

GNU LibreDWG

for version 0.12.4, 30 December 2020

**GNU LibreDWG Developers
and Thien-Thi Nguyen**

This manual is for GNU LibreDWG (version 0.12.4, 30 December 2020).

Copyright © 2010-2020 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, with no Front-Cover Texts, and with no Back-Cover Texts. A copy of the license is included in the section entitled “GNU Free Documentation License”.

Table of Contents

1	Overview	1
1.1	API/ABI version	1
1.2	Coverage	1
1.3	Related projects	3
2	Usage	5
3	Types	6
4	Objects	8
4.1	HEADER	8
4.2	ENTITIES	22
4.3	OBJECTS	92
5	Sections	259
5.1	HEADER Section	259
5.2	OBJECTS Section	259
5.3	CLASSES Section	259
5.4	HANDLES Section	260
5.5	R2004_Header	260
5.6	UNKNOWN Section	260
5.7	SummaryInfo	260
5.8	Preview	260
5.9	VBAPProject	261
5.10	AppInfo	261
5.11	AppInfoHistory	261
5.12	FileDepList	261
5.13	AcDS	261
5.14	RevHistory	261
5.15	Security	261
5.16	ObjFreeSpace	261
5.17	Template	261
5.18	AuxHeader	261
5.19	Signature	261
5.20	INFO	261
5.21	SYSTEM_MAP	261
6	Structures	262
6.1	EED	262
6.2	XDATA	263

7	Functions	264
7.1	Decoding.....	264
7.2	Encoding.....	265
7.3	add api	266
7.4	dynapi.....	267
7.5	strings	269
7.6	Other Formats	269
7.6.1	DXF	269
7.6.2	DXFB.....	270
7.6.3	JSON	270
7.6.4	GeoJSON	270
8	Errors	271
9	Programs	272
10	Bindings	275
11	Reference API	276
12	Reporting bugs	277
Appendix A GNU Free Documentation License ..		278
13	Index	286
13.1	General Index.....	286
13.2	Object and Field Index.....	290

1 Overview

LibreDWG is a free C library to read and write *DWG files*. The DWG file format was created in the 1970s for the then-emerging CAD applications.

This library is part of the GNU project, released under the aegis of GNU. It is made available under GPLv3+, i.e., under the terms of the GNU General Public License version 3, or (at your option) any later version.

It came out of code from the Qcad Community Edition product from Ribbonsoft.

1.1 API/ABI version

LibreDWG 0.12.4 provides the API/ABI version 1. We hope that this doesn't need to change much in the future.

See `include/dwg.h` for `LIBREDWG_VERSION_MAJOR`, `LIBREDWG_VERSION_MINOR` and `LIBREDWG_SO_VERSION`.

1.2 Coverage

Because the DWG file format is not open, its specification had to be reverse-engineered. The specification is almost complete. The LibreDWG implementation of the specification is an ongoing process; as of version 0.12.4, coverage is approximately 99%.

It can read the formats R13, R14, R2000, R2004, R2007, R2010, R2013 and R2018 for 99%. R11 and earlier cannot be read yet, only partially. Reading R11 and earlier is only enabled with the development git checkout, not the released tarball.

Here is a list of features that are still missing.

Reading pre-R13 DWG

Reading DWG formats for pre-R13 and some R2010+ non-graphical objects is an ongoing effort, some minor parts are missing. Most DWG's can be read, some undocumented classes are skipped.

Writing pre-R13 and R2004+ DWG

Writing DWG formats for R2004 and later: R2007, R2010, R2013, R2018 is an ongoing effort. You need to patch the code to enable writing to the R2004+ format. See the `work/2004` branch. Writing to the specific R2007 format is not implemented. We write as default in the R2000 format only.

Reading binary DXF

DXF support is now mostly implemented. ASCII DXF's are generated fully, with much more elements and fields and other free libraries, but AutoCAD fails to import some of them. See the `TODO` file for a detailed coverage report.

Reading binary DXF is still under construction, done about 80%.

Enabled entities and objects, but unstable, undertested. Field names may change:

For a detailed overview see the file `src/classes.inc` or `src/classes.c`.

```
ACSH_BREP_CLASS    ACSH_CHAMFER_CLASS    ACSH_CONE_CLASS
ACSH_PYRAMID_CLASS    ARC_DIMENSION    ASSOCACTION
ASSOCBLENDSURFACEACTIONBODY    ASSOCEXTENDSURFACEACTIONBODY
ASSOCXTRUDEDSURFACEACTIONBODY
```

ASSOCFILLETSSURFACEACTIONBODY ASSOCGEOMDEPENDENCY ASSOCLOFTEDSURFACEACTIONBODY ASSOCNETWORKASSOCDEPENDENCY ASSOCVALUEDEPENDENCY ASSOCNETWORKSURFACEACTIONBODY ASSOCOFFSETSSURFACEACTIONBODY ASSOCPATCHSURFACEACTIONBODY ASSOCPLANESURFACEACTIONBODY ASSOCREVOLVEDSURFACEACTIONBODY ASSOCTRIMSURFACEACTIONBODY BACKGROUND BLOCKLINEARPARAMETER BLOCKROTATIONPARAMETER BLOCKXYPARAMETER BLOCKVISIBILITYGRIP BLOCKVISIBILITYPARAMETER EVALUATION_GRAPH HELIX LARGE_RADIAL_DIMENSION LIGHTLIST MATERIAL MENTALRAYRENDERSETTINGS OBJECT_PTR RAPIDRTRENDERSETTINGS RENDERSETTINGS SECTION_SETTINGS SPATIAL_INDEX SUN TABLESTYLE (works only pre-2010)

Unhandled (fields spec'ed, but broken/undertested):

ACMECOMMANDHISTORY ACMESCOPE ACMESTATEMGR ACSH_EXTRUSION_CLASS ACSH_LOFT_CLASS ACSH_REVOLVE_CLASS ACSH_SWEEP_CLASS ALDIMOBJECTCONTEXTDATA ANNOTSCALEOBJECTCONTEXTDATA ASSOC2DCONSTRAINTGROUP ASSOCACTION ASSOCALIGNEDDIMACTIONBODY ASSOCEXTRUDEDSSURFACEACTIONBODY ASSOCGEOMDEPENDENCY ASSOCLOFTEDSURFACEACTIONBODY ASSOCNETWORKASSOCOSNAPPOINTREFACTIONPARAM ASSOCOSNAPPOINTREFACTIONPARAM ASSOCBERSUBENTMANAGER ASSOCREVOLVEDSURFACEACTIONBODY ASSOCVERTEXACTIONPARAM ATEXT BLKREFOBJECTCONTEXTDATA CONTEXTDATAMANAGER CSACDOCUMENTOPTIONS CURVEPATH DATALINK DATATABLE DIMASSOC DYNAMICBLOCKPROXYNODE EXTRUDEDSSURFACE FCFOBJECTCONTEXTDATA GEOMAPIMAGE GEOPOSITIONMARKER LAYOUTPRINTCONFIG LEADEROBJECTCONTEXTDATA LOFTEDSSURFACE MLEADEROBJECTCONTEXTDATA MOTIONPATH MTEXTATTRIBUTEOBJECTCONTEXTDATA MTEXTOBJECTCONTEXTDATA NAVISWORKSMODEL NAVISWORKSMODELDEF NURBSURFACE PERSUBENTMGR PLANESURFACE POINTPATH RENDERENVIRONMENT RENDERENTRY RENDERGLOBAL REVOLVEDSSURFACE RTEXT SUNSTUDY SWEPTSSURFACE TABLE (works only pre-2010) TABLECONTENT TEXTOBJECTCONTEXTDATA TVDEVICEPROPERTIES

ASSOCDIMDEPENDENCYBODY BLOCKPARAMDEPENDENCYBODY ALIGNMENTPARAMETERENTITY BASEPOINTPARAMETERENTITY FLIPPARAMETERENTITY LINEARPARAMETERENTITY POINTPARAMETERENTITY ROTATIONPARAMETERENTITY VISIBILITYPARAMETERENTITY VISIBILITYGRIPENTITY XYPARAMETERENTITY BLOCKALIGNEDCONSTRAINTPARAMETER BLOCKANGULARCONSTRAINTPARAMETER BLOCKARRAYACTION BLOCKDIAMETRICCONSTRAINTPARAMETER BLOCKHORIZONTALCONSTRAINTPARAMETER BLOCKLINEARCONSTRAINTPARAMETER

TER BLOCKLOOKUPACTION BLOCKLOOKUPPARAMETER BLOCK-
 POINTPARAMETER BLOCKPOLARGRIP BLOCKPOLARPARAMETER
 BLOCKPOLARSTRETCHACTION BLOCKPROPERTIESTABLE BLOCK-
 PROPERTIESTABLEGRIP BLOCKRADIALCONSTRAINTPARAMETER
 BLOCKREPRESENTATION BLOCKSTRETCHACTION BLOCKUSER-
 PARAMETER BLOCKVERTICALCONSTRAINTPARAMETER
 BLOCKXYGRIP POINTCLOUD POINTCLOUDEX POINTCLOUDEF
 POINTCLOUDEFEX POINTCLOUDEF_REACTOR POINTCLOUD-
 DEF_REACTOR_EX POINTCLOUDCOLORMAP

See `src/classes.inc`.

