log n) \)

gl_list_add_before  
\( O(n) \quad O(n) \quad O(1) \quad O(\log n) \quad O(1) \quad O(1) \quad O((\log n)^2 \log n) \)

gl_list_add_after  
\( O(n) \quad O(n) \quad O(1) \quad O(\log n) \quad O(1) \quad O(1) \quad O((\log n)^2 \log n) \)

gl_list_add_at  
\( O(n) \quad O(n) \quad O(n) \quad O(\log n) \quad O(n) \quad O(n) \quad O((\log n)^2 \log n) \)

gl_list_remove_at  
\( O(n) \quad O(n) \quad O(n) \quad O(\log n) \quad O(n) \quad O(n) \quad O((\log n)^2 \log n) \)

gl_list_remove_first  
\( O(n) \quad O(1) \quad O(1) \quad O(\log n) \quad O(n) \quad O(1) \quad O((\log n)^2 \log n) \)

gl_list_remove_last  
\( O(1) \quad O(1) \quad O(1) \quad O(\log n) \quad O(n) \quad O(1) \quad O((\log n)^2 \log n) \)

gl_list_remove  
\( O(n) \quad O(n) \quad O(n) \quad O(n) \quad O(n) \quad O(1) \quad O((\log n)^2 \log n) \)

gl_list_iterator  
\( O(1) \quad O(1) \quad O(1) \quad O(\log n) \quad O(n) \quad O(n) \quad O((\log n)^2 \log n) \)

gl_list_iterator_from_to  
\( O(1) \quad O(1) \quad O(1) \quad O(\log n) \quad O(1) \quad O(1) \quad O((\log n)^2 \log n) \)

gl_list_iterator_next  
\( O(\log n) \quad O(\log n) \quad O(n) \quad O(\log n) \quad O(n) \quad O(n) \quad O((\log n)^2 \log n) \)

gl_sortedlist_search  
\( O(\log n) \quad O(\log n) \quad O(n) \quad O(\log n) \quad O(n) \quad O(n) \quad O((\log n)^2 \log n) \)

gl_sortedlist_search_from  
\( O(\log n) \quad O(\log n) \quad O(n) \quad O(\log n) \quad O(n) \quad O(n) \quad O((\log n)^2 \log n) \)

gl_sortedlist_indexof  
\( O(\log n) \quad O(\log n) \quad O(n) \quad O(\log n) \quad O(n) \quad O(n) \quad O((\log n)^2 \log n) \)

gl_sortedlist_indexof_from  
\( O(\log n) \quad O(\log n) \quad O(n) \quad O(\log n) \quad O(n) \quad O(n) \quad O((\log n)^2 \log n) \)

gl_sortedlist_add  
\( O(n) \quad O(n) \quad O(n) \quad O(\log n) \quad O(n) \quad O(n) \quad O((\log n)^2 \log n) \)

gl_sortedlist_remove  
\( O(n) \quad O(n) \quad O(n) \quad O(\log n) \quad O(n) \quad O(n) \quad O((\log n)^2 \log n) \)

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>
</tbody>
</table>
The implementations and the guaranteed average performance for the operations for the “ordered set” data type are:

<table>
<thead>
<tr>
<th>Operation</th>
<th>ARRAY</th>
<th>TREE</th>
</tr>
</thead>
<tbody>
<tr>
<td>gl_oset_size</td>
<td>$O(1)$</td>
<td>$O(1)$</td>
</tr>
<tr>
<td>gl_oset_add</td>
<td>$O(n)$</td>
<td>$O(\log n)$</td>
</tr>
<tr>
<td>gl_oset_remove</td>
<td>$O(n)$</td>
<td>$O(\log n)$</td>
</tr>
<tr>
<td>gl_oset_search</td>
<td>$O(\log n)$</td>
<td>$O(\log n)$</td>
</tr>
<tr>
<td>gl_oset_search_atleast</td>
<td>$O(\log n)$</td>
<td>$O(\log n)$</td>
</tr>
<tr>
<td>gl_oset_iterator</td>
<td>$O(1)$</td>
<td>$O(\log n)$</td>
</tr>
<tr>
<td>gl_oset_iterator_next</td>
<td>$O(1)$</td>
<td>$O(\log n)$</td>
</tr>
</tbody>
</table>

The implementations and the guaranteed average performance for the operations for the “map” data type are:

<table>
<thead>
<tr>
<th>Operation</th>
<th>ARRAY</th>
<th>LINKEDHASH, HASH</th>
</tr>
</thead>
<tbody>
<tr>
<td>gl_map_size</td>
<td>$O(1)$</td>
<td>$O(1)$</td>
</tr>
<tr>
<td>gl_map_get</td>
<td>$O(n)$</td>
<td>$O(1)$</td>
</tr>
<tr>
<td>gl_map_put</td>
<td>$O(n)$</td>
<td>$O(1)$</td>
</tr>
<tr>
<td>gl_map_remove</td>
<td>$O(n)$</td>
<td>$O(1)$</td>
</tr>
<tr>
<td>gl_map_search</td>
<td>$O(n)$</td>
<td>$O(1)$</td>
</tr>
<tr>
<td>gl_map_iterator</td>
<td>$O(1)$</td>
<td>$O(1)$</td>
</tr>
<tr>
<td>gl_map_iterator_next</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 map” data type are:

<table>
<thead>
<tr>
<th>Operation</th>
<th>ARRAY</th>
<th>TREE</th>
</tr>
</thead>
<tbody>
<tr>
<td>gl_omap_size</td>
<td>$O(1)$</td>
<td>$O(1)$</td>
</tr>
<tr>
<td>gl_omap_get</td>
<td>$O(\log n)$</td>
<td>$O(\log n)$</td>
</tr>
<tr>
<td>gl_omap_put</td>
<td>$O(n)$</td>
<td>$O(\log n)$</td>
</tr>
<tr>
<td>gl_omap_remove</td>
<td>$O(n)$</td>
<td>$O(\log n)$</td>
</tr>
<tr>
<td>gl_omap_search</td>
<td>$O(\log n)$</td>
<td>$O(\log n)$</td>
</tr>
<tr>
<td>gl_omap_search_atleast</td>
<td>$O(\log n)$</td>
<td>$O(\log n)$</td>
</tr>
<tr>
<td>gl_omap_iterator</td>
<td>$O(1)$</td>
<td>$O(\log n)$</td>
</tr>
<tr>
<td>gl_omap_iterator_next</td>
<td>$O(1)$</td>
<td>$O(\log n)$</td>
</tr>
</tbody>
</table>

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>
</tbody>
</table>
15.11.2 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.

15.12 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.
15.12.1 c-type

The c-type 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 cisdigit (int c);
extern bool c_iscntrl (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 ctolower (int c);
extern int cupper (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.

15.12.2 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 mbcasecmp, mbsncasecmp, mbstrncase cmp.

15.12.3 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.

### 15.12.4 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 `mbstrcasestr`.

### 15.12.5 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 `mbsstr`.

### 15.12.6 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`.

### 15.12.7 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 ','.

### 15.13 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
$ my_cp --backup=true foo bar
my_cp: invalid argument 'true' 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.

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 },
```
Chapter 15: Particular Modules

```c
{ "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 =
{ argmatch_backup_args,
  argmatch_backup_docs,
  N_("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:
"),
  NULL
};
```

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

15.14 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.

15.15 progsname and getprogsname

Gnulib has two modules for retrieving the name of the currently executing program:
progsname and getprogsname.

The `progsname` 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 `getprogsname` module defines a function `getprogsname()`. 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 `getprogsname` module.

15.16 gdc: greatest common divisor

The `gdc` 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 `gdc` function for an integer type larger than ‘unsigned long’, you can
include the `gdc.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

\[
\text{WORD_T GCD (WORD_T a, WORD_T b);}
\]

If you need the least common multiple of two numbers, it can be computed like this:

\[
lcm(a,b) = \frac{a}{\text{gcd}(a,b)} \times b \quad \text{or} \quad lcm(a,b) = a \times \left(\frac{b}{\text{gcd}(a,b)}\right).
\]

Avoid the formula

\[
lcm(a,b) = \frac{a \times b}{\text{gcd}(a,b)}
\]

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 \(\text{gcd}(\text{LONG_MIN},\text{LONG_MIN}) = -\text{LONG_MIN} = \text{LONG_MAX} + 1\) does not fit into a signed 'long'.

15.17 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>Scan</th>
<th>Parse</th>
<th>Work</th>
<th>Phase 1</th>
<th>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>0.08 (80%)</td>
<td>0.12 (26%)</td>
<td>0.14 (29%)</td>
<td>0.04 (8%)</td>
<td>0.47</td>
</tr>
<tr>
<td></td>
<td>0.04 ( 9%)</td>
<td>0.08 (80%)</td>
<td>0.00 ( 0%)</td>
<td>0.00 ( 0%)</td>
<td>0.05 (10%)</td>
<td>0.05 (10%)</td>
<td>0.02 (20%)</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>0.33 (70%)</td>
<td>0.00 ( 0%)</td>
<td>0.35 (71%)</td>
<td>0.30 (64%)</td>
<td>0.30 (64%)</td>
<td>0.14 (29%)</td>
<td>0.04 (8%)</td>
<td>0.49</td>
</tr>
</tbody>
</table>

To set up timevar, copy the stub file \texttt{gnulib/lib/timevar.def} next to where \texttt{timevar.h} and \texttt{timevar.c} were imported in your project, and define your timers there. For instance:

\[
\text{DEFTIMEVAR (tv_total, "total time")}
\]

Do not remove tv_total, it is mandatory. You may change its associated string.

Use \texttt{timevar_push}/\texttt{timevar_pop} to start/stop timers, as in the following example.

\[
#include <config.h>
#include "timevar.h"
#include <stdio.h>
#include "read.h"
\]


```c
#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);
}
```

### 15.18 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:

```c
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");
```

### 15.19 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 in-
voked 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 24).

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 `prognname.h`.

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:

   ```c
   bindtextdomain (PACKAGE, LOCALEDIR);
   ```

   becomes:

   ```c
   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:

   ```bash
   @relocatable_sh@
   ```
prefix="@prefix@"
exec_prefix="@exec_prefix@"    # usually needs $prefix.
datarootdir="@datarootdir"   # 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 orig_installdir, depending on where the script
gets installed. Also, at the end, instead of sysconfdir and some_datadir, transform
those variables that you need.

7. If your package installs Perl scripts, also import the relocatable-perl module. Then,
   near the beginning of each Perl script that your package installs, add the following:

```
@relocatable_pl@
if (@"RELOCATABLE@" eq "yes") {
    my $exec_prefix = @"exec_prefix@";
    my @orig_installdir = @"bindir@";  # see Makefile.am's *_SCRIPTS variables
    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) = 0;
        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@");
$some_datadir = relocate(@datadir@/something");
8. In your `Makefile.am`, for every program `foo` that gets installed in, say, `${bindir}`, you add:

```plaintext
foo_CPPFLAGS = -DINSTALLDIR="${bindir}\"
if RELOCATABLE_VIA_LD
  foo_LDFLAGS = `$(RELOCATABLE_LDFLAGS) ${bindir}`
endif
```

When building gnulib to use with a relocatable library, you need to define the preprocessor symbol `IN_LIBRARY`. You may also want to build with `ENABLE_COSTLY_RELOCATABLE`, in which case you will also need to define `INSTALLDIR`. The following fragment can be added to an override `Makefile.am` used to build gnulib (see Section 3.8 [Modified build rules], page 23).

```plaintext
AM_CPPFLAGS += -DIN_LIBRARY -DENABLE_COSTLY_RELOCATABLE
if SHLIBS_IN_BINDIR
  AM_CPPFLAGS += -DINSTALLDIR="${bindir}\"
else
  AM_CPPFLAGS += -DINSTALLDIR="${libdir}\"
endif
```

`SHLIBS_IN_BINDIR` is defined in `configure.ac` as follows:

```plaintext
AM_CONDITIONAL([SHLIBS_IN_BINDIR],
  [case "$host_os" in mingw* | cygwin*) true;; *) false;; esac])
```

9. In your `Makefile.am`, for every library `libfoo` that gets installed in, say, `${libdir}`, you add:

```plaintext
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.

    ```plaintext
    RELOCATABLE_LIBRARY_PATH = ${libdir}
    ```

    If your `config.h` is not in `${top_builddir}`, then set `RELOCATABLE_CONFIG_H_DIR` to its directory, e.g.

    ```plaintext
    RELOCATABLE_CONFIG_H_DIR = ${top_builddir}/src
    ```

15.20 `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.

### 15.21 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_NBLOCKS` macro is used to estimate this quantity on systems which don’t actually have `st_blocks`. Each of these blocks contains `ST_NBLOCKSIZE` bytes.

The value of `ST_NBLOCKSIZE` 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.
16 Regular expressions

16.1 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 ‘\texttt{foo}’ matches the string ‘\texttt{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 ‘\texttt{f*}’ matches the set of strings made up of any number (including zero) of ‘\texttt{f}’s. As you can see, some characters in regular expressions match themselves (such as ‘\texttt{f}’) and some don’t (such as ‘\texttt{*}’); 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.

16.2 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.
16.2.1 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 `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 16.7.1.1 [GNU Pattern Buffers], page 792, for more information on pattern buffers. See Section 16.7.1.2 [GNU Regular Expression Compiling], page 792, and Section 16.7.2.1 [BSD Regular Expression Compiling], page 799, 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 16.3 [Common Operators], page 782, Section 16.4 [GNU Operators], page 790, and Section 16.5 [GNU Emacs Operators], page 791.

For reference, here is the complete list of syntax bits, in alphabetical order:

**RE_BACKSLASH_ESCAPE_IN_Lists**
If this bit is set, then \ inside a list (see Section 16.3.6 [List Operators], page 785) quotes (makes ordinary, if it’s special) the following character; if this bit isn’t set, then \ is an ordinary character inside lists. (See Section 16.2.4 [The Backslash Character], page 781, for what \ does outside of lists.)

**RE_BK_PLUS_QM**
If this bit is set, then \+ represents the match-one-or-more operator and ? represents the match-zero-or-more operator; if this bit isn’t set, then + represents the match-one-or-more operator and ? represents the match-zero-or-one operator. This bit is irrelevant if RE_LIMITED_OPS is set.

**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.

**RE_CONTEXT_INDEP_ANCHORS**
If this bit is set, then ‘^’ and ‘$’ are special anywhere outside a list; if this bit isn’t set, then these characters are special only in certain contexts. See Section 16.3.9.1 [Match-beginning-of-line Operator], page 789, and Section 16.3.9.2 [Match-end-of-line Operator], page 789.