Missing:

* PROXY subentities, PROXY_ENTITY

Halfway:

SUNSTUDY VBA_PROJECT ASSOCACTION ASSOCNET-
 WORK ASSOCALIGNEDDIMACTIONBODY ASSOCOSNAP-
 POINTREFACTIONPARAM ASSOCPERSSUBENTMANAGER
 PERSUBENTMGR ASSOC2DCONSTRAINTGROUP EVAL-
 UATION_GRAPH ASSOCOSNAPPOINTREFACTIONPARAM
 ACSH_BOX_CLASS ACSH_EXTRUSION_CLASS ACSH_HISTORY_CLASS
 ACSH_SWEEP_CLASS NAVISWORKSMODEL (i.e. COORDINATION
 MODEL) NAVISWORKSMODELDEF DATATABLE TABLESTYLE
 ASSOCGEOMDEPENDENCY LAYOUTPRINTCONFIG RENDERENVI-
 RONMENT RENDERGLOBAL LIGHTLIST SECTION_SETTINGS

Unhandled (i.e. passed through, no DXF and fields):

ACDSRECORD ACDSSHEMA NPOCOLLECTION RAPIDRTREN-
 DERENVIRONMENT XREFPANELOBJECT

no test coverage for entities:

I.e. we need an extended `example_2018.dwg` with all types, with the following
 missing entities:

ARCALIGNEDTEXT BODY CAMERA DIMENSION_ANG3PT DIMEN-
 SION_DIAMETER DIMENSION_RADIUS DGNUNDERLAY DWFUNDER-
 LAY GEOPOSITIONMARKER IMAGE LEADER LONG_TRANSACTION
 MESH MINSERT OLE2FRAME OLEFRAME POLYLINE_2D POLY-
 LINE_MESH PROXY_ENTITY PROXY_LWPOLYLINE SHAPE
 TOLERANCE VERTEX_2D VERTEX_MESH

and objects:

CSACDOCUMENTOPTIONS XREFPANELOBJECT IDBUFFER
 IMAGEDEF IMAGEDEF_REACTOR LAYER_INDEX LIGHTLIST
 NPOCOLLECTION OBJECT_PTR PLOTSETTINGS PROXY_OBJECT
 RASTERVARIABLES SPATIAL_INDEX UCS VBA_PROJECT

1.3 Related projects

Some projects that use DWG (and specifically LibreDWG) are:

FreeCAD <https://freecadweb.org/>

GRASS GIS

<http://grass.osgeo.org/>

Plans are to add support for SolveSpace, OpenSCAD and PythonCAD.

Related libraries:

libdwg The old version (documented in Esperanto) which was forked to LibreDWG in 2009. But in the meantime it got a DXF reader.

libdxfrw Read the DWG format for all versions r13+ but with much less elements, only those needed for DXF. Written in C++, under the GPLv2 license.

libopencad Read the R2000 DWG format. Written in C++, under the GPLv2 license.

OpenDWG

The OpenDWG's license does not allow the usage in free software projects.

Compared to libdwg, libdxfrw and libopencad, LibreDWG can read and write much more details. Which is especially important for attached links and data from third party applications: BIM, MAP, GIS, AEC, MECH, ... and for 3D solids and dynamic parametric constraints.

2 Usage

This chapter describes how to compile and link a program against LibreDWG. To access LibreDWG interface elements (see Chapter 3 [Types], page 6, see Chapter 7 [Functions], page 264), include its header file in the C code.

```
#include <dwg.h>
```

Optionally you can also use the

```
#include <dwg_api.h>
```

API.

Make sure you specify ‘-lredwg’ when linking, such as in this `Makefile.am` fragment:

```
AM_LDFLAGS += -lredwg
```

Note that the shared object library is named `libredwg` (with some system-specific extension, e.g., `.so`), so you do **not** want to specify `-llibredwg`, as that would (try to) link against `liblibredwg` and fail.

3 Types

LibreDWG types map closely to the type system of the DWG file format. This chapter describes the enums and structs used to define the single DWG structure, which is passed around the functions (see Chapter 7 [Functions], page 264).

BITCODE_RC <code>char</code>	[define]
1 raw unsigned char, <code>uint8_t</code>	
BITCODE_RS <code>short</code>	[define]
1 raw unsigned short int, <code>uint16_t</code>	
BITCODE_RL <code>long</code>	[define]
1 raw unsigned long int, <code>uint32_t</code>	
BITCODE_RD <code>double</code>	[define]
1 raw IEEE-754 double	
BITCODE_B <code>byte</code>	[define]
1 bit	
BITCODE_BB <code>byte</code>	[define]
2 bits	
BITCODE_3B <code>byte</code>	[define]
1-3 bits	
BITCODE_4BITS <code>byte</code>	[define]
4 bits (for VIEW <code>view_mode</code>)	
BITCODE_BS <code>short</code>	[define]
1 bit-encoded unsigned short	
BITCODE_BL <code>long</code>	[define]
1 bit-encoded unsigned long (max 32bit)	
BITCODE_BLL <code>uint64_t</code>	[define]
1 bit-encoded unsigned 64bit long	
BITCODE_BD <code>double</code>	[define]
1 bit-encoded double	
BITCODE_DD <code>double</code>	[define]
1 bit-encoded double with default	
BITCODE_MC <code>long int</code>	[define]
1-4 modular chars	
BITCODE_UMC <code>long unsigned int</code>	[define]
1-4 unsigned modular chars	
BITCODE_MS <code>long unsigned int</code>	[define]
1 modular short, max 2 words	

BITCODE_BE `double[3]` [define]
 1 bitencoded extrusion vector.
 Note that this specifies an OCS (Object Coordinate System) for each entity, with the default (0, 0, 1). An extrusion of (0, 0, -1) is typically caused by exploding a block inserted with a negative x scale, i.e. the sign of each X point needs to be flipped. For more see the vendor DXF documentation on OCS and `programs/geom.c`.

BITCODE_BT `double` [define]
 1 bitencoded thickness value

BITCODE_TV `char*` [define]
 length + ASCIIZ string The default text type until r2004.

BITCODE_TU `wchar*` [define]
 length + windows 2-byte wchar string (UCS-2). The default text type since r2007.

BITCODE_TF `char*` [define]
 Fixed length buffer, which can include NUL characters.

BITCODE_TFF `char*` [define]
 Embedded fixed length string, which can include NUL characters.

BITCODE_H `void*` [define]
 handle-references

BITCODE_CMC `struct Dwg_Color` [define]
 Dwg_Color struct with index or rgb, alpha and optional DBCOLOR handle, name, book_name.

[and some more]

Two types that do not derive from the type system of the DWG file format are the enums for return codes and error codes.

On non-C99 systems ensure that `stdint.h` and `inttypes.h` are available to use the proper C99 `int32_t`,... types, and not just the native fallback types `int/long`, which are different across platforms.

4 Objects

4.1 HEADER

All header variables.

ACADMAINTVER	RC, DXF 90
ANGBASE	BD, DXF 50
ANGDIR	B, DXF 70
APPID_CONTROL_OBJECT	H
ATTDIA	B, DXF 70
ATTMODE	BS, DXF 70
ATTREQ	B, DXF 70
AUNITS	BS, DXF 70
AUPREC	BS, DXF 70
BLIPMODE	B, DXF 70
BLOCK_CONTROL_OBJECT	H
BLOCK_RECORD_MSPACE	H
BLOCK_RECORD_PSPACE	H
CAMERADISPLAY	B, DXF 290
CAMERAHEIGHT	BD, DXF 40
CECOLOR	CMC, DXF 62
CELTSSCALE	BD, DXF 40
CELTYPE	H, DXF 6
CELWEIGHT	BSd, DXF 370
CEPSNTYPE	BS, DXF 380
CHAMFERA	BD, DXF 40
CHAMFERB	BD, DXF 40

CHAMFERC BD, DXF 40
CHAMFERD BD, DXF 40
CLAYER H, DXF 8
CMATERIAL
H, DXF 347
CMLJUST BS, DXF 70
CMLSCALE BD, DXF 40
CMLSTYLE H, DXF 2
COORDS BS, DXF 70
CPSNID H, DXF 390
CSHADOW RC, DXF 280
DELOBJ B, DXF 70
DGNFRAME RC, DXF 280
DICTIONARY_ACAD_GROUP
H
DICTIONARY_ACAD_MLINESYLE
H
DICTIONARY_COLOR
H
DICTIONARY_LAYOUT
H
DICTIONARY_LIGHTLIST
H
DICTIONARY_MATERIAL
H
DICTIONARY_NAMED_OBJECT
H
DICTIONARY_PLOTSETTINGS
H
DICTIONARY_PLOTSTYLENAME
H
DICTIONARY_VISUALSTYLE
H
DIMADEC BS, DXF 70
DIMALT B, DXF 70
DIMALTD BS, DXF 70