**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 *, and (if the syntax bit RE_LIMITED_OPS isn’t set) + and ? (or \+ and \?, depending on the syntax bit 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 { (or \{, depending on the syntax bit RE_NO_BK_BRACES) if it is the beginning of a valid interval and the syntax bit 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 16.6 [What Gets Matched?], page 791, 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 ‘)’.

16.2.2 Predefined Syntaxes
If you’re programming with Regex, you can set a pattern buffer’s (see Section 16.7.1.1 [GNU Pattern Buffers], page 792) syntax either to an arbitrary combination of syntax bits (see Section 16.2.1 [Syntax Bits], page 777) 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_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_HAT_LISTS_NOT_NEWLINE
 | RE_NEWLINE_ALT | RE_NO_BK_PARENS
 | RE_NO_BK_VBAR)

/* 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)
16.2.3 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.

16.2.4 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 16.2.1 [Syntax Bits], page 777). 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 16.3.6 [List Operators], page 785) 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,¹ 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 16.2.1 [Syntax Bits], page 777.

   Also:
   - ‘\b’ represents the match-word-boundary operator (see Section 16.4.1.2 [Match-word-boundary Operator], page 790).
   - ‘\B’ represents the match-within-word operator (see Section 16.4.1.3 [Match-within-word Operator], page 790).
   - ‘\<’ represents the match-beginning-of-word operator (see Section 16.4.1.4 [Match-beginning-of-word Operator], page 790).
   - ‘\>’ represents the match-end-of-word operator (see Section 16.4.1.5 [Match-end-of-word Operator], page 790).
   - ‘\w’ represents the match-word-constituent operator (see Section 16.4.1.6 [Match-word-constituent Operator], page 790).

¹ 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 16.3.6 [List Operators], page 785). 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 16.4.1.7 [Match-non-word-constituent Operator], page 790).
• ‘\ ’ represents the match-beginning-of-buffer operator and ‘\’ represents the match-end-of-buffer operator (see Section 16.4.2 [Buffer Operators], page 790).
• If Regex was compiled with the C preprocessor symbol emacs defined, then ‘\sclass’ represents the match-syntactic-class operator and ‘\Sclass’ represents the match-not-syntactic-class operator (see Section 16.5.1 [Syntactic Class Operators], page 791).

4. In all other cases, Regex ignores ‘\’. For example, ‘\n’ matches ‘n’.

16.3 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 16.2 [Regular Expression Syntax], page 776, 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 16.3.6 [List Operators], page 785).

16.3.1 The Match-self Operator (ordinary character)

This operator matches the character itself. All ordinary characters (see Section 16.2 [Regular Expression Syntax], page 776) 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’.

16.3.2 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.
- null 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’.

16.3.3 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’.
16.3.4 Repetition Operators

Repetition operators repeat the preceding regular expression a specified number of times.

16.3.4.1 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 `caaaar`, 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`.

16.3.4.2 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 16.3.4.1 [Match-zero-or-more Operator], page 783, 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`.

16.3.4.3 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 16.3.4.1 [Match-zero-or-more Operator], page 783, 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.

16.3.4.4 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.

16.3.5 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
are the open and close-group operators, then ‘fo(o|b)ar’ would match either ‘fooar’ or ‘fobar’. ‘fo|o|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|q)*(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.

16.3.6 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 either ‘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 16.3.6.1 [Collating Symbol Operators], page 786).

‘. ]’ represents the close-collating-symbol operator.

‘[^’ represents the open-equivalence-class operator (see Section 16.3.6.2 [Equivalence Class Operators], page 786).

‘=]’ 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 16: Regular expressions

Chapter 16: Regular expressions 786

\[ \text{[[: ]]} \]
represents the open-character-class operator (see Section 16.3.6.3 [Character Class Operators], page 786) if the syntax bit \texttt{RE\_CHAR\_CLASSES} is set and what follows is a valid character class expression.

\[ :\text{]} \]
represents the close-character-class operator if the syntax bit \texttt{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 16.3.6.4 [Range Operator], page 787) 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 ‘\.*’.

16.3.6.1 Collating Symbol Operators ([ . . . ])

Collating symbols can be represented inside lists. You form a collating symbol by putting a collating element between an \texttt{open-collating-symbol operator} and a \texttt{close-collating-symbol operator}. ‘[.‘ represents the open-collating-symbol operator and ‘.\text{]}’ represents the close-collating-symbol operator. For example, if ‘11’ is a collating element, then ‘[[ .11 .\text{]}]’ would match ‘11’.

16.3.6.2 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 \texttt{open-equivalence-class operator} and a \texttt{close-equivalence-class operator}. ‘[=‘ represents the open-equivalence-class operator and ‘=\text{]}’ represents the close-equivalence-class operator. For example, if ‘a’ and ‘A’ were an equivalence class, then both ‘[[=a=\text{]}]’ and ‘[[=A=\text{]}]’ 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.

16.3.6.3 Character Class Operators ([: . . . :])

If the syntax bit \texttt{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 \texttt{open-character-class operator} (represented by ‘[:) and a \texttt{close-character-class operator} (represented by ‘:\text{]’). 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 \texttt{print} except omits space
- **lower**: lowercase letters
- **print**: printable characters (in the ASCII encoding, space tilde—codes 040 through 0176)
16.3.6.4 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–z]’ matches a lowercase letter or a hyphen (in English, in ASCII).

16.3.7 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 16.3.5 [Alternation Operator], page 784) or a repetition operator (see Section 16.3.4 [Repetition Operators], page 783).

- keep track of the indices of the substring that matched a given group. See Section 16.7.1.8 [Using Registers], page 796, for a precise explanation. This lets you:
  - use the back-reference operator (see Section 16.3.8 [Back-reference Operator], page 788).
  - use registers (see Section 16.7.1.8 [Using Registers], page 796).

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 `')'`.

### 16.3.8 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 16.3.7 [Grouping Operators], page 787).

`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 `'(bana)na\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\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.

16.3.9 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.

16.3.9.1 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 16.3.7 [Grouping Operators], page 787, and Section 16.3.5 [Alternation Operator], page 784.

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 16.7.1.1 [GNU Pattern Buffers], page 792), 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.

16.3.9.2 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”.)
16.4 GNU Operators

Following are operators that GNU defines (and POSIX doesn’t).

16.4.1 Word Operators

The operators in this section require Regex to recognize parts of words. Regex uses a syntax table to determine whether or not a character is part of a word, i.e., whether or not it is word-constituent.

16.4.1.1 Non-Emacs Syntax Tables

A syntax table is an array indexed by the characters in your character set. In the ASCII encoding, therefore, a syntax table has 256 elements. Regex always uses a char * variable \texttt{re\_syntax\_table} as its syntax table. In some cases, it initializes this variable and in others it expects you to initialize it.

- If Regex is compiled with the preprocessor symbols \texttt{emacs} and \texttt{SYNTAX\_TABLE} both undefined, then Regex allocates \texttt{re\_syntax\_table} and initializes an element \( i \) either to \texttt{Sword} (which it defines) if \( i \) is a letter, number, or ‘\_’, or to zero if it’s not.
- If Regex is compiled with \texttt{emacs} undefined but \texttt{SYNTAX\_TABLE} defined, then Regex expects you to define a char * variable \texttt{re\_syntax\_table} to be a valid syntax table.
- See Section 16.5.1.1 [Emacs Syntax Tables], page 791, for what happens when Regex is compiled with the preprocessor symbol \texttt{emacs} defined.

16.4.1.2 The Match-word-boundary Operator (\textbackslash b)

This operator (represented by ‘\textbackslash b’) matches the empty string at either the beginning or the end of a word. For example, ‘\texttt{brat}\textbackslash b’ matches the separate word ‘\texttt{rat}’.

16.4.1.3 The Match-within-word Operator (\textbackslash B)

This operator (represented by ‘\textbackslash B’) matches the empty string within a word. For example, ‘c\textbackslash Brat\textbackslash Be’ matches ‘\texttt{crate}’, but ‘\texttt{dirty Brat}’ doesn’t match ‘\texttt{dirty rat}’.

16.4.1.4 The Match-beginning-of-word Operator (\textbackslash<)

This operator (represented by ‘\textbackslash<’) matches the empty string at the beginning of a word.

16.4.1.5 The Match-end-of-word Operator (\textbackslash>)

This operator (represented by ‘\textbackslash>’) matches the empty string at the end of a word.

16.4.1.6 The Match-word-constituent Operator (\textbackslash w)

This operator (represented by ‘\textbackslash w’) matches any word-constituent character.

16.4.1.7 The Match-non-word-constituent Operator (\textbackslash W)

This operator (represented by ‘\textbackslash W’) matches any character that is not word-constituent.

16.4.2 Buffer Operators

Following are operators which work on buffers. In Emacs, a buffer is, naturally, an Emacs buffer. For other programs, Regex considers the entire string to be matched as the buffer.
16.4.2.1 The Match-beginning-of-buffer Operator (\"")
This operator (represented by ‘\"") matches the empty string at the beginning of the buffer.

16.4.2.2 The Match-end-of-buffer Operator (\')
This operator (represented by ‘\') matches the empty string at the end of the buffer.

16.5 GNU Emacs Operators
Following are operators that GNU defines (and POSIX doesn’t) that you can use only when Regex is compiled with the preprocessor symbol emacs defined.

16.5.1 Syntactic Class Operators
The operators in this section require Regex to recognize the syntactic classes of characters. Regex uses a syntax table to determine this.

16.5.1.1 Emacs Syntax Tables
A syntax table is an array indexed by the characters in your character set. In the ASCII encoding, therefore, a syntax table has 256 elements.

If Regex is compiled with the preprocessor symbol emacs defined, then Regex expects you to define and initialize the variable re_syntax_table to be an Emacs syntax table. Emacs’ syntax tables are more complicated than Regex’s own (see Section 16.4.1.1 [Non-Emacs Syntax Tables], page 790). See Section “Syntax” in The GNU Emacs User’s Manual, for a description of Emacs’ syntax tables.

16.5.1.2 The Match-syntactic-class Operator (\sclass)
This operator matches any character whose syntactic class is represented by a specified character. ‘\sclass’ represents this operator where class is the character representing the syntactic class you want. For example, ‘w’ represents the syntactic class of word-constituent characters, so ‘\sw’ matches any word-constituent character.

16.5.1.3 The Match-not-syntactic-class Operator (\Sclass)
This operator is similar to the match-syntactic-class operator except that it matches any character whose syntactic class is not represented by the specified character. ‘\Sclass’ represents this operator. For example, ‘w’ represents the syntactic class of word-constituent characters, so ‘\Sw’ matches any character that is not word-constituent.

16.6 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 ‘acdac’, as it would if it were to choose the longest match for the first subexpression.
16.7 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.

16.7.1 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.

16.7.1.1 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:

\begin{verbatim}
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;
\end{verbatim}

16.7.1.2 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 16.7.1.1 [GNU Pattern Buffers], page 792).

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 16.2.1 [Syntax Bits], page 777, and Section 16.2.2 [Predefined Syntaxes], page 779.

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:

\(^4\) Regular expressions are also referred to as “patterns,” hence the name “pattern buffer.”
translate initialization

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 16.7.1.7 [GNU Translate Tables], page 796.

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.

16.7.1.3 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 16.7.1.2 [GNU Regular Expression Compiling], page 792), you can ask the matcher to match that pattern against a string using:

```c
int
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 16.7.1.8 [Using Registers], page 796, 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 16.7.1.2 [GNU Regular Expression Compiling], page 792, 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.

16.7.1.4 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 16.7.1.2 [GNU Regular Expression Compiling], page 792.

Here is the function declaration:

```c
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 16.7.1.3 [GNU Matching], page 793) 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 16.7.1.6 [Searching with Fastmaps], page 795.

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.

16.7.1.5 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 16.7.1.3 [GNU Matching], page 793) 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:

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.

16.7.1.6 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:

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
‘|’ 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.

### 16.7.1.7 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 between compiling the pattern buffer, compiling its fastmap, and matching or searching with the pattern buffer.

### 16.7.1.8 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 16.7.1.3 [GNU Matching], page 793, and Section 16.7.1.4 [GNU Searching], page 797).
Chapter 16: Regular expressions 797

[GNU Searching], page 794), 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_nsub elements (re_nsub is another field in the pattern buffer; see Section 16.7.1.1 [GNU Pattern Buffers], page 792). 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 i-th group that matches a substring of string, then the function sets regs->start[i] to the index in string where the substring matched by the i-th group begins, and regs->end[i] to the index just beyond that substring’s end. The function sets regs->start[0] and regs->end[0] to analogous information about the entire pattern.

For example, when you match ‘((a)(b))’ against ‘ab’, you get:

- 0 in regs->start[0] and 2 in regs->end[0]
- 0 in regs->start[1] and 2 in regs->end[1]
- 0 in regs->start[2] and 1 in regs->end[2]
• 1 in `regs->start[3]` and 2 in `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 `regs->start[0]` and 2 in `regs->end[0]`
  • 1 in `regs->start[1]` and 2 in `regs->end[1]`

• If the 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 `regs->start[i]` and `regs->end[i]` to −1.
  For example, when you match the pattern `'(a)*b'` against the string `'b'`, you get:
  • 0 in `regs->start[0]` and 1 in `regs->end[0]`
  • −1 in `regs->start[1]` and −1 in `regs->end[1]`

• If the i-th group matches a zero-length string, then the function sets `regs->start[i]` and `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 `regs->start[0]` and 1 in `regs->end[0]`
  • 0 in `regs->start[1]` and 0 in `regs->end[1]`

• If an i-th group contains a j-th group in turn not contained within any other group within group i and the function reports a match of the i-th group, then it records in `regs->start[j]` and `regs->end[j]` the last match (if it matched) of the 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 `regs->start[0]` and 3 in `regs->end[0]`
  • 2 in `regs->start[1]` and 3 in `regs->end[1]`
  • 2 in `regs->start[2]` and 2 in `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 `regs->start[0]` and 3 in `regs->end[0]`
  • 2 in `regs->start[1]` and 3 in `regs->end[1]`
  • 0 in `regs->start[2]` and 1 in `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 `regs->start[i]` and `regs->end[i]` to −1, then it also sets `regs->start[j]` and `regs->end[j]` to −1.
  For example, when you match the pattern `'((a)*b)*c'` against the string `'c'`, you get:
  • 0 in `regs->start[0]` and 1 in `regs->end[0]`
  • −1 in `regs->start[1]` and −1 in `regs->end[1]`
  • −1 in `regs->start[2]` and −1 in `regs->end[2]`

16.7.1.9 Freeing GNU Pattern Buffers

To free any allocated fields of a pattern buffer, use the POSIX function `regfree`:

```c
void
```
regfree (regex_t *preg)

preg is the pattern buffer whose allocated fields you want freed; this works because since the
type regex_t—the type for POSIX pattern buffers—is equivalent to the type re_pattern_buffer.

regfree also sets preg's 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.

16.7.2 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.

16.7.2.1 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
re_syntax_options (declared in regex.h) to some syntax (see Section 16.2 [Regular Ex-
pression Syntax], page 776).

To compile a regular expression use:

    char *
    re_comp (char *regex)

regex is the address of a null-terminated regular expression. 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 re_comp with the
null string (not the empty string) as the argument, it doesn’t change the contents of the
pattern buffer.

If re_comp successfully compiles the regular expression, it returns zero. If it can’t compile
the regular expression, it returns an error string. re_comp’s error messages are identical to
those of re_compile_pattern (see Section 16.7.1.2 [GNU Regular Expression Compiling],
page 792).

16.7.2.2 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 16.7.2.1 [BSD Regular Expression Compiling], page 799), you
can ask Regex to search for that pattern in a string using:

    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 16.7.1.6 [Searching with Fastmaps], page 795).
16.8 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.

16.8.1 ‘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 ‘^’ 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.

16.8.2 ‘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. ‘\’ 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.

16.8.3 ‘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.

16.8.4 ‘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.

16.8.5 ‘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.
\texttt{\textbackslash +} matches a `+`.
\texttt{\textbackslash ?} 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.

16.8.6 `grep` regular expression syntax

The character `\.` matches any single character.

\texttt{\textbackslash +} indicates that the regular expression should match one or more occurrences of the previous atom or regexp.
\texttt{\textbackslash ?} 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 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 ‘\(’
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.
16.8.7 ‘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.

GNU extensions are not supported and so ‘\w’, ‘\W’, ‘\<’, ‘\>’, ‘\b’, ‘\B’, ‘\`’, and ‘\’

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.

16.8.8 ‘posix-basic’ regular expression syntax

This is a synonym for ed.

16.8.9 ‘posix-egrep’ regular expression syntax

This is a synonym for egrep.
16.8.10 ‘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. ‘\‘ 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.
16.8.11 ‘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.

16.8.12 ‘sed’ regular expression syntax

This is a synonym for ed.
17 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).

17.1 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 \texttt{LD\_LIBRARY\_PATH}, the macro adds the appropriate run time search path options to the \texttt{LIB\<NAME\>} variable. This works on most systems. It can also be inhibited: The user of ‘\texttt{configure}’ can use the \texttt{--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 \texttt{LD\_LIBRARY\_PATH}.

The macros also set a variable \texttt{LTLIB\<NAME\>}, that should be used when linking with libtool. Both \texttt{LTLIB\<NAME\>} and \texttt{LIB\<NAME\>} contain essentially the same option, but where \texttt{LIB\<NAME\>} contains platform dependent flags like ‘\texttt{-Wl,-rpath}’, \texttt{LTLIB\<NAME\>} contains platform independent flags like ‘\texttt{-R}’.

If you, by mistake, use \texttt{LIB\<NAME\>} instead of \texttt{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 \texttt{LTLIB\<NAME\>} instead of \texttt{LIB\<NAME\>} when linking \texttt{without} libtool, you will observe build failures, because the ‘\texttt{-R}’ options contained in \texttt{LTLIB\<NAME\>} are not valid options to compilers such as GCC.

\textbf{Example of using AC\_LIB\_LINKFLAGS}

Suppose you want to use \texttt{libz}, the compression library.

1. In configure.ac you add the line
   \begin{verbatim}
   AC_CONFIG_AUX_DIR([build-aux])
   AC_LIB_LINKFLAGS([z])
   \end{verbatim}
   Note that since the \texttt{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 \texttt{build-aux} directory you add the file \texttt{config.rpath}, also part of the GnuLib havelib module. (\texttt{gnulib-tool} will usually do this for you automatically.)

3. In \texttt{Makefile.in} you add \texttt{@LIBZ@} to the link command line of your program. Or, if you are using Automake, you add \texttt{$\{}$LIBZ$\}$ to the \texttt{LDADD} variable that corresponds to your program.

\textbf{Dependencies}

The dependencies list is a space separated list of library names that \texttt{libname} is known to depend upon. Example: If \texttt{libfoo} depends on \texttt{libfoox}, and \texttt{libfooz} depends on \texttt{libfoox} and \texttt{libfoo}, you can write:

\begin{verbatim}
AC_LIB_LINKFLAGS([foo])
AC_LIB_LINKFLAGS([foox], [foo])
AC_LIB_LINKFLAGS([fooz], [foo x foyo])
\end{verbatim}

Explicit dependencies are necessary if you cannot assume that a \texttt{.la} file, created by libtool, is installed. If you can assume that \texttt{libfoo\texttt{.la}} is installed by libtool (and has not been omitted by the package distributor!), you can omit the explicit dependency and just write

\begin{verbatim}
AC_LIB_LINKFLAGS([foo])
\end{verbatim}

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, -I options with the necessary directories are added to the CPPFLAGS variable, for use by the whole package. For the linker, appropriate options are added to the LIB<NAME> and LTLIB<NAME> variables, for use during linking by those programs and libraries that need the dependency on lib<name>. You need to use the value of LIB<NAME> or LTLIB<NAME> in the Makefiles. LTLIB<NAME> is for use with libtool, whereas LIB<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:

```c
#define LIBNAME_VERSION 10203
extern int libname_version; /* initialized to LIBNAME_VERSION */
```

and use a test like

```plaintext
AC_TRY_RUN([int main () { return libname_version != LIBNAME_VERSION; }])
```

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, x86_64, ia64, sparc64, 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 prefix/lib, whereas the 64-bit libraries are installed in

- prefix/lib64 on many glibc systems,
- prefix/lib/64 on Solaris systems.

On such systems, in 64-bit mode, configure will search for the libraries in prefix/lib64 or prefix/lib/64, respectively, not in prefix/lib. A user can adhere to these system-wide conventions by using the ‘--libdir’ option when installing packages. When a user has already installed packages in 64-bit mode using the GNU default ‘--libdir=prefix/lib’, he can make this directory adhere to the system-wide convention by placing a symbolic link:

On glibc systems:

```bash
ln -s lib prefix/lib64
```

On Solaris systems:

```bash
ln -s . prefix/lib/64
```
17.2 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 17: Build Infrastructure Modules

813

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.
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 BUILDING_LIBFOO && HAVE_VISIBILITY
#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.
Note about other compilers: MSVC support can be added easily, by extending the
definition of the macro mentioned above, to something like this:
#if BUILDING_LIBFOO && HAVE_VISIBILITY
#define LIBFOO_DLL_EXPORTED __attribute__((__visibility__("default")))
#elif BUILDING_LIBFOO && defined _MSC_VER
#define LIBFOO_DLL_EXPORTED __declspec(dllexport)
#elif defined _MSC_VER
#define LIBFOO_DLL_EXPORTED __declspec(dllimport)
#else
#define LIBFOO_DLL_EXPORTED
#endif


17.3 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 provide 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](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:

```makefile
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:

```plaintext
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:

```makefile
if HAVE_LD_VERSION_SCRIPT
        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:

```plaintext
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`:

```makefile
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 17.2 [Exported Symbols of Shared Libraries], page 812).
17.4 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 gnu/lib/modules/configmake, or inspect your resulting gnu/lib Makefile.

17.5 warnings

The warnings module allows to regularly build a package with more GCC warnings than the default warnings emitted by GCC.

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 gnu/lib), 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.

17.6 manywarnings

The manywarnings module allows you to enable as many GCC warnings as possible for your package. The purpose is to protect against introducing new code that triggers warnings that weren’t already triggered by the existing code base.

An example use of the module is as follows:

```plaintext
gl_manywarn_all_gcc([warnings])
# Set up the list of the pointless, undesired warnings.
nw=
nw="$nw -Winline"  # It's OK to not inline.
nw="$nw -Wstrict-overflow"  # It's OK to optimize strictly.
nw="$nw -Wsystem-headers"  # Don't let system headers trigger warnings.
# Enable all GCC warnings not in this list.
gl_manywarn_complement([warnings], [$warnings], [$nw])
for w in $warnings; do
    gl_warn_add([$w])
done
```

This module is meant to be used by developers who are not very experienced regarding the various GCC warning options. In the beginning you will set the list of undesired warnings (‘nw’ in the example above) to empty, and compile the package with all possible warnings enabled. The GCC option ‘-fdiagnostics-show-option’, available in GCC 4.1 or newer, helps understanding which warnings originated from which option. Then you will go through the list of warnings. 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.

There are also many GCC warning options which 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 new version of GCC is released, you can add the new warning options that it introduces into the `gl_manywarn_all_gcc` macro (and submit your modification to the Gnulib maintainers :-)), and enjoy the benefits of the new warnings, while adding the undesired ones to the ‘nw’ variable.

17.7 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
Chapter 17: Build Infrastructure Modules

that enables use of Valgrind at configure time, when configure found it to be present; and one at the discretion of the developer.

17.7.1 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:

```makefile
gl_VALGRIND_TESTS_DEFAULT_NO
```

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:

```makefile
gl_VALGRIND_TESTS_DEFAULT_NO
```

17.7.2 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:

```bash
./configure VALGRINDFLAGS="--suppressions="/local.supp"
```

Alternatively during build phase:

```bash
make check VALGRINDFLAGS="--suppressions="/local.supp"
```

This is useful if you have a valgrind suppression file 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:

```bash
./configure DEFAULT_VALGRINDFLAGS="--quiet"
```

Alternatively, during the build phase:

```bash
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:

```bash
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:

AM_VALGRINDFLAGS = --suppressions=$(srcdir)/local-valgrind.sup
LOG_COMPILER = $(LOG_VALGRIND)

17.7.3 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.

17.7.4 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 Gnulib. 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.

17.8 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’:

build-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 semicolon at the end.
18 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
```

### 18.1 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.

### 18.2 Utilities for Makefiles

These are a couple of programs that are often useful 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`. 

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.

18.3 Programs for developing in Git checkouts

These are a couple of programs that 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.

build-aux/bootstrap
This program manages the Git submodules, including Gnulib, and is also a wrapper around `gnulib-tool` and `automake`, that generates files from other files.
Note: Because this program mixes version control management and generation of files in non-obvious ways, it has a number of usability issues for the advanced developer.

build-aux/bootstrap.conf
This is the template configuration file. After copying it into 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.

18.4 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.

18.5 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 17.2 [Exported Symbols of Shared Libraries], page 812.

18.6 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.
19 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.

19.1 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.

19.2 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.
Appendix A  GNU Free Documentation License

Version 1.3, 3 November 2008

https://fsf.org/

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

0. PREAMBLE

The purpose of this License is to make a manual, textbook, or other functional and useful document free in the sense of freedom: to assure everyone the effective freedom to copy and redistribute it, with or without modifying it, either commercially or non-commercially. Secondarily, this License preserves for the author and publisher a way to get credit for their work, while not being considered responsible for modifications made by others.

This License is a kind of “copyleft”, which means that derivative works of the document must themselves be free in the same sense. It complements the GNU General Public License, which is a copyleft license designed for free software.

We have designed this License in order to use it for manuals for free software, because free software needs free documentation: a free program should come with manuals providing the same freedoms that the software does. But this License is not limited to software manuals; it can be used for any textual work, regardless of subject matter or whether it is published as a printed book. We recommend this License principally for works whose purpose is instruction or reference.

1. APPLICABILITY AND DEFINITIONS

This License applies to any manual or other work, in any medium, that contains a notice placed by the copyright holder saying it can be distributed under the terms of this License. Such a notice grants a world-wide, royalty-free license, unlimited in duration, to use that work under the conditions stated herein. The “Document”, below, refers to any such manual or work. Any member of the public is a licensee, and is addressed as “you”. You accept the license if you copy, modify or distribute the work in a way requiring permission under copyright law.

A “Modified Version” of the Document means any work containing the Document or a portion of it, either copied verbatim, or with modifications and/or translated into another language.

A “Secondary Section” is a named appendix or a front-matter section of the Document that deals exclusively with the relationship of the publishers or authors of the Document to the Document’s overall subject (or to related matters) and contains nothing that could fall directly within that overall subject. (Thus, if the Document is in part a textbook of mathematics, a Secondary Section may not explain any mathematics.) The relationship could be a matter of historical connection with the subject or with related matters, or of legal, commercial, philosophical, ethical or political position regarding them.

The “Invariant Sections” are certain Secondary Sections whose titles are designated, as being those of Invariant Sections, in the notice that says that the Document is released
under this License. If a section does not fit the above definition of Secondary then it is not allowed to be designated as Invariant. The Document may contain zero Invariant Sections. If the Document does not identify any Invariant Sections then there are none. The “Cover Texts” are certain short passages of text that are listed, as Front-Cover Texts or Back-Cover Texts, in the notice that says that the Document is released under this License. A Front-Cover Text may be at most 5 words, and a Back-Cover Text may be at most 25 words.

A “Transparent” copy of the Document means a machine-readable copy, represented in a format whose specification is available to the general public, that is suitable for revising the document straightforwardly with generic text editors or (for images composed of pixels) generic paint programs or (for drawings) some widely available drawing editor, and that is suitable for input to text formatters or for automatic translation to a variety of formats suitable for input to text formatters. A copy made in an otherwise Transparent file format whose markup, or absence of markup, has been arranged to thwart or discourage subsequent modification by readers is not Transparent. An image format is not Transparent if used for any substantial amount of text. A copy that is not “Transparent” is called “Opaque”.

Examples of suitable formats for Transparent copies include plain ASCII without markup, Texinfo input format, La\TeX input format, SGML or XML using a publicly available DTD, and standard-conforming simple HTML, PostScript or PDF designed for human modification. Examples of transparent image formats include PNG, XCF and JPG. Opaque formats include proprietary formats that can be read and edited only by proprietary word processors, SGML or XML for which the DTD and/or processing tools are not generally available, and the machine-generated HTML, PostScript or PDF produced by some word processors for output purposes only.

The “Title Page” means, for a printed book, the title page itself, plus such following pages as are needed to hold, legibly, the material this License requires to appear in the title page. For works in formats which do not have any title page as such, “Title Page” means the text near the most prominent appearance of the work’s title, preceding the beginning of the body of the text.

The “publisher” means any person or entity that distributes copies of the Document to the public.

A section “Entitled XYZ” means a named subunit of the Document whose title either is precisely XYZ or contains XYZ in parentheses following text that translates XYZ in another language. (Here XYZ stands for a specific section name mentioned below, such as “Acknowledgements”, “Dedications”, “Endorsements”, or “History”.) To “Preserve the Title” of such a section when you modify the Document means that it remains a section “Entitled XYZ” according to this definition.