DIMALTF BD, DXF 40
DIMALTMZF
BD
DIMALTMZS
T, DXF 1
DIMALTRND
BD, DXF 40
DIMALTTD BS, DXF 70
DIMALTTZ BS, DXF 70
DIMALTU BS, DXF 70
DIMALTZ BS, DXF 70
DIMAPOST TV, DXF 1
DIMAPOST_T
T
DIMARCSYM
BS, DXF 70
DIMASO B, DXF 70
DIMASSOC RC, DXF 280
DIMASZ BD, DXF 40
DIMATFIT BS, DXF 70
DIMAUNIT BS, DXF 70
DIMAZIN BS, DXF 70
DIMBLK H, DXF 1
DIMBLK1 H, DXF 1
DIMBLK1_T
T
DIMBLK2 H, DXF 1
DIMBLK2_T
T
DIMBLK_T T
DIMCEN BD, DXF 40
DIMCLRD CMC, DXF 70
DIMCLRD_C
RS
DIMCLRE CMC, DXF 70

DIMCLRE_C	RS
DIMCLRT	CMC, DXF 70
DIMCLRT_C	RS
DIMDEC	BS, DXF 70
DIMDLE	BD, DXF 40
DIMDLI	BD, DXF 40
DIMDSEP	BS, DXF 70
DIMEXE	BD, DXF 40
DIMEXO	BD, DXF 40
DIMFIT	BS, DXF 70
DIMFRAC	BS, DXF 70
DIMFXL	BD, DXF 40
DIMFXLON	B, DXF 70
DIMGAP	BD, DXF 40
DIMJOGANG	BD, DXF 40
DIMJUST	BS, DXF 70
DIMLDRBLK	H, DXF 1
DIMLFAC	BD, DXF 40
DIMLIM	B, DXF 70
DIMLTEX1	H, DXF 6
DIMLTEX2	H, DXF 6
DIMLTYPE	H, DXF 6
DIMLUNIT	BS, DXF 70
DIMLWD	BSd, DXF 70
DIMLWE	BSd, DXF 70
DIMMALTZ	BS
DIMMALTZ	BS
DIMMZP	BD
DIMMZS	T, DXF 1

DIMPOST	TV, DXF 1
DIMPOST_T	T
DIMRND	BD, DXF 40
DIMSAH	B, DXF 70
DIMSAV	B
DIMSCALE	BD, DXF 40
DIMSD1	B, DXF 70
DIMSD2	B, DXF 70
DIMSE1	B, DXF 70
DIMSE2	B, DXF 70
DIMSHO	B, DXF 70
DIMSOXD	B, DXF 70
DIMSTYLE	H, DXF 2
DIMSTYLE_CONTROL_OBJECT	H
DIMTAD	BS, DXF 70
DIMTDEC	BS, DXF 70
DIMTFAC	BD, DXF 40
DIMTFILL	BS, DXF 70
DIMTFILLCLR	CMC, DXF 70
DIMTIH	B, DXF 70
DIMTIX	B, DXF 70
DIMTM	BD, DXF 40
DIMTMOVE	BS, DXF 70
DIMTOFL	B, DXF 70
DIMTOH	B, DXF 70
DIMTOL	B, DXF 70
DIMTOLJ	BS, DXF 70
DIMTP	BD, DXF 40
DIMTSZ	BD, DXF 40
DIMTVP	BD, DXF 40
DIMTXSTY	H, DXF 7

DIMTXT BD, DXF 40
DIMTXTDIRECTION
 B, DXF 70
DIMTZIN BS, DXF 70
DIMUNIT BS, DXF 70
DIMUPT B, DXF 70
DIMZIN BS, DXF 70
DISPSILH B, DXF 70
DRAGMODE BS, DXF 70
DRAGVS H, DXF 349
DWFFRAME RC, DXF 280
DWGCODEPAGE
 TV, DXF 3
ELEVATION
 BD, DXF 40
ENDCAPS B, DXF 280
EXTMAX 3BD, DXF 30
EXTMIN 3BD, DXF 30
EXTNAMES B, DXF 290
FACETRES BD
FILLETRAD
 BD, DXF 40
FILLMODE B, DXF 70
FINGERPRINTGUID
 TV, DXF 2
FLAGS BL
GRIDMODE RS
GRIDUNIT 2RD
HALOGAP RC, DXF 280
HANDLING BS, DXF 70
HANDSEED H, DXF 5
HIDETEXT RC, DXF 280
HYPERLINKBASE
 T, DXF 1
INDEXCTL RC, DXF 280

INSBASE 3BD, DXF 30
INSUNITS BS, DXF 70
INTERFERECOLOR
CMC, DXF 62
INTERFEREOBJVS
H, DXF 345
INTERFEREVPVS
H, DXF 346
INTERSECTIONCOLOR
BS, DXF 70
INTERSECTIONDISPLAY
RC, DXF 280
ISOLINES BS
JOINSTYLE
B, DXF 280
LATITUDE BD, DXF 40
LAYER_CONTROL_OBJECT
H
LENSLENGTH
BD, DXF 40
LIGHTGLYPHDISPLAY
RC, DXF 280
LIMCHECK B, DXF 70
LIMMAX 2DPOINT, DXF 20
LIMMIN 2DPOINT, DXF 20
LOFTANG1 BD, DXF 40
LOFTANG2 BD, DXF 40
LOFTMAG1 BD, DXF 40
LOFTMAG2 BD, DXF 40
LOFTNORMALS
RC, DXF 280
LOFTPARAM
BS, DXF 70
LONGITUDE
BD, DXF 40
LTSCALE BD, DXF 40

LTYPE_BYBLOCK
H

LTYPE_BYLAYER
H

LTYPE_CONTINUOUS
H

LTYPE_CONTROL_OBJECT
H

LUNITS BS, DXF 70

LUPREC BS, DXF 70

LWDISPLAY
B, DXF 290

MAXACTVP BS, DXF 70

MEASUREMENT
BS, DXF 70

MENU TV, DXF 1

MIRRTEXT B, DXF 70

NORTHDIRECTION
BD, DXF 40

OBSCOLOR BS, DXF 70

OBSLTYPE RC, DXF 280

OLESTARTUP
B, DXF 290

ORTHOMODE
B, DXF 70

OSMODE BS, DXF 70

PDMODE BS, DXF 70

PDSIZE BD, DXF 40

PELEVATION
BD, DXF 40

PELLIPSE B

PEXTMAX 3BD, DXF 30

PEXTMIN 3BD, DXF 30

PICKSTYLE
BS, DXF 70

PINSBASE 3BD, DXF 30

PLIMCHECK
 B, DXF 70

PLIMMAX 2DPOINT, DXF 20

PLIMMIN 2DPOINT, DXF 20

PLINEGEN B, DXF 70

PLINEWID BD, DXF 40

PROJECTNAME
 TV, DXF 1

PROXYGRAPHICS
 BS, DXF 70

PSLTSCALE
 B, DXF 70

PSOLHEIGHT
 BD, DXF 40

PSOLWIDTH
 BD, DXF 40

PSTYLEMODE
 B, DXF 290

PSVPSCALE
 BD, DXF 40

PUCSBASE H, DXF 2

PUCSNAME H, DXF 2

PUCSORG 3BD, DXF 30

PUCSORGBACK
 3BD, DXF 30

PUCSORGBOTTOM
 3BD, DXF 30

PUCSORGFRONT
 3BD, DXF 30

PUCSORGGLEFT
 3BD, DXF 30

PUCSORGRIGHT
 3BD, DXF 30

PUCSORGTOP
 3BD, DXF 30

PUCSORTHOREF
 H, DXF 2

PUCSORTHOVIEW
BS, DXF 70

PUCSXDIR 3BD, DXF 30

PUCSYDIR 3BD, DXF 30

QTEXTMODE
B, DXF 70

REALWORLDSCALE
B, DXF 290

REGENMODE
B, DXF 70

REQUIREDVERSIONS
BLL, DXF 160

SAVEIMAGES
BS

SHADEDGE BS, DXF 70

SHADEDIF BS, DXF 70

SHADOWPLANELOCATION
BD, DXF 40

SHOWHIST RC, DXF 280

SKETCHINC
BD, DXF 40

SKPOLY B, DXF 70

SNAPANG RD

SNAPBASE 2RD

SNAPISOPAIR
RS

SNAPMODE RS

SNAPSTYL RS

SNAPUNIT 2RD

SOLIDHIST
RC, DXF 280

SORTENTS RC, DXF 280

SPLFRAME B, DXF 70

SPLINESEGS
BS, DXF 70

SPLINETYPE
BS, DXF 70

STEPSIZE BD, DXF 40
STEPSPERSEC
BD, DXF 40
STYLESHEET
TV, DXF 1
STYLE_CONTROL_OBJECT
H
SURFTAB1 BS, DXF 70
SURFTAB2 BS, DXF 70
SURFTYPE BS, DXF 70
SURFU BS, DXF 70
SURFV BS, DXF 70
TDCREATE TIMEBLL, DXF 40
TDINDWG TIMEBLL, DXF 40
TDUCREATE
TIMEBLL, DXF 40
TDUPDATE TIMEBLL, DXF 40
TDUSRTIMER
TIMEBLL, DXF 40
TDUUPDATE
TIMEBLL, DXF 40
TEXTQLTY BS
TEXTSIZE BD, DXF 40
TEXTSTYLE
H, DXF 7
THICKNESS
BD, DXF 40
TILEMODE B, DXF 70
TILEMODELIGHTSYNCH
RC, DXF 280
TIMEZONE BL, DXF 70
TRACEWID BD, DXF 40
TREEDEPTH
BS, DXF 70
TSTACKALIGN
BS