The Document may include Warranty Disclaimers next to the notice which states that this License applies to the Document. These Warranty Disclaimers are considered to be included by reference in this License, but only as regards disclaiming warranties: any other implication that these Warranty Disclaimers may have is void and has no effect on the meaning of this License.

2. VERBATIM COPYING
You may copy and distribute the Document in any medium, either commercially or noncommercially, provided that this License, the copyright notices, and the license notice saying this License applies to the Document are reproduced in all copies, and that you add no other conditions whatsoever to those of this License. You may not use technical measures to obstruct or control the reading or further copying of the copies you make or distribute. However, you may accept compensation in exchange for copies. If you distribute a large enough number of copies you must also follow the conditions in section 3.

You may also lend copies, under the same conditions stated above, and you may publicly display copies.

3. COPYING IN QUANTITY

If you publish printed copies (or copies in media that commonly have printed covers) of the Document, numbering more than 100, and the Document’s license notice requires Cover Texts, you must enclose the copies in covers that carry, clearly and legibly, all these Cover Texts: Front-Cover Texts on the front cover, and Back-Cover Texts on the back cover. Both covers must also clearly and legibly identify you as the publisher of these copies. The front cover must present the full title with all words of the title equally prominent and visible. You may add other material on the covers in addition. Copying with changes limited to the covers, as long as they preserve the title of the Document and satisfy these conditions, can be treated as verbatim copying in other respects.

If the required texts for either cover are too voluminous to fit legibly, you should put the first ones listed (as many as fit reasonably) on the actual cover, and continue the rest onto adjacent pages.

If you publish or distribute Opaque copies of the Document numbering more than 100, you must either include a machine-readable Transparent copy along with each Opaque copy, or state in or with each Opaque copy a computer-network location from which the general network-using public has access to download using public-standard network protocols a complete Transparent copy of the Document, free of added material. If you use the latter option, you must take reasonably prudent steps, when you begin distribution of Opaque copies in quantity, to ensure that this Transparent copy will remain thus accessible at the stated location until at least one year after the last time you distribute an Opaque copy (directly or through your agents or retailers) of that edition to the public.

It is requested, but not required, that you contact the authors of the Document well before redistributing any large number of copies, to give them a chance to provide you with an updated version of the Document.

4. MODIFICATIONS

You may copy and distribute a Modified Version of the Document under the conditions of sections 2 and 3 above, provided that you release the Modified Version under precisely this License, with the Modified Version filling the role of the Document, thus licensing distribution and modification of the Modified Version to whoever possesses a copy of it. In addition, you must do these things in the Modified Version:

A. Use in the Title Page (and on the covers, if any) a title distinct from that of the Document, and from those of previous versions (which should, if there were any,
be listed in the History section of the Document). You may use the same title as a previous version if the original publisher of that version gives permission.

B. List on the Title Page, as authors, one or more persons or entities responsible for authorship of the modifications in the Modified Version, together with at least five of the principal authors of the Document (all of its principal authors, if it has fewer than five), unless they release you from this requirement.

C. State on the Title page the name of the publisher of the Modified Version, as the publisher.

D. Preserve all the copyright notices of the Document.

E. Add an appropriate copyright notice for your modifications adjacent to the other copyright notices.

F. Include, immediately after the copyright notices, a license notice giving the public permission to use the Modified Version under the terms of this License, in the form shown in the Addendum below.

G. Preserve in that license notice the full lists of Invariant Sections and required Cover Texts given in the Document’s license notice.

H. Include an unaltered copy of this License.

I. Preserve the section Entitled “History”, Preserve its Title, and add to it an item stating at least the title, year, new authors, and publisher of the Modified Version as given on the Title Page. If there is no section Entitled “History” in the Document, create one stating the title, year, authors, and publisher of the Document as given on its Title Page, then add an item describing the Modified Version as stated in the previous sentence.

J. Preserve the network location, if any, given in the Document for public access to a Transparent copy of the Document, and likewise the network locations given in the Document for previous versions it was based on. These may be placed in the “History” section. You may omit a network location for a work that was published at least four years before the Document itself, or if the original publisher of the version it refers to gives permission.

K. For any section Entitled “Acknowledgements” or “Dedications”, Preserve the Title of the section, and preserve in the section all the substance and tone of each of the contributor acknowledgements and/or dedications given therein.

L. Preserve all the Invariant Sections of the Document, unaltered in their text and in their titles. Section numbers or the equivalent are not considered part of the section titles.

M. Delete any section Entitled “Endorsements”. Such a section may not be included in the Modified Version.

N. Do not retitle any existing section to be Entitled “Endorsements” or to conflict in title with any Invariant Section.

O. Preserve any Warranty Disclaimers.

If the Modified Version includes new front-matter sections or appendices that qualify as Secondary Sections and contain no material copied from the Document, you may at your option designate some or all of these sections as invariant. To do this, add their
Appendix A: GNU Free Documentation License

titles to the list of Invariant Sections in the Modified Version’s license notice. These titles must be distinct from any other section titles.

You may add a section Entitled “Endorsements”, provided it contains nothing but endorsements of your Modified Version by various parties—for example, statements of peer review or that the text has been approved by an organization as the authoritative definition of a standard.

You may add a passage of up to five words as a Front-Cover Text, and a passage of up to 25 words as a Back-Cover Text, to the end of the list of Cover Texts in the Modified Version. Only one passage of Front-Cover Text and one of Back-Cover Text may be added by (or through arrangements made by) any one entity. If the Document already includes a cover text for the same cover, previously added by you or by arrangement made by the same entity you are acting on behalf of, you may not add another; but you may replace the old one, on explicit permission from the previous publisher that added the old one.

The author(s) and publisher(s) of the Document do not by this License give permission to use their names for publicity for or to assert or imply endorsement of any Modified Version.

5. COMBINING DOCUMENTS

You may combine the Document with other documents released under this License, under the terms defined in section 4 above for modified versions, provided that you include in the combination all of the Invariant Sections of all of the original documents, unmodified, and list them all as Invariant Sections of your combined work in its license notice, and that you preserve all their Warranty Disclaimers.

The combined work need only contain one copy of this License, and multiple identical Invariant Sections may be replaced with a single copy. If there are multiple Invariant Sections with the same name but different contents, make the title of each such section unique by adding at the end of it, in parentheses, the name of the original author or publisher of that section if known, or else a unique number. Make the same adjustment to the section titles in the list of Invariant Sections in the license notice of the combined work.

In the combination, you must combine any sections Entitled “History” in the various original documents, forming one section Entitled “History”; likewise combine any sections Entitled “Acknowledgements”, and any sections Entitled “Dedications”. You must delete all sections Entitled “Endorsements.”

6. COLLECTIONS OF DOCUMENTS

You may make a collection consisting of the Document and other documents released under this License, and replace the individual copies of this License in the various documents with a single copy that is included in the collection, provided that you follow the rules of this License for verbatim copying of each of the documents in all other respects.

You may extract a single document from such a collection, and distribute it individually under this License, provided you insert a copy of this License into the extracted document, and follow this License in all other respects regarding verbatim copying of that document.
7. AGGREGATION WITH INDEPENDENT WORKS

A compilation of the Document or its derivatives with other separate and independent documents or works, in or on a volume of a storage or distribution medium, is called an “aggregate” if the copyright resulting from the compilation is not used to limit the legal rights of the compilation’s users beyond what the individual works permit. When the Document is included in an aggregate, this License does not apply to the other works in the aggregate which are not themselves derivative works of the Document.

If the Cover Text requirement of section 3 is applicable to these copies of the Document, then if the Document is less than one half of the entire aggregate, the Document’s Cover Texts may be placed on covers that bracket the Document within the aggregate, or the electronic equivalent of covers if the Document is in electronic form. Otherwise they must appear on printed covers that bracket the whole aggregate.

8. TRANSLATION

Translation is considered a kind of modification, so you may distribute translations of the Document under the terms of section 4. Replacing Invariant Sections with translations requires special permission from their copyright holders, but you may include translations of some or all Invariant Sections in addition to the original versions of these Invariant Sections. You may include a translation of this License, and all the license notices in the Document, and any Warranty Disclaimers, provided that you also include the original English version of this License and the original versions of those notices and disclaimers. In case of a disagreement between the translation and the original version of this License or a notice or disclaimer, the original version will prevail.

If a section in the Document is Entitled “Acknowledgements”, “Dedications”, or “History”, the requirement (section 4) to Preserve its Title (section 1) will typically require changing the actual title.

9. TERMINATION

You may not copy, modify, sublicense, or distribute the Document except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, or distribute it is void, and will automatically terminate your rights under this License.

However, if you cease all violation of this License, then your license from a particular copyright holder is reinstated (a) provisionally, unless and until the copyright holder explicitly and finally terminates your license, and (b) permanently, if the copyright holder fails to notify you of the violation by some reasonable means prior to 60 days after the cessation.

Moreover, your license from a particular copyright holder is reinstated permanently if the copyright holder notifies you of the violation by some reasonable means, this is the first time you have received notice of violation of this License (for any work) from that copyright holder, and you cure the violation prior to 30 days after your receipt of the notice.

Termination of your rights under this section does not terminate the licenses of parties who have received copies or rights from you under this License. If your rights have been terminated and not permanently reinstated, receipt of a copy of some or all of the same material does not give you any rights to use it.
10. FUTURE REVISIONS OF THIS LICENSE

The Free Software Foundation may publish new, revised versions of the GNU Free Documentation License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns. See https://www.gnu.org/licenses/.

Each version of the License is given a distinguishing version number. If the Document specifies that a particular numbered version of this License “or any later version” applies to it, you have the option of following the terms and conditions either of that specified version or of any later version that has been published (not as a draft) by the Free Software Foundation. If the Document does not specify a version number of this License, you may choose any version ever published (not as a draft) by the Free Software Foundation. If the Document specifies that a proxy can decide which future versions of this License can be used, that proxy’s public statement of acceptance of a version permanently authorizes you to choose that version for the Document.

11. RELICENSING

“Massive Multiauthor Collaboration Site” (or “MMC Site”) means any World Wide Web server that publishes copyrightable works and also provides prominent facilities for anybody to edit those works. A public wiki that anybody can edit is an example of such a server. A “Massive Multiauthor Collaboration” (or “MMC”) contained in the site means any set of copyrightable works thus published on the MMC site.

“CC-BY-SA” means the Creative Commons Attribution-Share Alike 3.0 license published by Creative Commons Corporation, a not-for-profit corporation with a principal place of business in San Francisco, California, as well as future copyleft versions of that license published by that same organization.

“Incorporate” means to publish or republish a Document, in whole or in part, as part of another Document.

An MMC is “eligible for relicensing” if it is licensed under this License, and if all works that were first published under this License somewhere other than this MMC, and subsequently incorporated in whole or in part into the MMC, (1) had no cover texts or invariant sections, and (2) were thus incorporated prior to November 1, 2008.

The operator of an MMC Site may republish an MMC contained in the site under CC-BY-SA on the same site at any time before August 1, 2009, provided the MMC is eligible for relicensing.
ADDENDUM: How to use this License for your documents

To use this License in a document you have written, include a copy of the License in the document and put the following copyright and license notices just after the title page:

```
Copyright (C) year your name.
Permission is granted to copy, distribute and/or modify this document
under the terms of the GNU Free Documentation License, Version 1.3
or any later version published by the Free Software Foundation;
with no Invariant Sections, no Front-Cover Texts, and no Back-Cover
Texts. A copy of the license is included in the section entitled "GNU
Free Documentation License".
```

If you have Invariant Sections, Front-Cover Texts and Back-Cover Texts, replace the "with...Texts." line with this:

```
with the Invariant Sections being list their titles, with
the Front-Cover Texts being list, and with the Back-Cover Texts
being list.
```

If you have Invariant Sections without Cover Texts, or some other combination of the three, merge those two alternatives to suit the situation.

If your document contains nontrivial examples of program code, we recommend releasing these examples in parallel under your choice of free software license, such as the GNU General Public License, to permit their use in free software.
Index

| $                  | 789          |
| $................................. | 789          |
| (                   | 787          |
| (................................. | 787          |
| )                   | 787          |
| *                  | 783          |
| '*'.............................. | 783          |
| +                  | 783          |
| '+'............................. | 783          |
| -                  | 785          |
| '-'............................ | 785          |
| .                  | 782          |
| '.'............................ | 782          |
| =                  | 786          |
| '='] in regex        | 786          |
| ?                  | 783          |
| '?'........................... | 783          |
| [                  | 785          |
| ['.............................. | 785          |
| ['=] in regex        | 786          |
| ['.............................. | 785          |
| ['colon'] in regex   | 786          |
| ]                  | 785          |
| ].............................. | 785          |
| ^                  | 785, 789     |
| '^'............................ | 785          |

- _attribute_ .................................. 745
- _libc_single_threaded ...................... 690
- _exit ....................................... 79
- _Exit ....................................... 79
- _Fork ........................................ 711
- _GL_EXTERN_INLINE ......................... 756
- _GL_INLINE .................................. 756
- _GL_INLINE_HEADER_BEGIN .................... 756
- _GL_INLINE_HEADER_END ...................... 756
- _longjmp ................................... 79
- _Noreturn .................................. 747
- _setjmp ..................................... 79
- _tolower .................................... 80
- _toupper .................................... 80
- _Fork ........................................ 711
- _Exit ....................................... 79
- __attribute__ .............................. 79
| A    | alca                              | 493 |
|      | a64l                              | 493 |
|      | abort                             | 493 |
|      | Aborting execution                | 493 |
|      | abs                              | 493 |
|      | AC_LIB_HAVE_LINKFLAGS(name, [dependencies], [includes], [testcode], [missing-message]) | 493 |
|      | AC_LIB_LINKFLAGS(name, [dependencies]) | 493 |
|      | accept                           | 493 |
|      | accept4                           | 493 |
|      | access                           | 493 |
|      | acct                             | 493 |
|      | acos                             | 493 |
|      | acof                             | 493 |
|      | acosf                            | 493 |
|      |acosl                             | 493 |
|      | addmntent                        | 493 |
|      | addseverity                      | 493 |
|      | adjtime                          | 493 |
|      | adjtimex                         | 493 |
|      | advance                          | 493 |
|      | aio_cancel                       | 493 |
|      | aio_error                        | 493 |
|      | aio_fasync                       | 493 |
|      | aio_init                         | 493 |
|      | aio_read                         | 493 |
|      | aio_return                       | 493 |
|      | aio_suspend                      | 493 |
|      | aio_write                        | 493 |
|      | alarm                            | 493 |
|      | aligned_alloc                    | 493 |
|      | ALLOC_N                          | 493 |
|      | ALLOC_N_UNINITIALIZED            | 493 |
|      | alloca                           | 493 |
|      | allocated initialization          | 493 |
|      | ALLOC                           | 493 |
|      | alphsort                         | 493 |
|      | alternation operator             | 493 |
|      | alternation operator and ""     | 493 |
|      | anchoring                        | 493 |
|      | anchors                          | 493 |
|      | argp_err_exit_status             | 493 |
|      | argp_error                       | 493 |
|      | argp_failure                     | 493 |
|      | argp_help                        | 493 |
|      | argp_parse                       | 493 |
|      | argp_program_bug_address         | 493 |
|      | argp_program_version             | 493 |
|      | argp_program_version_hook        | 493 |
|      | argp_state_help                  | 493 |
|      | argp_usage                       | 493 |
|      | argz_add                         | 493 |
|      | argz_add_sep                     | 493 |
|      | argz_append                      | 493 |
|      | argz_count                       | 493 |