TSTACKSIZE
 BS

UCSBASE H, DXF 2

UCSNAME H, DXF 2

UCSORG 3BD, DXF 30

UCSORGBACK
 3BD, DXF 30

UCSORGBOTTOM
 3BD, DXF 30

UCSORGFRONT
 3BD, DXF 30

UCSORGLEFT
 3BD, DXF 30

UCSORGRIGHT
 3BD, DXF 30

UCSORGTOP
 3BD, DXF 30

UCSORTHOREF
 H, DXF 2

UCSORTHOVIEW
 BS, DXF 70

UCSXDIR 3BD, DXF 30

UCSYDIR 3BD, DXF 30

UCS_CONTROL_OBJECT
 H

UNITMODE BS, DXF 70

USERI1 BS, DXF 70

USERI2 BS, DXF 70

USERI3 BS, DXF 70

USERI4 BS, DXF 70

USERI5 BS, DXF 70

USERR1 BD, DXF 40

USERR2 BD, DXF 40

USERR3 BD, DXF 40

USERR4 BD, DXF 40

USERR5 BD, DXF 40

USRTIMER B, DXF 70
VERSIONGUID
TV, DXF 2
VIEWCTR 2RD
VIEWSIZE RD
VIEW_CONTROL_OBJECT
H
VISRETAIN
B, DXF 70
VPORT_CONTROL_OBJECT
H
VX_CONTROL_OBJECT
H
VX_TABLE_RECORD
H
WIREFRAME
B
WORLDVIEW
B, DXF 70
XCLIPFRAME
RC, DXF 290
XEDIT B, DXF 290
_3DDWFPREC
BD, DXF 40
bitsize RL
bitsize_hi
RL
size RL
unknown_0
BD
unknown_1
BD
unknown_10
BS
unknown_11
B
unknown_12
BL

unknown_13
BL

unknown_14
BL

unknown_14b
BL

unknown_15
BL

unknown_16
BL

unknown_17
BL

unknown_2
BD

unknown_20
H

unknown_21
BL

unknown_22
BL

unknown_23
BD

unknown_3
BD

unknown_54
BS

unknown_55
BS

unknown_56
BS

unknown_57
BS

unknown_8
BL

unknown_9
BL

unknown_text1
TV

```

unknown_text2
    TV

unknown_text3
    TV

unknown_text4
    TV

```

4.2 ENTITIES

All graphical objects with its fields. See [Common Entity fields], page 255,

3DFACE

```

parent    struct _dwg_object_entity*

has_no_flags
    B

z_is_zero
    B

corner1   3BD, DXF 10
corner2   3BD, DXF 11
corner3   3BD, DXF 12
corner4   3BD, DXF 13

invis_flags
    BS, DXF 70

```

3DSOLID

```

parent    struct _dwg_object_entity*

acis_empty
    B, DXF 290

unknown   B

version   BS, DXF 70

num_blocks
    BL

block_size
    BL*

encr_sat_data
    char **, DXF 1

sab_size  BL

acis_data
    RC*

```

```
wireframe_data_present
    B

point_present
    B

point      3BD

isolines   BL

isoline_present
    B

num_wires
    BL

wires      Dwg_3DSOLID_wire*

num_silhouettes
    BL

silhouettes
    Dwg_3DSOLID_silhouette*

_dxf_sab_converted
    B

acis_empty2
    B

extra_acis_data
    struct _dwg_entity_3DSOLID*

num_materials
    BL

materials
    Dwg_3DSOLID_material*

revision_guid[39]
    RC, DXF 2

revision_major
    BL

revision_minor1
    BS

revision_minor2
    BS

revision_bytes[9]
    RC

end_marker
    BL

history_id
    H, DXF 350
```

has_revision_guid
B

acis_empty_bit
B

ALIGNMENTPARAMETERENTITY

parent struct _dwg_object_entity*

ARC

parent struct _dwg_object_entity*

center 3BD, DXF 10

radius BD, DXF 40

thickness
BT, DXF 39

extrusion
BE, DXF 210

start_angle
BD, DXF 50

end_angle
BD, DXF 51

ARCALIGNEDTEXT

parent struct _dwg_object_entity*

text_size
D2T, DXF 42

xscale D2T, DXF 41

char_spacing
D2T, DXF 43

style T, DXF 7

t2 T, DXF 2

t3 T, DXF 3

text_value
T, DXF 1

offset_from_arc
D2T, DXF 44

right_offset
D2T, DXF 45

left_offset
D2T, DXF 46

```

center    3BD, DXF 10
radius    BD, DXF 40
start_angle
          BD, DXF 50
end_angle
          BD, DXF 51
extrusion
          3BD, DXF 210
color     BL, DXF 90
is_reverse
          BS, DXF 70
text_direction
          BS, DXF 71
alignment
          BS, DXF 72
text_position
          BS, DXF 73
font_19   BS, DXF 74
bs2       BS, DXF 75
is_underlined
          BS, DXF 76
bs1       BS, DXF 77
font      BS, DXF 78
is_shx    BS, DXF 79
wizard_flag
          BS, DXF 280
arc_handle
          H, DXF 330

```

ARC_DIMENSION

```

parent    struct _dwg_object_entity*
class_version
          RC, DXF 280
extrusion
          BE, DXF 210
def_pt    3BD, DXF 10
text_midpt
          2RD, DXF 11

```

elevation BD, DXF 31

flag RC, DXF 70

flag1 RC

user_text
T, DXF 1

text_rotation
BD, DXF 53

horiz_dir
BD, DXF 51

ins_scale
3BD_1

ins_rotation
BD, DXF 54

attachment
BS, DXF 71

lspace_style
BS, DXF 72

lspace_factor
BD, DXF 41

act_measurement
BD, DXF 42

unknown B, DXF 73

flip_arrow1
B, DXF 74

flip_arrow2
B, DXF 75

clone_ins_pt
2RD, DXF 12

dimstyle H, DXF 3

block H

xline1_pt
3BD, DXF 13

xline2_pt
3BD, DXF 14

center_pt
3BD, DXF 15

is_partial
 B, DXF 70

arc_start_param
 BD, DXF 41

arc_end_param
 BD, DXF 42

has_leader
 B, DXF 71

leader1_pt
 3BD, DXF 16

leader2_pt
 3BD, DXF 17

ATTDEF

parent struct _dwg_object_entity*

elevation
 BD, DXF 30

ins_pt 2DPOINT, DXF 10

alignment_pt
 2DPOINT, DXF 11

extrusion
 BE, DXF 210

thickness
 RD, DXF 39

oblique_angle
 RD, DXF 51

rotation RD, DXF 50

height RD, DXF 40

width_factor
 RD, DXF 41

default_value
 T, DXF 1

generation
 BS, DXF 71

horiz_alignment
 BS, DXF 72

vert_alignment
 BS, DXF 74

dataflags RC
class_version RC, DXF 280
type RC, DXF 70
tag T, DXF 2
field_length BS
flags RC
lock_position_flag B
style H, DXF 7
mtext_handles H, DXF 340
annotative_data_size BS, DXF 70
annotative_data_bytes RC
annotative_app H
annotative_short BS
attdef_class_version RC
prompt T, DXF 3

ATTRIB

parent struct _dwg_object_entity*
elevation BD, DXF 30
ins_pt 2DPOINT, DXF 10
alignment_pt 2DPOINT, DXF 11
extrusion BE, DXF 210
thickness RD, DXF 39
oblique_angle RD, DXF 51

rotation RD, DXF 50
 height RD, DXF 40
 width_factor
 RD, DXF 41
 text_value
 T, DXF 1
 generation
 BS, DXF 71
 horiz_alignment
 BS, DXF 72
 vert_alignment
 BS, DXF 74
 dataflags
 RC
 class_version
 RC, DXF 280
 type RC, DXF 70
 tag T, DXF 2
 field_length
 BS
 flags RC
 lock_position_flag
 B
 style H, DXF 7
 mtext_handles
 H, DXF 340
 annotative_data_size
 BS, DXF 70
 annotative_data_bytes
 RC
 annotative_app
 H
 annotative_short
 BS

BASEPOINTPARAMETERENTITY

parent struct _dwg_object_entity*

BLOCK

parent struct _dwg_object_entity*

name T, DXF 2

filename T, DXF 4

BODY

See [3DSOLID], page 22,

CAMERA

parent struct _dwg_object_entity*

view H

CIRCLE

parent struct _dwg_object_entity*

center 3BD, DXF 10

radius BD, DXF 40

thickness
BT, DXF 39

extrusion
BE, DXF 210

DGNUNDERLAY

parent struct _dwg_object_entity*

extrusion
BE, DXF 210

ins_pt 3BD, DXF 10

scale 3BD_1, DXF 41

angle BD, DXF 50

flag RC, DXF 280

contrast RC, DXF 281

fade RC, DXF 282

num_clip_verts
BL

clip_verts
2RD*, DXF 11

num_clip_inverts
BS, DXF 170

clip_inverts
2RD*, DXF 12

definition_id
H, DXF 340

DIMENSION_ALIGNED

```
parent      struct _dwg_object_entity*
class_version
            RC, DXF 280
extrusion
            BE, DXF 210
def_pt      3BD, DXF 10
text_midpt
            2RD, DXF 11
elevation
            BD, DXF 31
flag        RC, DXF 70
flag1       RC
user_text
            T, DXF 1
text_rotation
            BD, DXF 53
horiz_dir
            BD, DXF 51
ins_scale
            3BD_1
ins_rotation
            BD, DXF 54
attachment
            BS, DXF 71
lspace_style
            BS, DXF 72
lspace_factor
            BD, DXF 41
act_measurement
            BD, DXF 42
unknown     B, DXF 73
flip_arrow1
            B, DXF 74
flip_arrow2
            B, DXF 75
clone_ins_pt
            2RD, DXF 12
```

dimstyle H, DXF 3
 block H
 xline1_pt
 3BD, DXF 13
 xline2_pt
 3BD, DXF 14
 oblique_angle
 BD

DIMENSION_ANG2LN

parent struct _dwg_object_entity*
 class_version
 RC, DXF 280
 extrusion
 BE, DXF 210
 def_pt 3BD, DXF 10
 text_midpt
 2RD, DXF 11
 elevation
 BD, DXF 31
 flag RC, DXF 70
 flag1 RC
 user_text
 T, DXF 1
 text_rotation
 BD, DXF 53
 horiz_dir
 BD, DXF 51
 ins_scale
 3BD_1
 ins_rotation
 BD, DXF 54
 attachment
 BS, DXF 71
 lspace_style
 BS, DXF 72
 lspace_factor
 BD, DXF 41

act_measurement
 BD, DXF 42
 unknown B, DXF 73
 flip_arrow1
 B, DXF 74
 flip_arrow2
 B, DXF 75
 clone_ins_pt
 2RD, DXF 12
 dimstyle H, DXF 3
 block H
 xline1start_pt
 3BD, DXF 13
 xline1end_pt
 3BD, DXF 14
 xline2start_pt
 3BD, DXF 15
 xline2end_pt
 3BD, DXF 16

DIMENSION_ANG3PT

parent struct _dwg_object_entity*
 class_version
 RC, DXF 280
 extrusion
 BE, DXF 210
 def_pt 3BD, DXF 10
 text_midpt
 2RD, DXF 11
 elevation
 BD, DXF 31
 flag RC, DXF 70
 flag1 RC
 user_text
 T, DXF 1
 text_rotation
 BD, DXF 53
 horiz_dir
 BD, DXF 51

ins_scale 3BD_1
 ins_rotation BD, DXF 54
 attachment BS, DXF 71
 lspace_style BS, DXF 72
 lspace_factor BD, DXF 41
 act_measurement BD, DXF 42
 unknown B, DXF 73
 flip_arrow1 B, DXF 74
 flip_arrow2 B, DXF 75
 clone_ins_pt 2RD, DXF 12
 dimstyle H, DXF 3
 block H
 xline1_pt 3BD, DXF 13
 xline2_pt 3BD, DXF 14
 center_pt 3BD, DXF 15

DIMENSION_DIAMETER

parent struct _dwg_object_entity*
 class_version RC, DXF 280
 extrusion BE, DXF 210
 def_pt 3BD, DXF 10
 text_midpt 2RD, DXF 11
 elevation BD, DXF 31

flag RC, DXF 70
flag1 RC
user_text
 T, DXF 1
text_rotation
 BD, DXF 53
horiz_dir
 BD, DXF 51
ins_scale
 3BD_1
ins_rotation
 BD, DXF 54
attachment
 BS, DXF 71
lspace_style
 BS, DXF 72
lspace_factor
 BD, DXF 41
act_measurement
 BD, DXF 42
unknown B, DXF 73
flip_arrow1
 B, DXF 74
flip_arrow2
 B, DXF 75
clone_ins_pt
 2RD, DXF 12
dimstyle H, DXF 3
block H
first_arc_pt
 3BD, DXF 15
leader_len
 BD, DXF 40

DIMENSION_LINEAR

parent struct _dwg_object_entity*
class_version
 RC, DXF 280

extrusion
 BE, DXF 210

def_pt 3BD, DXF 10

text_midpt
 2RD, DXF 11

elevation
 BD, DXF 31

flag RC, DXF 70

flag1 RC

user_text
 T, DXF 1

text_rotation
 BD, DXF 53

horiz_dir
 BD, DXF 51

ins_scale
 3BD.1

ins_rotation
 BD, DXF 54

attachment
 BS, DXF 71

lspace_style
 BS, DXF 72

lspace_factor
 BD, DXF 41

act_measurement
 BD, DXF 42

unknown B, DXF 73

flip_arrow1
 B, DXF 74

flip_arrow2
 B, DXF 75

clone_ins_pt
 2RD, DXF 12

dimstyle H, DXF 3

block H

xline1_pt
 3BD, DXF 13

xline2_pt
3BD, DXF 14

oblique_angle
BD, DXF 52

dim_rotation
BD, DXF 50

DIMENSION_ORDINATE

parent struct _dwg_object_entity*

class_version
RC, DXF 280

extrusion
BE, DXF 210

def_pt 3BD, DXF 10

text_midpt
2RD, DXF 11

elevation
BD, DXF 31

flag RC, DXF 70

flag1 RC

user_text
T, DXF 1

text_rotation
BD, DXF 53

horiz_dir
BD, DXF 51

ins_scale
3BD_1

ins_rotation
BD, DXF 54

attachment
BS, DXF 71

lspace_style
BS, DXF 72

lspace_factor
BD, DXF 41

act_measurement
BD, DXF 42

unknown B, DXF 73

flip_arrow1
 B, DXF 74
 flip_arrow2
 B, DXF 75
 clone_ins_pt
 2RD, DXF 12
 dimstyle H, DXF 3
 block H
 feature_location_pt
 3BD, DXF 13
 leader_endpt
 3BD, DXF 14
 flag2 RC

DIMENSION_RADIUS

parent struct _dwg_object_entity*
 class_version
 RC, DXF 280
 extrusion
 BE, DXF 210
 def_pt 3BD, DXF 10
 text_midpt
 2RD, DXF 11
 elevation
 BD, DXF 31
 flag RC, DXF 70
 flag1 RC
 user_text
 T, DXF 1
 text_rotation
 BD, DXF 53
 horiz_dir
 BD, DXF 51
 ins_scale
 3BD_1
 ins_rotation
 BD, DXF 54
 attachment
 BS, DXF 71

lspace_style
 BS, DXF 72
 lspace_factor
 BD, DXF 41
 act_measurement
 BD, DXF 42
 unknown B, DXF 73
 flip_arrow1
 B, DXF 74
 flip_arrow2
 B, DXF 75
 clone_ins_pt
 2RD, DXF 12
 dimstyle H, DXF 3
 block H
 first_arc_pt
 3BD, DXF 15
 leader_len
 BD, DXF 40

DWFUNDERLAY

See [UNDERLAY], page 30,

ELLIPSE

parent struct _dwg_object_entity*
 center 3BD, DXF 10
 sm_axis 3BD, DXF 11
 extrusion
 BE, DXF 210
 axis_ratio
 BD, DXF 40
 start_angle
 BD, DXF 41
 end_angle
 BD, DXF 42