<p>| B    | back-references                   | 493 |
|      | backtrace                         | 493 |
|      | backtrace_symbols                 | 493 |
|      | backtrace_symbols_fd              | 493 |
|      | backtracking                      | 493 |
|      | basename                          | 493 |
|      | bcmp                              | 493 |
|      | bcopy                             | 493 |
|      | bdflush                           | 493 |
|      | beginning-of-line operator        | 493 |
|      | bind                              | 493 |
|      | bind_textdomain_codeset           | 493 |
|      | bindresvport                      | 493 |</p>
<table>
<thead>
<tr>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>close</td>
<td>112</td>
</tr>
<tr>
<td>closedir</td>
<td>112</td>
</tr>
<tr>
<td>closefrom</td>
<td>712</td>
</tr>
<tr>
<td>closelog</td>
<td>112</td>
</tr>
<tr>
<td>cmd_broadcast</td>
<td>112</td>
</tr>
<tr>
<td>cmd_destroy</td>
<td>113</td>
</tr>
<tr>
<td>cmd_init</td>
<td>113</td>
</tr>
<tr>
<td>cmd_signal</td>
<td>113</td>
</tr>
<tr>
<td>cmd_timedwait</td>
<td>113</td>
</tr>
<tr>
<td>cmd_wait</td>
<td>114</td>
</tr>
<tr>
<td>'colon[]' in regex</td>
<td>786</td>
</tr>
<tr>
<td>comments describing functions</td>
<td>33</td>
</tr>
<tr>
<td>conditional dependencies</td>
<td>29</td>
</tr>
<tr>
<td>configmake module</td>
<td>815</td>
</tr>
<tr>
<td>configmake.h module for updating</td>
<td>815</td>
</tr>
<tr>
<td>confstr</td>
<td>114</td>
</tr>
<tr>
<td>conj</td>
<td>114</td>
</tr>
<tr>
<td>conjf</td>
<td>114</td>
</tr>
<tr>
<td>conjl</td>
<td>115</td>
</tr>
<tr>
<td>connect</td>
<td>115</td>
</tr>
<tr>
<td>copy_file_range</td>
<td>712</td>
</tr>
<tr>
<td>copysign</td>
<td>115</td>
</tr>
<tr>
<td>copysignf</td>
<td>115</td>
</tr>
<tr>
<td>copysignl</td>
<td>116</td>
</tr>
<tr>
<td>cos</td>
<td>116</td>
</tr>
<tr>
<td>cosf</td>
<td>116</td>
</tr>
<tr>
<td>cosh</td>
<td>116</td>
</tr>
<tr>
<td>coshf</td>
<td>116</td>
</tr>
<tr>
<td>coshl</td>
<td>117</td>
</tr>
<tr>
<td>cosl</td>
<td>117</td>
</tr>
<tr>
<td>cpow</td>
<td>117</td>
</tr>
<tr>
<td>cpowf</td>
<td>118</td>
</tr>
<tr>
<td>cpowl</td>
<td>118</td>
</tr>
<tr>
<td>cproj</td>
<td>118</td>
</tr>
<tr>
<td>cprojf</td>
<td>118</td>
</tr>
<tr>
<td>cprojl</td>
<td>119</td>
</tr>
<tr>
<td>creal</td>
<td>119</td>
</tr>
<tr>
<td>crealf</td>
<td>119</td>
</tr>
<tr>
<td>creall</td>
<td>119</td>
</tr>
<tr>
<td>creat</td>
<td>120</td>
</tr>
<tr>
<td>crypt</td>
<td>120</td>
</tr>
<tr>
<td>csin</td>
<td>120</td>
</tr>
<tr>
<td>csinf</td>
<td>121</td>
</tr>
<tr>
<td>csinh</td>
<td>121</td>
</tr>
<tr>
<td>csinhf</td>
<td>121</td>
</tr>
<tr>
<td>csinh1</td>
<td>121</td>
</tr>
<tr>
<td>csinl</td>
<td>122</td>
</tr>
<tr>
<td>csqrt</td>
<td>122</td>
</tr>
<tr>
<td>csqrtf</td>
<td>122</td>
</tr>
<tr>
<td>csqrt1</td>
<td>122</td>
</tr>
<tr>
<td>ctan</td>
<td>123</td>
</tr>
<tr>
<td>ctanf</td>
<td>123</td>
</tr>
<tr>
<td>ctanh</td>
<td>123</td>
</tr>
<tr>
<td>ctanhf</td>
<td>123</td>
</tr>
<tr>
<td>ctanh1</td>
<td>124</td>
</tr>
<tr>
<td>ctanl</td>
<td>124</td>
</tr>
<tr>
<td>ctermid</td>
<td>124</td>
</tr>
<tr>
<td>ctime</td>
<td>124</td>
</tr>
<tr>
<td>ctime_r</td>
<td>125</td>
</tr>
<tr>
<td>cuserid</td>
<td>647</td>
</tr>
</tbody>
</table>

**D**

<table>
<thead>
<tr>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>daddl</td>
<td>125</td>
</tr>
<tr>
<td>daemon</td>
<td>713</td>
</tr>
<tr>
<td>daylight</td>
<td>126</td>
</tr>
<tr>
<td>dbm_clearerr</td>
<td>126</td>
</tr>
<tr>
<td>dbm_close</td>
<td>126</td>
</tr>
<tr>
<td>dbm_delete</td>
<td>126</td>
</tr>
<tr>
<td>dbm_error</td>
<td>127</td>
</tr>
<tr>
<td>dbm_fetch</td>
<td>127</td>
</tr>
<tr>
<td>dbm_firstkey</td>
<td>127</td>
</tr>
<tr>
<td>dbm_nextkey</td>
<td>127</td>
</tr>
<tr>
<td>dbm_open</td>
<td>128</td>
</tr>
<tr>
<td>dbm_store</td>
<td>128</td>
</tr>
<tr>
<td>dcgettext</td>
<td>525</td>
</tr>
<tr>
<td>dgettext</td>
<td>526</td>
</tr>
<tr>
<td>dgettext</td>
<td>128</td>
</tr>
<tr>
<td>difftime</td>
<td>128</td>
</tr>
<tr>
<td>dirent-safer</td>
<td>756</td>
</tr>
<tr>
<td>dirfd</td>
<td>129</td>
</tr>
<tr>
<td>dirname</td>
<td>129</td>
</tr>
<tr>
<td>div</td>
<td>129</td>
</tr>
<tr>
<td>dl_iterate_phdr</td>
<td>528</td>
</tr>
<tr>
<td>dladdr</td>
<td>502</td>
</tr>
<tr>
<td>dladdr1</td>
<td>502</td>
</tr>
<tr>
<td>dlclose</td>
<td>129</td>
</tr>
<tr>
<td>dlerror</td>
<td>130</td>
</tr>
<tr>
<td>dlinfo</td>
<td>502</td>
</tr>
<tr>
<td>dlopen</td>
<td>503</td>
</tr>
<tr>
<td>dlopen</td>
<td>130</td>
</tr>
<tr>
<td>dlsym</td>
<td>130</td>
</tr>
<tr>
<td>dlvsym</td>
<td>503</td>
</tr>
<tr>
<td>dmall</td>
<td>130</td>
</tr>
<tr>
<td>dn_comp</td>
<td>580</td>
</tr>
<tr>
<td>dn_expand</td>
<td>581</td>
</tr>
<tr>
<td>dn_skipname</td>
<td>581</td>
</tr>
<tr>
<td>dgettext</td>
<td>526</td>
</tr>
<tr>
<td>double inclusion of header files</td>
<td>31</td>
</tr>
<tr>
<td>dprintf</td>
<td>131</td>
</tr>
<tr>
<td>drand48</td>
<td>131</td>
</tr>
<tr>
<td>drand48_r</td>
<td>656</td>
</tr>
<tr>
<td>drem</td>
<td>531</td>
</tr>
<tr>
<td>dremf</td>
<td>531</td>
</tr>
<tr>
<td>dreml</td>
<td>531</td>
</tr>
<tr>
<td>dsb1</td>
<td>132</td>
</tr>
<tr>
<td>dup</td>
<td>132</td>
</tr>
<tr>
<td>dup2</td>
<td>132</td>
</tr>
<tr>
<td>dup3</td>
<td>713</td>
</tr>
<tr>
<td>duplocale</td>
<td>133</td>
</tr>
<tr>
<td>dylib</td>
<td>708</td>
</tr>
</tbody>
</table>
E

ether_hostton ............................................ 557
ether_aton ................................................. 558
ether_ntoa ................................................. 558
ether_ntoa_r .............................................. 558
everget ....................................................... 558
euidaccess ................................................... 714
eventfd ....................................................... 677
eventfd_read ............................................... 677
eventfd_write ............................................... 678
exec1 ......................................................... 138
execle ......................................................... 138
execcl ......................................................... 138
execv ......................................................... 139
execve ......................................................... 139
execveat ..................................................... 714
execvp ......................................................... 140
execvep ....................................................... 714
exit ........................................................ 140
exp ........................................................ 140
exp10 ........................................................ 532
exp10f ......................................................... 532
exp10l ........................................................ 532
exp2 ........................................................ 141
exp2f ........................................................ 141
exp2l ........................................................ 141
expf ........................................................ 142
exp1 ........................................................ 142
explicit_bzero .............................................. 669
expm1 ........................................................ 142
expm1f ......................................................... 143
expm1l ......................................................... 143
EXPR_SIGNED ............................................... 748
extern inline ............................................... 755
Extra tests modules ........................................ 40