ENDBLK

parent struct _dwg_object_entity*

EXTRUDESURFACE

parent struct _dwg_object_entity*

```
acis_empty
    B, DXF 290

unknown    B

version    BS, DXF 70

num_blocks
    BL

block_size
    BL*

encr_sat_data
    char **, DXF 1

sab_size   BL

acis_data
    RC*

wireframe_data_present
    B

point_present
    B

point      3BD

isolines   BL

isoline_present
    B

num_wires
    BL

wires      Dwg_3DSOLID_wire*

num_silhouettes
    BL

silhouettes
    Dwg_3DSOLID_silhouette*

_dxf_sab_converted
    B

acis_empty2
    B

extra_acis_data
    struct _dwg_entity_3DSOLID*

num_materials
    BL

materials
    Dwg_3DSOLID_material*
```

```
revision_guid[39]
    RC, DXF 2

revision_major
    BL

revision_minor1
    BS

revision_minor2
    BS

revision_bytes[9]
    RC

end_marker
    BL

history_id
    H, DXF 350

has_revision_guid
    B

acis_empty_bit
    B

modeler_format_version
    BS

bindata_size
    BL

bindata    TF

u_isolines
    BS, DXF 71

v_isolines
    BS, DXF 72

class_version
    BL

draft_angle
    BD, DXF 42

draft_start_distance
    BD, DXF 43

draft_end_distance
    BD, DXF 44

twist_angle
    BD, DXF 45

scale_factor
    BD, DXF 48
```

align_angle
 BD, DXF 49

sweep_entity_transmatrix
 BD*, DXF 46

path_entity_transmatrix
 BD*, DXF 47

is_solid B, DXF 290

sweep_alignment_flags
 BS, DXF 70

path_flags
 BS, DXF 71

align_start
 B, DXF 292

bank B, DXF 293

base_point_set
 B, DXF 294

sweep_entity_transform_computed
 B, DXF 295

path_entity_transform_computed
 B, DXF 296

reference_vector_for_controlling_twist
 3BD, DXF 11

sweep_entity
 H

path_entity
 H

sweep_vector
 3BD, DXF 10

sweep_transmatrix
 BD*, DXF 40

FLIPPARAMETERENTITY

parent struct _dwg_object_entity*

GEOPOSITIONMARKER

parent struct _dwg_object_entity*

class_version
 BS, DXF 90

position 3BD, DXF 10

radius BD, DXF 40
landing_gap
BD, DXF 40
notes T, DXF 1
text_alignment
RC, DXF 280
mtext_visible
B, DXF 290
enable_frame_text
B, DXF 290
mtext struct _dwg_object*

HATCH

parent struct _dwg_object_entity*
is_gradient_fill
BL, DXF 450
reserved BL, DXF 451
gradient_angle
BD, DXF 460
gradient_shift
BD, DXF 461
single_color_gradient
BL, DXF 452
gradient_tint
BD, DXF 462
num_colors
BL, DXF 453
colors Dwg_HATCH_Color*
gradient_name
T, DXF 470
elevation
BD, DXF 30
extrusion
BE, DXF 210
name T, DXF 2
is_solid_fill
B, DXF 70
is_associative
B, DXF 71

num_paths BL, DXF 91
paths Dwg_HATCH_Path*
style BS, DXF 75
pattern_type
BS, DXF 76
angle BD, DXF 52
scale_spacing
BD, DXF 41
double_flag
B, DXF 77
num_deflines
BS, DXF 78
deflines Dwg_HATCH_DefLine*
has_derived
B
pixel_size
BD, DXF 47
num_seeds
BL, DXF 98
seeds 2RD*, DXF 10

HELIX

parent struct _dwg_object_entity*
flag BS, DXF 70
scenario BS
degree BS, DXF 71
splineflags1
BL
knotparam
BL
fit_tol BD, DXF 44
beg_tan_vec
3BD, DXF 12
end_tan_vec
3BD, DXF 13
rational B

closed_b B
periodic B
weighted B
knot_tol BD, DXF 42
ctrl_tol BD, DXF 43
num_fit_pts
 BS, DXF 74
fit_pts 3DPOINT*, DXF 11
num_knots
 BL, DXF 72
knots BD*, DXF 40
num_ctrl_pts
 BL, DXF 73
ctrl_pts Dwg_SPLINE_control_point*
major_version
 BL, DXF 90
maint_version
 BL, DXF 91
axis_base_pt
 3BD, DXF 10
start_pt 3BD, DXF 11
axis_vector
 3BD, DXF 12
radius BD, DXF 40
turns BD, DXF 41
turn_height
 BD, DXF 42
handedness
 B, DXF 290
constraint_type
 RC, DXF 280

IMAGE

parent struct _dwg_object_entity*
class_version
 BL, DXF 90
pt0 3BD, DXF 10

uvec 3BD, DXF 11
vvec 3BD, DXF 12
size 2RD, DXF 13
display_props
 BS, DXF 70
clipping B, DXF 280
brightness
 RC, DXF 281
contrast RC, DXF 282
fade RC, DXF 283
clip_mode
 B, DXF 290
clip_boundary_type
 BS, DXF 71
num_clip_verts
 BL, DXF 91
clip_verts
 2RD*, DXF 14
imagedef H, DXF 340
imagedefreactor
 H, DXF 360

INSERT

parent struct _dwg_object_entity*
ins_pt 3DPOINT, DXF 10
scale_flag
 BB
scale 3BD_1, DXF 41
rotation BD, DXF 50
extrusion
 BE, DXF 210
has_attribs
 B, DXF 66
num_owned
 BL
block_header
 H, DXF 2

```
first_attrib
    H
last_attrib
    H
attribs    H*
seqend    H
```

LARGE_RADIAL_DIMENSION

```
parent    struct _dwg_object_entity*
class_version
    RC, DXF 280
extrusion
    BE, DXF 210
def_pt    3BD, DXF 10
text_midpt
    2RD, DXF 11
elevation
    BD, DXF 31
flag      RC, DXF 70
flag1     RC
user_text
    T, DXF 1
text_rotation
    BD, DXF 53
horiz_dir
    BD, DXF 51
ins_scale
    3BD_1
ins_rotation
    BD, DXF 54
attachment
    BS, DXF 71
lspace_style
    BS, DXF 72
lspace_factor
    BD, DXF 41
act_measurement
    BD, DXF 42
```

unknown B, DXF 73
flip_arrow1
 B, DXF 74
flip_arrow2
 B, DXF 75
clone_ins_pt
 2RD, DXF 12
dimstyle H, DXF 3
block H
first_arc_pt
 3BD, DXF 15
leader_len
 BD, DXF 40
ovr_center
 3BD, DXF 12
jog_point
 3BD, DXF 13

LEADER

parent struct _dwg_object_entity*
unknown_bit_1
 B
path_type
 BS, DXF 72
annot_type
 BS, DXF 73
num_points
 BL, DXF 76
points 3DPOINT*, DXF 10
origin 3DPOINT
extrusion
 BE, DXF 210
x_direction
 3DPOINT, DXF 211
inspt_offset
 3DPOINT, DXF 212
endptproj
 3DPOINT

dimgap BD
box_height BD, DXF 40
box_width BD
hookline_dir B, DXF 74
arrowhead_on B, DXF 71
arrowhead_type BS
dimasz BD
unknown_bit_2 B
unknown_bit_3 B
unknown_short_1 BS
byblock_color BS, DXF 77
hookline_on B, DXF 75
unknown_bit_5 B
associated_annotation H, DXF 340
dimstyle H, DXF 3

LIGHT

parent struct _dwg_object_entity*
class_version BL, DXF 90
name T, DXF 1
type BL, DXF 70
status B, DXF 290
color CMC, DXF 63
plot_glyph B, DXF 291

intensity
BD, DXF 40

position 3BD, DXF 10

target 3BD, DXF 11

attenuation_type
BL, DXF 72

use_attenuation_limits
B, DXF 292

attenuation_start_limit
BD, DXF 41

attenuation_end_limit
BD, DXF 42

hotspot_angle
BD, DXF 50

falloff_angle
BD, DXF 51

cast_shadows
B, DXF 293

shadow_type
BL, DXF 73

shadow_map_size
BS, DXF 91

shadow_map_softness
RC, DXF 280

is_photometric
B

has_photometric_data
B, DXF 1

has_webfile
B, DXF 290

webfile T, DXF 300

physical_intensity_method
BS, DXF 70

physical_intensity
BD, DXF 40

illuminance_dist
BD, DXF 41

lamp_color_type
BS, DXF 71

lamp_color_temp
BD, DXF 42

lamp_color_preset
BS, DXF 72

lamp_color_rgb
BL

web_rotation
3BD_1, DXF 43

extlight_shape
BS, DXF 73

extlight_length
BD, DXF 46

extlight_width
BD, DXF 47

extlight_radius
BD, DXF 48

webfile_type
BS, DXF 74

web_symetry
BS, DXF 75

has_target_grip
BS, DXF 76

web_flux BD, DXF 49

web_angle1
BD, DXF 50

web_angle2
BD, DXF 51

web_angle3
BD, DXF 52

web_angle4
BD, DXF 53

web_angle5
BD, DXF 54

glyph_display_type
BS, DXF 77

LINE

parent struct _dwg_object_entity*

z_is_zero
RC

start 3BD, DXF 10
 end 3BD, DXF 11
 thickness
 BT, DXF 39
 extrusion
 BE, DXF 210