F

fabs ........................................................ 143
fabsf ........................................................ 143
fabsl ........................................................ 144
facesat ......................................................... 144
fadd ........................................................ 145
faddl ........................................................ 145
fallocate .................................................... 511
fanotify_init ............................................... 678
fanotify_mark ............................................... 678
fastmap initialization .................................... 793
fastmaps ..................................................... 795
fattach ....................................................... 145
fchdir ......................................................... 145
fchmod ......................................................... 146
fchmod ......................................................... 146
fchmodat .................................................... 146
fchown ......................................................... 146
fchownat ..................................................... 147
fclose ......................................................... 147
fcloseall .................................................... 648
fcntl ......................................................... 147
fcntl-safer .................................................. 756
fcvt ........................................................ 469
<table>
<thead>
<tr>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>fgetwc_unlocked</td>
<td>657</td>
</tr>
<tr>
<td>FD_CLR</td>
<td>78</td>
</tr>
<tr>
<td>FD_ISSET</td>
<td>78</td>
</tr>
<tr>
<td>FD_SET</td>
<td>78</td>
</tr>
<tr>
<td>FD_ZERO</td>
<td>78</td>
</tr>
<tr>
<td>fdatasync</td>
<td>148</td>
</tr>
<tr>
<td>fdetach</td>
<td>148</td>
</tr>
<tr>
<td>fdim</td>
<td>149</td>
</tr>
<tr>
<td>fdimf</td>
<td>149</td>
</tr>
<tr>
<td>fdiml</td>
<td>149</td>
</tr>
<tr>
<td>fdiv</td>
<td>149</td>
</tr>
<tr>
<td>fdopen</td>
<td>150</td>
</tr>
<tr>
<td>fdopendir</td>
<td>150</td>
</tr>
<tr>
<td>feclearexcept</td>
<td>151</td>
</tr>
<tr>
<td>feclampexcept</td>
<td>512</td>
</tr>
<tr>
<td>feenableexcept</td>
<td>513</td>
</tr>
<tr>
<td>fegetenv</td>
<td>513</td>
</tr>
<tr>
<td>fegetexcept</td>
<td>513</td>
</tr>
<tr>
<td>fegetexceptflag</td>
<td>513</td>
</tr>
<tr>
<td>fegetmode</td>
<td>513</td>
</tr>
<tr>
<td>fegetround</td>
<td>513</td>
</tr>
<tr>
<td>feholdexcept</td>
<td>648</td>
</tr>
<tr>
<td>feraiseexcept</td>
<td>648</td>
</tr>
<tr>
<td>fesetenv</td>
<td>648</td>
</tr>
<tr>
<td>fesetexcept</td>
<td>648</td>
</tr>
<tr>
<td>fesetexceptflag</td>
<td>648</td>
</tr>
<tr>
<td>fesetmode</td>
<td>648</td>
</tr>
<tr>
<td>fesetround</td>
<td>648</td>
</tr>
<tr>
<td>fetestexcept</td>
<td>648</td>
</tr>
<tr>
<td>fetestexceptflag</td>
<td>648</td>
</tr>
<tr>
<td>feupdateenvflag</td>
<td>648</td>
</tr>
<tr>
<td>fexecve</td>
<td>155</td>
</tr>
<tr>
<td>fflush</td>
<td>155</td>
</tr>
<tr>
<td>fflush_unlocked</td>
<td>649</td>
</tr>
<tr>
<td>ffs</td>
<td>156</td>
</tr>
<tr>
<td>ffsi1</td>
<td>669</td>
</tr>
<tr>
<td>ffsi1l</td>
<td>669</td>
</tr>
<tr>
<td>fgetc</td>
<td>156</td>
</tr>
<tr>
<td>fgetc_unlocked</td>
<td>649</td>
</tr>
<tr>
<td>fgetfilecon</td>
<td>636</td>
</tr>
<tr>
<td>fgetgrent</td>
<td>519</td>
</tr>
<tr>
<td>fgetgrent_r</td>
<td>520</td>
</tr>
<tr>
<td>fgetpos</td>
<td>520</td>
</tr>
<tr>
<td>fgetpv</td>
<td>520</td>
</tr>
<tr>
<td>fgetpv_r</td>
<td>520</td>
</tr>
<tr>
<td>fgets</td>
<td>520</td>
</tr>
<tr>
<td>fgets_unlocked</td>
<td>649</td>
</tr>
<tr>
<td>fgetsp</td>
<td>638</td>
</tr>
<tr>
<td>fgetsp_r</td>
<td>638</td>
</tr>
<tr>
<td>fgetwc</td>
<td>157</td>
</tr>
<tr>
<td>fgetwc_unlocked</td>
<td>727</td>
</tr>
<tr>
<td>fgets</td>
<td>157</td>
</tr>
<tr>
<td>fgets_unlocked</td>
<td>728</td>
</tr>
<tr>
<td>fgetxattr</td>
<td>704</td>
</tr>
<tr>
<td>fileno</td>
<td>157</td>
</tr>
<tr>
<td>fileno_unlocked</td>
<td>650</td>
</tr>
<tr>
<td>finding modules</td>
<td>16</td>
</tr>
<tr>
<td>finite</td>
<td>533</td>
</tr>
<tr>
<td>finitef</td>
<td>533</td>
</tr>
<tr>
<td>finitel</td>
<td>533</td>
</tr>
<tr>
<td>flistxattr</td>
<td>704</td>
</tr>
<tr>
<td>flock</td>
<td>678</td>
</tr>
<tr>
<td>flockfile</td>
<td>158</td>
</tr>
<tr>
<td>floor</td>
<td>158</td>
</tr>
<tr>
<td>floorf</td>
<td>158</td>
</tr>
<tr>
<td>fmax</td>
<td>160</td>
</tr>
<tr>
<td>fmaxf</td>
<td>160</td>
</tr>
<tr>
<td>fmaxmag</td>
<td>160</td>
</tr>
<tr>
<td>fmaxmagn</td>
<td>160</td>
</tr>
<tr>
<td>fmfnopen</td>
<td>161</td>
</tr>
<tr>
<td>fmin</td>
<td>161</td>
</tr>
<tr>
<td>fminf</td>
<td>162</td>
</tr>
<tr>
<td>fminmag</td>
<td>162</td>
</tr>
<tr>
<td>fminmagn</td>
<td>162</td>
</tr>
<tr>
<td>fnmopen</td>
<td>162</td>
</tr>
<tr>
<td>fmod</td>
<td>163</td>
</tr>
<tr>
<td>fmodf</td>
<td>163</td>
</tr>
<tr>
<td>fmodl</td>
<td>163</td>
</tr>
<tr>
<td>fmsg</td>
<td>164</td>
</tr>
<tr>
<td>fmull</td>
<td>164</td>
</tr>
<tr>
<td>fnmatch</td>
<td>165</td>
</tr>
<tr>
<td>fopen</td>
<td>165</td>
</tr>
<tr>
<td>fopen-safer</td>
<td>756</td>
</tr>
<tr>
<td>fopencookie</td>
<td>650</td>
</tr>
<tr>
<td>fork</td>
<td>166</td>
</tr>
<tr>
<td>forktty</td>
<td>574</td>
</tr>
<tr>
<td>fpathconf</td>
<td>166</td>
</tr>
<tr>
<td>fpclassify</td>
<td>166</td>
</tr>
<tr>
<td>fprintf</td>
<td>166</td>
</tr>
<tr>
<td>fputc</td>
<td>168</td>
</tr>
<tr>
<td>fputc_unlocked</td>
<td>650</td>
</tr>
<tr>
<td>fputs</td>
<td>168</td>
</tr>
<tr>
<td>fputs_unlocked</td>
<td>651</td>
</tr>
<tr>
<td>fputwc</td>
<td>169</td>
</tr>
<tr>
<td>fputwc_unlocked</td>
<td>728</td>
</tr>
<tr>
<td>fputws</td>
<td>169</td>
</tr>
<tr>
<td>fputws_unlocked</td>
<td>729</td>
</tr>
<tr>
<td>fread</td>
<td>169</td>
</tr>
<tr>
<td>fread_unlocked</td>
<td>651</td>
</tr>
<tr>
<td>free</td>
<td>170</td>
</tr>
<tr>
<td>freeaddrinfo</td>
<td>170</td>
</tr>
<tr>
<td>Function</td>
<td>Page</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>get_avphys_pages</td>
<td>694</td>
</tr>
<tr>
<td>get_current_dir_name</td>
<td>715</td>
</tr>
<tr>
<td>get_delim</td>
<td>185</td>
</tr>
<tr>
<td>getdate</td>
<td>185</td>
</tr>
<tr>
<td>getdate_r</td>
<td>708</td>
</tr>
<tr>
<td>getdelim</td>
<td>185</td>
</tr>
<tr>
<td>getdomainname</td>
<td>715</td>
</tr>
<tr>
<td>getent</td>
<td>687</td>
</tr>
<tr>
<td>getenv</td>
<td>186</td>
</tr>
<tr>
<td>getentropiy</td>
<td>186</td>
</tr>
<tr>
<td>geteuid</td>
<td>186</td>
</tr>
<tr>
<td>getegid</td>
<td>186</td>
</tr>
<tr>
<td>getegid_r</td>
<td>186</td>
</tr>
<tr>
<td>getgid</td>
<td>186</td>
</tr>
<tr>
<td>getgid_r</td>
<td>186</td>
</tr>
<tr>
<td>getgrnam</td>
<td>187</td>
</tr>
<tr>
<td>getgrnam_r</td>
<td>187</td>
</tr>
<tr>
<td>getgrgid</td>
<td>187</td>
</tr>
<tr>
<td>getgrgid_r</td>
<td>187</td>
</tr>
<tr>
<td>getgrspec</td>
<td>515</td>
</tr>
<tr>
<td>getgrspec_r</td>
<td>515</td>
</tr>
<tr>
<td>getgrunlist</td>
<td>520</td>
</tr>
<tr>
<td>gethostbyaddr</td>
<td>470</td>
</tr>
<tr>
<td>gethostbyaddr_r</td>
<td>549</td>
</tr>
<tr>
<td>gethostbyname</td>
<td>470</td>
</tr>
<tr>
<td>gethostbyname_r</td>
<td>550</td>
</tr>
<tr>
<td>gethostbyname</td>
<td>470</td>
</tr>
<tr>
<td>gethostbyname2</td>
<td>550</td>
</tr>
<tr>
<td>gethostbyname2_r</td>
<td>550</td>
</tr>
<tr>
<td>gethostent</td>
<td>188</td>
</tr>
<tr>
<td>gethostent_r</td>
<td>551</td>
</tr>
<tr>
<td>gethostid</td>
<td>188</td>
</tr>
<tr>
<td>gethostid_r</td>
<td>188</td>
</tr>
<tr>
<td>gethostname</td>
<td>189</td>
</tr>
<tr>
<td>getifaddrs</td>
<td>524</td>
</tr>
<tr>
<td>getipv4sourcefilter</td>
<td>559</td>
</tr>
<tr>
<td>getitimer</td>
<td>189</td>
</tr>
<tr>
<td>getline</td>
<td>189</td>
</tr>
<tr>
<td>getloadavg</td>
<td>657</td>
</tr>
<tr>
<td>getlogin</td>
<td>190</td>
</tr>
<tr>
<td>fsetpos</td>
<td>175</td>
</tr>
<tr>
<td>fsetpos</td>
<td>175</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>getpwuid</td>
<td>186</td>
</tr>
<tr>
<td>Function</td>
<td>Page</td>
</tr>
<tr>
<td>----------------------------</td>
<td>------</td>
</tr>
<tr>
<td>inet6_opt_append</td>
<td>560</td>
</tr>
<tr>
<td>inet6_opt_find</td>
<td>561</td>
</tr>
<tr>
<td>inet6_opt_finish</td>
<td>561</td>
</tr>
<tr>
<td>inet6_opt_get_val</td>
<td>561</td>
</tr>
<tr>
<td>inet6_opt_init</td>
<td>561</td>
</tr>
<tr>
<td>inet6_opt_next</td>
<td>561</td>
</tr>
<tr>
<td>inet6_opt_next</td>
<td>561</td>
</tr>
<tr>
<td>inet6_opt_set_val</td>
<td>562</td>
</tr>
<tr>
<td>inet6_option_alloc</td>
<td>559</td>
</tr>
<tr>
<td>inet6_option_append</td>
<td>560</td>
</tr>
<tr>
<td>inet6_option_find</td>
<td>560</td>
</tr>
<tr>
<td>inet6_option_init</td>
<td>560</td>
</tr>
<tr>
<td>inet6_option_next</td>
<td>560</td>
</tr>
<tr>
<td>inet6_option_space</td>
<td>560</td>
</tr>
<tr>
<td>inet6_rth_add</td>
<td>562</td>
</tr>
<tr>
<td>inet6_rth_getaddr</td>
<td>562</td>
</tr>
<tr>
<td>inet6_rth_init</td>
<td>562</td>
</tr>
<tr>
<td>inet6_rth_reverse</td>
<td>562</td>
</tr>
<tr>
<td>inet6_rth_reverse</td>
<td>562</td>
</tr>
<tr>
<td>inet6_rth_segments</td>
<td>563</td>
</tr>
<tr>
<td>inet6_rth_space</td>
<td>563</td>
</tr>
<tr>
<td>initgroups</td>
<td>521</td>
</tr>
<tr>
<td>int</td>
<td>744</td>
</tr>
<tr>
<td>INTO_ADD_OK</td>
<td>750</td>
</tr>
<tr>
<td>INTO_ADD_OVERFLOW</td>
<td>753</td>
</tr>
<tr>
<td>INTO_ADD_RANGE_OVERFLOW</td>
<td>754</td>
</tr>
<tr>
<td>INTO_ADD_WRAPV</td>
<td>751</td>
</tr>
<tr>
<td>INTO_BUFSIZE_BOUND</td>
<td>749</td>
</tr>
<tr>
<td>INTO_DIVIDE_OVERFLOW</td>
<td>753</td>
</tr>
<tr>
<td>INTO_DIVIDE_RANGE_OVERFLOW</td>
<td>755</td>
</tr>
<tr>
<td>INTO_LEFT_SHIFT_OVERFLOW</td>
<td>753</td>
</tr>
<tr>
<td>INTO_LEFT_SHIFT_RANGE_OVERFLOW</td>
<td>755</td>
</tr>
<tr>
<td>INTO_MULTIPLY_OK</td>
<td>750</td>
</tr>
<tr>
<td>INTO_MULTIPLY_OVERFLOW</td>
<td>753</td>
</tr>
<tr>
<td>INTO_MULTIPLY_RANGE_OVERFLOW</td>
<td>755</td>
</tr>
<tr>
<td>INTO_MULTIPLY_WRAPV</td>
<td>752</td>
</tr>
<tr>
<td>INTO_NEGATE_OVERFLOW</td>
<td>753</td>
</tr>
<tr>
<td>INTO_NEGATE_RANGE_OVERFLOW</td>
<td>755</td>
</tr>
<tr>
<td>INTO_REMAINDER_OVERFLOW</td>
<td>753</td>
</tr>
<tr>
<td>INTO_REMAINDER_RANGE_OVERFLOW</td>
<td>755</td>
</tr>
<tr>
<td>INTO_STRLEN_BOUND</td>
<td>749</td>
</tr>
<tr>
<td>INTO_SUBTRACT_OK</td>
<td>750</td>
</tr>
<tr>
<td>INTO_SUBTRACT_OVERFLOW</td>
<td>753</td>
</tr>
<tr>
<td>INTO_SUBTRACT_RANGE_OVERFLOW</td>
<td>755</td>
</tr>
<tr>
<td>INTO_SUBTRACT_WRAPV</td>
<td>752</td>
</tr>
<tr>
<td>integer arithmetic portability</td>
<td>10</td>
</tr>
<tr>
<td>integer bounds</td>
<td>749</td>
</tr>
<tr>
<td>integer overflow</td>
<td>747</td>
</tr>
<tr>
<td>integer overflow checking</td>
<td>749</td>
</tr>
<tr>
<td>integer properties</td>
<td>747</td>
</tr>
<tr>
<td>integer range overflow</td>
<td>753</td>
</tr>
</tbody>
</table>
integer type overflow ........................................ 752
interval expression ........................................... 784
invoking gnulib-tool .......................................... 16
ioctl .......................................................... 212
isoper .......................................................... 681
ispl ............................................................ 681
isalnum .......................................................... 212
isalnum_l ......................................................... 213
isalpha .......................................................... 213
isalpha_l ......................................................... 214
isascii .......................................................... 214
isastream ......................................................... 214
isatty ........................................................... 215
isblank .......................................................... 215
isblank_l ......................................................... 216
iscntrl .......................................................... 216
iscntrl_l ......................................................... 216
isctype ......................................................... 501
isdigit .......................................................... 217
isdigit_l .......................................................... 217
isfctype ......................................................... 691
isfinite .......................................................... 218
isgraph .......................................................... 218
isgraph_l .......................................................... 219
isgreater .......................................................... 219
isgreaterequal .................................................... 219
isinf .............................................................. 219
isinff ............................................................. 535
isinfl ............................................................. 535
isless ............................................................. 220
islessequal ........................................................ 220
islessgreater ...................................................... 220
islower ........................................................... 220
islower_l .......................................................... 221
isnan ............................................................. 221
isnanf ............................................................. 221
isnanl ............................................................. 221
isnormal .......................................................... 222
isprint ........................................................... 222
isprint_l .......................................................... 222
ispunct ........................................................... 223
ispunct_l .......................................................... 223
isspace ........................................................... 224
isspace_l .......................................................... 224
isunordered ....................................................... 224
isupper ............................................................ 225
isupper_l ........................................................... 225
iswalnum .......................................................... 226
iswalnum_l .......................................................... 226
iswalpha .......................................................... 226
iswalpha_l .......................................................... 227
iswblank .......................................................... 227
iswblank_l .......................................................... 227
iswcntrl .......................................................... 228
iswcntrl_l .......................................................... 228
iswctype .......................................................... 228
iswctype_l .......................................................... 229
iswdigit .......................................................... 229
iswdxigit_l .......................................................... 229
iswdxigit .......................................................... 230
iswdxigit_l .......................................................... 230
iswgraph .......................................................... 230
iswgraph_l .......................................................... 230
iswlower .......................................................... 231
iswlower_l .......................................................... 231
iswprint .......................................................... 231
iswprint_l .......................................................... 231
iswpunct .......................................................... 232
iswpunct_l .......................................................... 232
iswspace .......................................................... 232
iswspace_l .......................................................... 233
iswupper .......................................................... 233
iswupper_l .......................................................... 233
isxdigit ........................................................... 234
isxdigit_l .......................................................... 234
isxdigit ........................................................... 234
isxdigit_l .......................................................... 235

J

j0 .............................................................. 235
jof .............................................................. 536
j0i .............................................................. 536
j0l .............................................................. 235
j1 .............................................................. 235
j1f .............................................................. 537
j1l .............................................................. 537
jn .............................................................. 236
jnf .............................................................. 537
jnl .............................................................. 538
jrand48 ............................................................ 236
jrand48_r ............................................................ 658

K

key_decryptsession ............................................. 586
key_decryptsession_pk .......................................... 586
key_encryptsession ............................................. 586
key_encryptsession_pk .......................................... 586
key_gendes ...................................................... 587
key_get_conv .................................................... 587
key_secretkey_is_set .......................................... 587
key_setsecret .................................................... 587
kill ............................................................. 236
killpg ............................................................ 236
klogctl ............................................................ 682
Index

L

logb .................................................. 249
logf .................................................. 249
login .................................................. 725
login_tty ............................................. 726
log1 .................................................. 250
long-running tests modules ....................... 40
longjmp ............................................... 250
lrand48 .............................................. 250
lrand48_r ............................................ 659
lremovexattr ......................................... 706
lrint .................................................. 251
lrintf ............................................... 251
lrintl ............................................... 251
lround ............................................... 251
lroundf ............................................. 252
lroundl ............................................. 252
lsearch ............................................. 252
lseek ................................................. 252
lsetxattr ........................................... 706
lstat ................................................ 253
lutimes ................................................ 698

M

madvise .............................................. 682
makecontext ......................................... 471
mallinfo ............................................. 528
mallinfo2 .......................................... 528
malloc ........................................ ...... 253, 703
malloc_info ......................................... 529
malloc_stats ......................................... 529
malloc_trim ......................................... 529
malloc_usable_size ................................ 529
malloc ............................................... 530
matching list ........................................ 785
matching newline .................................... 785
matching with GNU functions ..................... 793
matherr ............................................. 539
mblen ................................................ 254
mblen ................................................ 254
mbrc16 .............................................. 254
mbrtoc32 ............................................ 255
mbrtoc .............................................. 255
mbrtowc ..............................................
mbtowc ..............................................
mbrtowcs ............................................
mbtowcs ............................................
mbrtovcs ............................................
mbtovcs ............................................
memalign ............................................ 530
memccpy ............................................. 258
memchr .............................................. 258
memcmp .............................................. 258
memcpy .............................................. 258
memfd_create ........................................ 682
memfrob .............................................. 670

842
<table>
<thead>
<tr>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>nis_lookup</td>
<td>621</td>
</tr>
<tr>
<td>nis_mkdir</td>
<td>621</td>
</tr>
<tr>
<td>nis_modify</td>
<td>621</td>
</tr>
<tr>
<td>nis_modify_entry</td>
<td>622</td>
</tr>
<tr>
<td>nis_name_of</td>
<td>622</td>
</tr>
<tr>
<td>nis_name_of_r</td>
<td>622</td>
</tr>
<tr>
<td>nis_next_entry</td>
<td>622</td>
</tr>
<tr>
<td>nis_perror</td>
<td>622</td>
</tr>
<tr>
<td>nis_ping</td>
<td>623</td>
</tr>
<tr>
<td>nis_print_directory</td>
<td>623</td>
</tr>
<tr>
<td>nis_print_entry</td>
<td>623</td>
</tr>
<tr>
<td>nis_print_group</td>
<td>623</td>
</tr>
<tr>
<td>nis_print_group_entry</td>
<td>623</td>
</tr>
<tr>
<td>nis_print_link</td>
<td>624</td>
</tr>
<tr>
<td>nis_print_result</td>
<td>624</td>
</tr>
<tr>
<td>nis_print_rights</td>
<td>624</td>
</tr>
<tr>
<td>nis_print_table</td>
<td>624</td>
</tr>
<tr>
<td>nis_remove</td>
<td>625</td>
</tr>
<tr>
<td>nis_remove_entry</td>
<td>625</td>
</tr>
<tr>
<td>nis_removemember</td>
<td>625</td>
</tr>
<tr>
<td>nis_rmdir</td>
<td>625</td>
</tr>
<tr>
<td>nis_servstate</td>
<td>626</td>
</tr>
<tr>
<td>nis_sperror</td>
<td>626</td>
</tr>
<tr>
<td>nis_sperror_r</td>
<td>626</td>
</tr>
<tr>
<td>nis_stats</td>
<td>626</td>
</tr>
<tr>
<td>nis_verifygroup</td>
<td>626</td>
</tr>
<tr>
<td>nl_langinfo</td>
<td>277</td>
</tr>
<tr>
<td>nl_langinfo_l</td>
<td>277</td>
</tr>
<tr>
<td>nonmatching list</td>
<td>785</td>
</tr>
<tr>
<td>noreturn</td>
<td>747</td>
</tr>
<tr>
<td>not_bol_field in pattern buffer</td>
<td>789</td>
</tr>
<tr>
<td>nrand48</td>
<td>278</td>
</tr>
<tr>
<td>nrand48_r</td>
<td>661</td>
</tr>
<tr>
<td>ntohl</td>
<td>278</td>
</tr>
<tr>
<td>ntohs</td>
<td>278</td>
</tr>
<tr>
<td>ntp_adjtime</td>
<td>700</td>
</tr>
<tr>
<td>ntp_gettime</td>
<td>700</td>
</tr>
<tr>
<td>ntp_gettimex</td>
<td>701</td>
</tr>
<tr>
<td>num_regs in struct re_registers</td>
<td>797</td>
</tr>
<tr>
<td>opendir</td>
<td>280</td>
</tr>
<tr>
<td>openlog</td>
<td>280</td>
</tr>
<tr>
<td>openpty</td>
<td>575</td>
</tr>
<tr>
<td>optarg</td>
<td>281</td>
</tr>
<tr>
<td>opterr</td>
<td>281</td>
</tr>
<tr>
<td>optind</td>
<td>281</td>
</tr>
<tr>
<td>optopt</td>
<td>282</td>
</tr>
<tr>
<td>or operator</td>
<td>784</td>
</tr>
<tr>
<td>Out of Memory handling</td>
<td>40</td>
</tr>
<tr>
<td>overflow, integer</td>
<td>747</td>
</tr>
<tr>
<td>overflow, integer range</td>
<td>753</td>
</tr>
<tr>
<td>overflow, integer type</td>
<td>752</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>parenthizing</td>
<td>787</td>
</tr>
<tr>
<td>parse_printf_format</td>
<td>567</td>
</tr>
<tr>
<td>pathconf</td>
<td>282</td>
</tr>
<tr>
<td>pattern buffer initialization</td>
<td>702</td>
</tr>
<tr>
<td>pattern buffer, definition of</td>
<td>792</td>
</tr>
<tr>
<td>pause</td>
<td>282</td>
</tr>
<tr>
<td>pclose</td>
<td>282</td>
</tr>
<tr>
<td>perror</td>
<td>282</td>
</tr>
<tr>
<td>personality</td>
<td>686</td>
</tr>
<tr>
<td>pipe</td>
<td>283</td>
</tr>
<tr>
<td>pipe2</td>
<td>718</td>
</tr>
<tr>
<td>pipe2-safer</td>
<td>756</td>
</tr>
<tr>
<td>pkey_alloc</td>
<td>683</td>
</tr>
<tr>
<td>pkey_free</td>
<td>684</td>
</tr>
<tr>
<td>pkey_get</td>
<td>684</td>
</tr>
<tr>
<td>pkey_mprotect</td>
<td>684</td>
</tr>
<tr>
<td>pkey_set</td>
<td>685</td>
</tr>
<tr>
<td>pmap_getmaps</td>
<td>597</td>
</tr>
<tr>
<td>pmap_getport</td>
<td>597</td>
</tr>
<tr>
<td>pmap_rmtcall</td>
<td>598</td>
</tr>
<tr>
<td>pmap_set</td>
<td>598</td>
</tr>
<tr>
<td>pmap_unset</td>
<td>598</td>
</tr>
<tr>
<td>poll</td>
<td>283</td>
</tr>
<tr>
<td>popen</td>
<td>283</td>
</tr>
<tr>
<td>popen-safer</td>
<td>576</td>
</tr>
<tr>
<td>portability, integer arithmetic</td>
<td>10</td>
</tr>
<tr>
<td>posix_fadvise</td>
<td>284</td>
</tr>
<tr>
<td>posix_fallocate</td>
<td>284</td>
</tr>
<tr>
<td>posix_fadvise</td>
<td>285</td>
</tr>
<tr>
<td>posix_memalign</td>
<td>285</td>
</tr>
<tr>
<td>posix_openpt</td>
<td>286</td>
</tr>
<tr>
<td>posix_spawn</td>
<td>286</td>
</tr>
<tr>
<td>posix_spawn_file_actions_addchdir_np</td>
<td>645</td>
</tr>
<tr>
<td>posix_spawn_file_actions_addclose</td>
<td>286</td>
</tr>
<tr>
<td>posix_spawn_file_actions_addclosefrom_np</td>
<td>646</td>
</tr>
<tr>
<td>posix_spawn_file_actions_adddup2</td>
<td>287</td>
</tr>
<tr>
<td>posix_spawn_file_actions_addfchdir_np</td>
<td>646</td>
</tr>
<tr>
<td>posix_spawn_file_actions_addopen</td>
<td>287</td>
</tr>
<tr>
<td>posix_spawn_file_actions_destroy</td>
<td>287</td>
</tr>
<tr>
<td>posix_spawn_file_actions_init</td>
<td>288</td>
</tr>
<tr>
<td>posix_spawnattr_destroy</td>
<td>288</td>
</tr>
</tbody>
</table>

O

<table>
<thead>
<tr>
<th>Module</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obsolete modules</td>
<td>40</td>
</tr>
<tr>
<td>obstack_alloc_failed_handler</td>
<td>563</td>
</tr>
<tr>
<td>obstack_exit_failure</td>
<td>564</td>
</tr>
<tr>
<td>obstack_free</td>
<td>564</td>
</tr>
<tr>
<td>obstack_printf</td>
<td>564</td>
</tr>
<tr>
<td>obstack_vprintf</td>
<td>565</td>
</tr>
<tr>
<td>on_exit</td>
<td>661</td>
</tr>
<tr>
<td>open</td>
<td>278</td>
</tr>
<tr>
<td>open-group operator and ‘‘‘</td>
<td>789</td>
</tr>
<tr>
<td>open_by_handle_at</td>
<td>512</td>
</tr>
<tr>
<td>open_memstream</td>
<td>280</td>
</tr>
<tr>
<td>open_wmemstream</td>
<td>281</td>
</tr>
<tr>
<td>openat</td>
<td>279</td>
</tr>
<tr>
<td>openat-safer</td>
<td>756</td>
</tr>
</tbody>
</table>

P

parenthesizing                      | 787 |
pathconf                           | 282 |
pathconf                           | 282 |
pathconf                           | 702 |
pathconf                           | 792 |
pause                             | 282 |
pclose                            | 282 |
perror                           | 282 |
personality                       | 686 |
pipe                              | 283 |
pipe2                             | 718 |
pipe2-safer                       | 756 |
pkey_alloc                        | 683 |
pkey_free                         | 684 |
pkey_get                          | 684 |
pkey_mprotect                     | 684 |
pkey_set                          | 685 |
pmap_getmaps                      | 597 |
pmap_getport                      | 597 |
pmap_rmtcall                      | 598 |
pmap_set                          | 598 |
pmap_unset                        | 598 |
poll                             | 283 |
popen                            | 283 |
popen-safer                       | 756 |
portability, integer arithmetic    | 10  |
<table>
<thead>
<tr>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>putsgent</td>
<td>523</td>
</tr>
<tr>
<td>putspent</td>
<td>640</td>
</tr>
<tr>
<td>pututline</td>
<td>724</td>
</tr>
<tr>
<td>putuxline</td>
<td>341</td>
</tr>
<tr>
<td>putw</td>
<td>652</td>
</tr>
<tr>
<td>putwc</td>
<td>341</td>
</tr>
<tr>
<td>putwc_unlocked</td>
<td>730</td>
</tr>
<tr>
<td>putwchar</td>
<td>341</td>
</tr>
<tr>
<td>putwchar_unlocked</td>
<td>730</td>
</tr>
<tr>
<td>pvalloc</td>
<td>530</td>
</tr>
<tr>
<td>pwrite</td>
<td>341</td>
</tr>
<tr>
<td>pwritev</td>
<td>702</td>
</tr>
<tr>
<td>pwritev2</td>
<td>702</td>
</tr>
</tbody>
</table>

**Q**

<table>
<thead>
<tr>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>qecvt</td>
<td>662</td>
</tr>
<tr>
<td>qecvt_r</td>
<td>662</td>
</tr>
<tr>
<td>qfcvt</td>
<td>663</td>
</tr>
<tr>
<td>qfcvt_r</td>
<td>663</td>
</tr>
<tr>
<td>qgcevt</td>
<td>663</td>
</tr>
<tr>
<td>qsort</td>
<td>342</td>
</tr>
<tr>
<td>qsort_r</td>
<td>664</td>
</tr>
<tr>
<td>quick_exit</td>
<td>342</td>
</tr>
<tr>
<td>quotactl</td>
<td>687</td>
</tr>
<tr>
<td>quote</td>
<td>768</td>
</tr>
<tr>
<td>quote_n</td>
<td>768</td>
</tr>
<tr>
<td>quotearg</td>
<td>768</td>
</tr>
<tr>
<td>quotearg_alloc</td>
<td>768</td>
</tr>
</tbody>
</table>