LINEARPARAMETERENTITY

parent struct _dwg_object_entity*

LOFTEDSURFACE

parent struct _dwg_object_entity*

acis_empty
 B, DXF 290
 unknown B
 version BS, DXF 70
 num_blocks
 BL
 block_size
 BL*
 encr_sat_data
 char **, DXF 1
 sab_size BL
 acis_data
 RC*
 wireframe_data_present
 B
 point_present
 B
 point 3BD
 isolines BL
 isoline_present
 B
 num_wires
 BL
 wires Dwg_3DSOLID_wire*
 num_silhouettes
 BL


```
silhouettes
    Dwg_3DSOLID_silhouette*

_dxf_sab_converted
    B

acis_empty2
    B

extra_acis_data
    struct _dwg_entity_3DSOLID*

num_materials
    BL

materials
    Dwg_3DSOLID_material*

revision_guid[39]
    RC, DXF 2

revision_major
    BL

revision_minor1
    BS

revision_minor2
    BS

revision_bytes[9]
    RC

end_marker
    BL

history_id
    H, DXF 350

has_revision_guid
    B

acis_empty_bit
    B

modeler_format_version
    BS, DXF 70

u_isolines
    BS, DXF 71

v_isolines
    BS, DXF 72

loft_entity_transmatrix
    BD*, DXF 40
```

plane_normal_lofting_type
BL, DXF 70

start_draft_angle
BD, DXF 41

end_draft_angle
BD, DXF 42

start_draft_magnitude
BD, DXF 43

end_draft_magnitude
BD, DXF 44

arc_length_parameterization
B, DXF 290

no_twist B, DXF 291

align_direction
B, DXF 292

simple_surfaces
B, DXF 293

closed_surfaces
B, DXF 294

solid B, DXF 295

ruled_surface
B, DXF 296

virtual_guide
B, DXF 297

num_cross_sections
BS

num_guide_curves
BS

cross_sections
H*, DXF 310

guide_curves
H*, DXF 310

path_curve
H

LWPOLYLINE

parent struct _dwg_object_entity*

flag BS, DXF 70

`const_width` BD, DXF 43
`elevation` BD, DXF 38
`thickness` BD, DXF 39
`extrusion` BE, DXF 210
`num_points` BL, DXF 90
`points` 2RD*, DXF 10
`num_bulges` BL
`bulges` BD*, DXF 42
`num_vertexids` BL
`vertexids` BL*, DXF 91
`num_widths` BL
`widths` Dwg_LWPOLYLINE_width*

MESH

`parent` struct `_dwg-object_entity*`
`dlevel` BS, DXF 71
`is_watertight` B, DXF 72
`num_subdiv_vertex` BL, DXF 91
`subdiv_vertex` 3DPOINT*, DXF 10
`num_vertex` BL, DXF 92
`vertex` 3DPOINT*, DXF 10
`num_faces` BL, DXF 93
`faces` BL*, DXF 90
`num_edges` BL, DXF 94

edges Dwg_MESH_edge*
num_crease BL, DXF 95
crease BD*, DXF 140

MINSERT

parent struct _dwg_object_entity*
ins_pt 3DPOINT, DXF 10
scale_flag BB
scale 3BD_1, DXF 41
rotation BD, DXF 50
extrusion BE, DXF 210
has_attribs B, DXF 66
num_owned BL
num_cols BS, DXF 70
num_rows BS, DXF 71
col_spacing BD, DXF 44
row_spacing BD, DXF 45
block_header H, DXF 2
first_attrib H
last_attrib H
attribs H*
seqend H

MLINE

parent struct _dwg_object_entity*
scale BD, DXF 40
justification RC, DXF 70

```

base_point      3BD, DXF 10
extrusion       BE, DXF 210
flags           BS, DXF 71
num_lines       RC, DXF 73
num_verts       BS, DXF 72
verts           Dwg_MLINE_vertex*
mlinestyle      H, DXF 340

```

MPOLYGON

```

parent          struct _dwg_object_entity*
is_gradient_fill BL
reserved        BL
gradient_angle  BD
gradient_shift  BD
single_color_gradient BL
gradient_tint   BD
num_colors      BL
colors          Dwg_HATCH_Color*
gradient_name   T
elevation       BD, DXF 30
extrusion       BE, DXF 210
name            T, DXF 2
is_solid_fill   B, DXF 70

```

`is_associative` B, DXF 71

`num_paths` BL, DXF 91

`paths` Dwg_HATCH_Path*

`style` BS, DXF 75

`pattern_type` BS, DXF 76

`angle` BD, DXF 52

`scale_spacing` BD, DXF 41

`double_flag` B, DXF 77

`num_deflines` BS, DXF 78

`deflines` Dwg_HATCH_DefLine*

`color` CMC, DXF 62

`x_dir` 2RD, DXF 11

`num_boundary_handles` BL, DXF 99

MTEXT

`parent` struct _dwg_object_entity*

`ins_pt` 3BD, DXF 10

`extrusion` BE, DXF 210

`x_axis_dir` 3BD, DXF 11

`rect_height` BD, DXF 41

`rect_width` BD, DXF 40

`text_height` BD, DXF 40

`attachment` BS, DXF 71

`flow_dir` BS, DXF 72

extents_width
 BD, DXF 42

extents_height
 BD, DXF 43

text T, DXF 1

style H, DXF 7

linespace_style
 BS, DXF 73

linespace_factor
 BD, DXF 44

unknown_b0
 B

bg_fill_flag
 BL, DXF 90

bg_fill_scale
 BL, DXF 45

bg_fill_color
 CMC, DXF 63

bg_fill_trans
 BL, DXF 441

is_not_annotative
 B

class_version
 BS

default_flag
 B, DXF 70

appid H

ignore_attachment
 BL

column_type
 BS, DXF 71

numfragments
 BL, DXF 72

column_width
 BD, DXF 44

gutter BD, DXF 45

auto_height
 B, DXF 73

`flow_reversed`
B, DXF 74

`num_column_heights`
BL, DXF 72

`column_heights`
BD*, DXF 46

MULTILEADER

`parent` struct `_dwg_object_entity*`

`class_version`
BS, DXF 270

`ctx` Dwg_MLEADER_AnnotContext

`mleaderstyle`
H, DXF 340

`flags` BL, DXF 90

`type` BS, DXF 170

`color` CMC, DXF 91

`ltype` H, DXF 341

`linewt` BLd, DXF 171

`has_landing`
B, DXF 290

`has_dogleg`
B, DXF 291

`landing_dist`
BD, DXF 41

`arrow_handle`
H, DXF 342

`arrow_size`
BD, DXF 42

`style_content`
BS, DXF 172

`text_style`
H, DXF 343

`text_left`
BS, DXF 173

`text_right`
BS, DXF 95

`text_angletype`
BS, DXF 174

`text_alignment`
BS, DXF 175

`text_color`
CMC, DXF 92

`has_text_frame`
B, DXF 292

`block_style`
H, DXF 344

`block_color`
CMC, DXF 93

`block_scale`
3BD, DXF 10

`block_rotation`
BD, DXF 43

`style_attachment`
BS, DXF 176

`is_annotative`
B, DXF 293

`num_arrowheads`
BL

`arrowheads`
Dwg_LEADER_ArrowHead*

`num_blocklabels`
BL

`blocklabels`
Dwg_LEADER_BlockLabel*

`is_neg_textdir`
B, DXF 294

`ipe_alignment`
BS, DXF 178

`justification`
BS, DXF 179

`scale_factor`
BD, DXF 45

`attach_dir`
BS, DXF 271

`attach_top`
BS, DXF 273

attach_bottom
BS, DXF 272

is_text_extended
B, DXF 295

NAVISWORKSMODEL

parent struct _dwg_object_entity*

flags BS, DXF 70

definition
H, DXF 340

transmatrix
BD*, DXF 40

unitfactor
BD, DXF 40

NURBSURFACE

parent struct _dwg_object_entity*

acis_empty
B, DXF 290

unknown B

version BS, DXF 70

num_blocks
BL

block_size
BL*

encr_sat_data
char **, DXF 1

sab_size BL

acis_data
RC*

wireframe_data_present
B

point_present
B

point 3BD

isolines BL

isoline_present
B

```
num_wires          BL
wires              Dwg_3DSOLID_wire*
num_silhouettes    BL
silhouettes        Dwg_3DSOLID_silhouette*
_dxf_sab_converted B
acis_empty2        B
extra_acis_data    struct _dwg_entity_3DSOLID*
num_materials      BL
materials          Dwg_3DSOLID_material*
revision_guid[39]  RC, DXF 2
revision_major     BL
revision_minor1    BS
revision_minor2    BS
revision_bytes[9]  RC
end_marker         BL
history_id         H, DXF 350
has_revision_guid  B
acis_empty_bit     B
u_isolines         BS, DXF 71
v_isolines         BS, DXF 72
```

short170 BS, DXF 170
cv_hull_display
 B, DXF 290
uvec1 3BD, DXF 10
vvec1 3BD, DXF 11
uvec2 3BD, DXF 12
vvec2 3BD, DXF 13

OLE2FRAME

parent struct _dwg_object_entity*
type BS, DXF 71
mode BS, DXF 72
lock_aspect
 RC, DXF 73
data_size
 BL, DXF 90
data TF, DXF 310
oleversion
 BS, DXF 70
oleclient
 TF, DXF 3
pt1 3BD, DXF 10
pt2 3BD, DXF 11

OLEFRAME

parent struct _dwg_object_entity*
flag BS, DXF 70
mode BS
data_size
 BL, DXF 90
data TF, DXF 310