**R**

<table>
<thead>
<tr>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>raise</td>
<td>342</td>
</tr>
<tr>
<td>rand</td>
<td>342</td>
</tr>
<tr>
<td>rand_r</td>
<td>343</td>
</tr>
<tr>
<td>random</td>
<td>343</td>
</tr>
<tr>
<td>random_r</td>
<td>664</td>
</tr>
<tr>
<td>range argument to re_search</td>
<td>794</td>
</tr>
<tr>
<td>raxmemchr</td>
<td>671</td>
</tr>
<tr>
<td>rcmd</td>
<td>554</td>
</tr>
<tr>
<td>rcmd_af</td>
<td>555</td>
</tr>
<tr>
<td>re_comp</td>
<td>577</td>
</tr>
<tr>
<td>re_compile_fastmap</td>
<td>577</td>
</tr>
<tr>
<td>re_compile_pattern</td>
<td>578</td>
</tr>
<tr>
<td>re_exec</td>
<td>578</td>
</tr>
<tr>
<td>re_match</td>
<td>578</td>
</tr>
<tr>
<td>re_match_2</td>
<td>578</td>
</tr>
<tr>
<td>re_nsub field, set by re_compile_pattern</td>
<td>793</td>
</tr>
<tr>
<td>re_pattern_buffer definition</td>
<td>792</td>
</tr>
<tr>
<td>re_registers</td>
<td>797</td>
</tr>
<tr>
<td>re_search</td>
<td>578</td>
</tr>
<tr>
<td>re_search_2</td>
<td>578</td>
</tr>
<tr>
<td>re_set_registers</td>
<td>579</td>
</tr>
<tr>
<td>re_set_syntax</td>
<td>579</td>
</tr>
<tr>
<td>re_syntax_options</td>
<td>579</td>
</tr>
<tr>
<td>re_syntax_options initialization</td>
<td>792</td>
</tr>
<tr>
<td>RE_BACKSLASH_ESCAPE_IN_LIST</td>
<td>777</td>
</tr>
<tr>
<td>Function</td>
<td>Page</td>
</tr>
<tr>
<td>----------------------</td>
<td>------</td>
</tr>
<tr>
<td>remquo</td>
<td>351</td>
</tr>
<tr>
<td>remquof</td>
<td>351</td>
</tr>
<tr>
<td>remquo2</td>
<td>351</td>
</tr>
<tr>
<td>rename</td>
<td>351</td>
</tr>
<tr>
<td>renameat</td>
<td>352</td>
</tr>
<tr>
<td>renameat2</td>
<td>652</td>
</tr>
<tr>
<td>res_dnok</td>
<td>581</td>
</tr>
<tr>
<td>res_hnok</td>
<td>581</td>
</tr>
<tr>
<td>res_init</td>
<td>581</td>
</tr>
<tr>
<td>res_mailok</td>
<td>581</td>
</tr>
<tr>
<td>res_mkquery</td>
<td>582</td>
</tr>
<tr>
<td>res_nmkquery</td>
<td>582</td>
</tr>
<tr>
<td>res_nquery</td>
<td>582</td>
</tr>
<tr>
<td>res_nquerydomain</td>
<td>583</td>
</tr>
<tr>
<td>res_nsearch</td>
<td>583</td>
</tr>
<tr>
<td>res_nsend</td>
<td>583</td>
</tr>
<tr>
<td>res_owmk</td>
<td>583</td>
</tr>
<tr>
<td>res_query</td>
<td>584</td>
</tr>
<tr>
<td>res_querydomain</td>
<td>584</td>
</tr>
<tr>
<td>res_search</td>
<td>584</td>
</tr>
<tr>
<td>res_send</td>
<td>584</td>
</tr>
<tr>
<td>revoke</td>
<td>718</td>
</tr>
<tr>
<td>rewind</td>
<td>353</td>
</tr>
<tr>
<td>rewinddir</td>
<td>353</td>
</tr>
<tr>
<td>reexec</td>
<td>555</td>
</tr>
<tr>
<td>reexec_af</td>
<td>555</td>
</tr>
<tr>
<td>rindex</td>
<td>472</td>
</tr>
<tr>
<td>rint</td>
<td>354</td>
</tr>
<tr>
<td>rintf</td>
<td>354</td>
</tr>
<tr>
<td>rint1</td>
<td>354</td>
</tr>
<tr>
<td>rmdir</td>
<td>354</td>
</tr>
<tr>
<td>round</td>
<td>355</td>
</tr>
<tr>
<td>roundeven</td>
<td>355</td>
</tr>
<tr>
<td>roundevenf</td>
<td>355</td>
</tr>
<tr>
<td>roundevenl</td>
<td>356</td>
</tr>
<tr>
<td>roundf</td>
<td>356</td>
</tr>
<tr>
<td>round1</td>
<td>356</td>
</tr>
<tr>
<td>rpc_createerr</td>
<td>593</td>
</tr>
<tr>
<td>rpmatch</td>
<td>664</td>
</tr>
<tr>
<td>rresvport</td>
<td>555</td>
</tr>
<tr>
<td>rresvport_af</td>
<td>556</td>
</tr>
<tr>
<td>rtime</td>
<td>589</td>
</tr>
<tr>
<td>ruserok</td>
<td>556</td>
</tr>
<tr>
<td>ruserok_af</td>
<td>556</td>
</tr>
<tr>
<td>scandir</td>
<td>358</td>
</tr>
</tbody>
</table>

**S**

<table>
<thead>
<tr>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>sbpk</td>
<td>719</td>
</tr>
<tr>
<td>scalb</td>
<td>473</td>
</tr>
<tr>
<td>scalbf</td>
<td>541</td>
</tr>
<tr>
<td>scalbl</td>
<td>541</td>
</tr>
<tr>
<td>scalbln</td>
<td>357</td>
</tr>
<tr>
<td>scalblnf</td>
<td>357</td>
</tr>
<tr>
<td>scalblnl</td>
<td>357</td>
</tr>
<tr>
<td>scalbn</td>
<td>357</td>
</tr>
<tr>
<td>scalbnf</td>
<td>358</td>
</tr>
<tr>
<td>scalbln1</td>
<td>358</td>
</tr>
</tbody>
</table>

**Index** 848
setjmp .......................... 367  
sigandset ........................ 642 
setrainkey ......................... 368  
sigblock ......................... 642 
setlinebuf ......................... 653  
sigdelset ......................... 377 
sgettextlocale ...................... 368  
sigdestroy ............... 672  
setlogin .......................... 719  
sigemptyset ...................... 377 
selogmask ......................... 369  
sigfillset ......................... 378 
setsmntent ......................... 549  
siggetmask ....................... 642 
ssetsnetent ......................... 369  
sighold .......................... 378 
setsnetgrent ....................... 556  
sigignore ......................... 378 
sgrp ................................ 370  
siginterrupt ...................... 378 
s-gettimeofday ...................... 371  
sigismember ....................... 379 
s-getprotoent ...................... 371  
sigisemptyset ..................... 379 
s-getpriority ...................... 371  
signam .......................... 380 
sesetregid ......................... 372  
signalfd ......................... 690 
sesetpgid .......................... 371  
signal ................................ 379 
sesetprotoent ....................... 371  
signifand ........................ 541 
sesetptwentyt ....................... 371  
signifandd ....................... 542 
sesetregid ......................... 720  
signifreturn ..................... 643 
sesetredisuid ....................... 720  
siglongjmp ....................... 643 
sesetreuid ......................... 372  
sigpause ......................... 380 
sesetsockopt ....................... 373  
sigpending ....................... 380 
sesetsockoptfilter .............. 563  
sigpending ................................ 380 
sesetspend ......................... 640  
sigprocmask ....................... 380 
sesetspend ......................... 640  
sigqueue ......................... 644 
sesetspent ......................... 665  
sigwait ......................... 382 
sesettimeofday .................... 699  
sigwaitinfo ....................... 382 
sesetttyent ......................... 711  
sin ................................ 383 
sesetuid .................. 373  
sinccos .................... 542 
sesetusershell .................... 721  
sincosf ...................... 543 
sesetutent ......................... 724  
sincosl ...................... 543 
sesetuxtentr ....................... 374  
sinf .......................... 383 
sesetvbuf ................... 374  
sinh ................................ 383 
sesetxattr ......................... 707  
sinhf .......................... 383 
sesetsigent ......................... 523  
sinhl .......................... 384 
sesetsigent_r ...................... 524  
sinf ...................... 384 
sesetspent ......................... 640  
sleep ......................... 384 
sesetspent_r ....................... 641  
strpos ..................... 384 
shm_open ......................... 374  
sockatmark ..................... 386 
shm_unlink ....................... 374  
socket ....................... 386 
shmat ......................... 375  
socketpair ..................... 386 
shmctl ......................... 375  
specification ........ 33  
shmget ......................... 375  
sprintf ..................... 386 
shutdown ......................... 376  
sprofil ..................... 687 
sigabbrev_np ...................... 672  
sqrt ..................... 388 
sigaction ......................... 376  
sqrtf ..................... 388 
sigaddset ......................... 376  
sqrtl ..................... 388 
sigaltstack ....................... 377  
srand ..................... 388 

swapcontext .............................................. 473
swapoff ................................................. 693
swapon .................................................. 694
swprintf .................................................. 408
svscnf .................................................... 408
symbol ..................................................... 408
symlink ................................................... 409
symlinkat ............................................... 409
sync ....................................................... 409
sync_file_range ......................................... 512
syncfs ...................................................... 721
syntax bits ............................................... 777
syntax field, set by re_compile_pattern ............. 793
syntax initialization ...................................... 792
syntax of regular expressions .......................... 776
sys_errlist .............................................. 653
sys_errr .................................................... 653
sys_siglist ............................................... 644
syscall .................................................... 721
sysconf .................................................... 409
tsysctl .................................................... 694
tsysinfo ................................................... 695
tsyslog ..................................................... 410
system ..................................................... 410
sysv_signal ............................................... 645

T

tan .......................................................... 410
tanf .......................................................... 410
tanh .......................................................... 411
tanhf ........................................................ 411
tanhl ........................................................ 411
tanl .......................................................... 411
tcdrain ...................................................... 412
tcflow ....................................................... 412
tcflush ..................................................... 412
tgetattr ..................................................... 412
tgetpgrp .................................................... 413
tgetsid ...................................................... 413
tcsendbreak .............................................. 413
tcsattr ...................................................... 413
tcsetpgrp .................................................. 414
tdelete ....................................................... 414
tdestroy .................................................... 636
telldir ...................................................... 414
temnan ...................................................... 414
tests modules, C++ ....................................... 40
tests modules, long-running ............................ 40
tests modules, privileged ................................ 40
tests modules, unportable ................................ 40
textdomain ............................................... 527
tfend ....................................................... 415
tgamma ...................................................... 415
tgammaf ..................................................... 415
tgammal ...................................................... 415
tgkill ....................................................... 645
thrd_create .............................................. 416
thrd_current ............................................. 416
Index

wcsetattr ............................................. 456
wcstod .............................................. 457
wcstod_l ............................................ 731
wcstof .............................................. 457
wcstof_l ............................................ 731
wcstomax ............................................ 457
wcstok .............................................. 458
wcstol .............................................. 458
wcstold ............................................. 732
wcstold_l ........................................... 732
wcstoll ............................................. 459
wcstoll_l ........................................... 732
wcstombs ............................................ 459
wcstoct ............................................. 732
wcstou ............................................. 459
wcstou_l ............................................ 733
wcstoull ............................................ 459
wcstoull_l .......................................... 733
wcstoumax .......................................... 460
wcstouq ............................................. 733
wcs wcs ............................................. 474
wcs width ........................................... 460
wcsxfm .............................................. 460
wcsxfm_l ............................................ 460
wctob .............................................. 461
wctomb ............................................. 461
wctrans ............................................. 461
wctrans_l ........................................... 462
wctype .............................................. 462
wctype_l ............................................ 462
wcs width ........................................... 463
wmemchr ............................................. 463
wmemcmp ............................................ 463
wmemcp y ............................................ 464
wmemmove ........................................... 464
wmemcpy ............................................. 733
word boundaries, matching .......................... 790
word exp ............................................. 464
word free ............................................ 465
wprintf ............................................. 465
wraparound integer arithmetic ...................... 751
write ................................................. 465
writev ............................................... 466
wscanf .............................................. 466

X

xalloc_die ........................................... 40
xdr_array .......................................... 606
xdr_authunix_parms ................................. 589
xdr_bool .......................................... 606
xdr_bytes .......................................... 606
xdr_callhdr ........................................ 599
xdr_callmsg ........................................ 600
xdr_cback_data .................................... 627
xdr_char ............................................ 607
xdr_cryptkeyarg ................................... 593
xdr_cryptkeyarg2 .................................. 593
xdr_cryptkeyres ................................... 594
xdr_des_block ...................................... 588
xdr_domainname ..................................... 627
xdr_double .......................................... 607
xdr_enum ............................................ 607
xdr_float ............................................ 607
xdr_getcred .......................................... 594
xdr_getcredres ..................................... 594
xdr_hyper ............................................ 608
xdr_getcredres ..................................... 608
xdr_int ............................................. 608
xdr_key .............................................. 609
xdr_keybuf .......................................... 594
xdr_keydat .......................................... 627
xdr_keystatus ....................................... 594
xdr_long ............................................. 609
xdr_netname ........................................ 595
xdr_netnamestr ..................................... 595
xdr_netobj .......................................... 609
xdr_obj ............................................. 627
xdr_opaque .......................................... 609
xdr_opaque_auth .................................... 588
xdr_pmap ............................................ 598
xdr_pmaplist ........................................ 599
xdr_pointer ......................................... 610
xdr_quad ............................................ 610
xdr_quad_t .......................................... 610
xdr_reference ....................................... 610
xdr_repymsg ........................................ 600
xdr_rmtcall_args ................................... 599
xdr_rmtcallres ..................................... 599
xdr_short ............................................ 610
xdr_sizeof .......................................... 610
xdr_string .......................................... 611
xdr_u ................................................. 611
xdr_u_char .......................................... 611
xdr_u_hyper ......................................... 611
xdr_u_int .......................................... 611
xdr_u_long .......................................... 612
xdr_u_longlong ...................................... 612
xdr_u_longlong_t ................................... 612
xdr_u_quad .......................................... 612
xdr_u_short ......................................... 612
xdr_uint_ ............................................ 612
xdr_union ........................................... 613
xdr_unixcred ....................................... 595
xdr_valid ............................................ 627
xdr_vector .......................................... 613
xdr_void ............................................. 614
xdr_wrapstring ...................................... 614
xdr_ybind_resctype ................................ 628
xdr_ybind_resctype ................................ 628
xdr_ymap_parms .................................... 628
Index 854

xdr_ypmaplist .......................... 628
xdr_yppushresp_xfr ........................ 628
xdr_ypreq_key ................................ 628
xdr_ypreq_nokey .......................... 628
xdr_ypreq_xfr ................................ 629
xdr_ypresp_all .............................. 629
xdr_ypresp_key_val .......................... 629
xdr_ypresp_maplist .......................... 629
xdr_ypresp_master ............................ 629
xdr_ypresp_order ............................ 629
xdr_ypresp_val ................................ 629
xdr_ypresp_xfr .............................. 630
xdr_ypstat .................................. 630
xdrrec_create .............................. 614
xdrrec_endofrecord .......................... 615
xdrrec_eof .................................. 615
xdrrec_skiprecord ............................ 615
xdrstdio_create ............................. 615
xpnt_register .................................. 605
xpnt_unregister .............................. 606
xstdopen ................................ 756

Y

y0 ......................................... 467
y0f ........................................ 543
y0l ........................................ 544
y1 ......................................... 467
y1f ........................................ 544
y1l ........................................ 544
yn ......................................... 467
ynf ........................................ 545
ynl ........................................ 545
yp_all .................................... 630
yp_bind ................................... 631
yp_first .................................. 631
yp_get_default_domain ..................... 631
yp_master .................................. 631
yp_match .................................. 631
yp_next ................................... 631
yp_order .................................. 632
yp_unbind ................................ 632
ypbinderr_string ........................... 632
yperr_string ................................ 632
ypprot_err ................................. 632