PDFUNDERLAY

See [UNDERLAY], page 30,

PLANESURFACE

parent struct _dwg_object_entity*
acis_empty
 B, DXF 290

```
unknown    B
version    BS, DXF 70
num_blocks BL
block_size BL*
encr_sat_data
    char **, DXF 1
sab_size   BL
acis_data  RC*
wireframe_data_present
    B
point_present
    B
point      3BD
isolines   BL
isoline_present
    B
num_wires  BL
wires      Dwg_3DSOLID_wire*
num_silhouettes
    BL
silhouettes
    Dwg_3DSOLID_silhouette*
_dxf_sab_converted
    B
acis_empty2
    B
extra_acis_data
    struct _dwg_entity_3DSOLID*
num_materials
    BL
materials  Dwg_3DSOLID_material*
revision_guid[39]
    RC, DXF 2
```

```

revision_major
    BL
revision_minor1
    BS
revision_minor2
    BS
revision_bytes[9]
    RC
end_marker
    BL
history_id
    H, DXF 350
has_revision_guid
    B
acis_empty_bit
    B
modeler_format_version
    BS, DXF 70
u_isolines
    BS, DXF 71
v_isolines
    BS, DXF 72
class_version
    BL

```

POINT

```

parent    struct _dwg_object_entity*
x         BD, DXF 10
y         BD, DXF 20
z         BD, DXF 30
thickness
    BT, DXF 39
extrusion
    BE, DXF 210
x_ang    BD, DXF 50

```

POINTCLOUD

```

parent    struct _dwg_object_entity*
class_version
    BS, DXF 70

```

origin 3BD, DXF 10

saved_filename
T, DXF 1

num_source_files
BL, DXF 90

source_files
TV*, DXF 2

extents_min
3BD, DXF 11

extents_max
3BD, DXF 12

numpoints
RLL, DXF 92

ucs_name T, DXF 3

ucs_origin
3BD, DXF 13

ucs_x_dir
3BD, DXF 210

ucs_y_dir
3BD, DXF 211

ucs_z_dir
3BD, DXF 212

pointclouddef
H, DXF 330

reactor H, DXF 360

show_intensity
B

intensity_scheme
BS, DXF 71

intensity_style
Dwg_POINTCLOUD_IntensityStyle

show_clipping
B

num_clippings
BL

clippings
Dwg_POINTCLOUD_Clippings*

POINTCLOUDEX

parent struct _dwg_object_entity*

class_version
BS, DXF 70

extents_min
3BD, DXF 10

extents_max
3BD, DXF 11

ucs_origin
3BD, DXF 12

ucs_x_dir
3BD, DXF 210

ucs_y_dir
3BD, DXF 211

ucs_z_dir
3BD, DXF 212

is_locked
B, DXF 290

pointclouddefex
H, DXF 330

reactor H, DXF 360

name T, DXF 1

show_intensity
B, DXF 291

stylization_type
BS, DXF 71

intensity_colorscheme
T, DXF 1

cur_colorscheme
T, DXF 1

classification_colorscheme
T, DXF 1

elevation_min
BD, DXF 40

elevation_max
BD, DXF 41

intensity_min
BL, DXF 90


```

intensity_max
    BL, DXF 91

intensity_out_of_range_behavior
    BS, DXF 71

elevation_out_of_range_behavior
    BS, DXF 72

elevation_apply_to_fixed_range
    B, DXF 292

intensity_as_gradient
    B, DXF 293

elevation_as_gradient
    B, DXF 294

show_cropping
    B, DXF 295

unknown_b10
    BL, DXF 93

unknown_b11
    BL, DXF 93

num_croppings
    BL, DXF 92

croppings
    Dwg_POINTCLOUDEX_Croppings*

```

POINTPARAMETERENTITY

```

parent    struct _dwg_object_entity*

```

POLARGRIPENTITY

```

parent    struct _dwg_object_entity*

```

POLYLINE_2D

```

parent    struct _dwg_object_entity*

has_vertex
    B, DXF 66

num_owned
    BL

first_vertex
    H

last_vertex
    H

vertex    H*

```

```

seqend      H
flag        BS, DXF 70
curve_type  BS, DXF 75
start_width BD, DXF 40
end_width   BD, DXF 41
thickness   BT, DXF 39
elevation   BD
extrusion   BE, DXF 210

```

POLYLINE_3D

```

parent      struct _dwg_object_entity*
has_vertex  B, DXF 66
num_owned   BL
first_vertex H
last_vertex H
vertex      H*
seqend      H
curve_type  RC, DXF 75
flag        RC, DXF 70

```

POLYLINE_MESH

```

parent      struct _dwg_object_entity*
has_vertex  B, DXF 66
num_owned   BL
first_vertex H

```

```

last_vertex      H
vertex           H*
seqend          H
flag            BS, DXF 70
curve_type      BS, DXF 75
num_m_verts     BS, DXF 71
num_n_verts     BS, DXF 72
m_density       BS, DXF 73
n_density       BS, DXF 74

```

POLYLINE_PFACE

```

parent          struct _dwg_object_entity*
has_vertex      B, DXF 66
num_owned       BL
first_vertex    H
last_vertex     H
vertex         H*
seqend         H
numverts       BS, DXF 71
numfaces       BS, DXF 72

```

PROXY_ENTITY

```

parent          struct _dwg_object_entity*
class_id       BL, DXF 91
version        BL, DXF 95
maint_version   BL, DXF 97
from_dxf       B, DXF 70

```

```

data_numbits
    BL

data_size
    BL, DXF 93

data
    TF, DXF 310

num_objids
    BL

objids
    H*, DXF 340

```

RAY

```

parent
    struct _dwg_object_entity*

point
    3BD, DXF 10

vector
    3BD, DXF 11

```

REGION

See [3DSOLID], page 22,

REVOLVEDSURFACE

```

parent
    struct _dwg_object_entity*

acis_empty
    B, DXF 290

unknown
    B

version
    BS, DXF 70

num_blocks
    BL

block_size
    BL*

encr_sat_data
    char **, DXF 1

sab_size
    BL

acis_data
    RC*

wireframe_data_present
    B

point_present
    B

point
    3BD

isolines
    BL

isoline_present
    B

```

```
num_wires          BL
wires              Dwg_3DSOLID_wire*
num_silhouettes   BL
silhouettes       Dwg_3DSOLID_silhouette*
_dxf_sab_converted B
acis_empty2       B
extra_acis_data   struct _dwg_entity_3DSOLID*
num_materials     BL
materials         Dwg_3DSOLID_material*
revision_guid[39] RC, DXF 2
revision_major    BL
revision_minor1   BS
revision_minor2   BS
revision_bytes[9] RC
end_marker        BL
history_id        H, DXF 350
has_revision_guid B
acis_empty_bit    B
modeler_format_version BS, DXF 70
u_isolines        BS, DXF 71
```

v_isolines
 BS, DXF 72

class_version
 BL, DXF 90

id BL, DXF 90

axis_point
 3BD, DXF 10

axis_vector
 3BD, DXF 11

revolve_angle
 BD, DXF 40

start_angle
 BD, DXF 41

revolved_entity_transmatrix
 BD*, DXF 42

draft_angle
 BD, DXF 43

draft_start_distance
 BD, DXF 44

draft_end_distance
 BD, DXF 45

twist_angle
 BD, DXF 46

solid B, DXF 290

close_to_axis
 B, DXF 291

ROTATIONPARAMETERENTITY

parent struct _dwg_object_entity*

RTEXT

parent struct _dwg_object_entity*

pt 3BD, DXF 10

extrusion
 BE, DXF 210

rotation BD, DXF 50

height BD, DXF 50

flags BS, DXF 70

text_value
T, DXF 1

style H, DXF 7

SECTIONOBJECT

parent struct _dwg_object_entity*

state BL, DXF 90

flags BL, DXF 91

name T, DXF 1

vert_dir 3BD, DXF 10

top_height
BD, DXF 40

bottom_height
BD, DXF 41

indicator_alpha
BS, DXF 70

indicator_color
CMC, DXF 62

num_verts
BL, DXF 92

verts 3BD*, DXF 11

num_blverts
BL, DXF 93

blverts 3BD*, DXF 12

section_settings
H, DXF 360

SEQEND

parent struct _dwg_object_entity*

SHAPE

parent struct _dwg_object_entity*

ins_pt 3BD, DXF 10

scale BD, DXF 40

rotation BD, DXF 50

width_factor
BD, DXF 41

oblique_angle
BD, DXF 51

thickness BD, DXF 39
style_id BS
extrusion BE, DXF 210
style H, DXF 7

SOLID

parent struct _dwg_object_entity*
thickness BT, DXF 39
elevation BD, DXF 38
corner1 2RD, DXF 10
corner2 2RD, DXF 11
corner3 2RD, DXF 12
corner4 2RD, DXF 13
extrusion BE, DXF 210

SPLINE

parent struct _dwg_object_entity*
flag RS
scenario BS
degree BS, DXF 71
splineflags1 BL
knotparam BL
fit_tol BD, DXF 44
beg_tan_vec 3BD, DXF 12
end_tan_vec 3BD, DXF 13
closed_b B
periodic B
rational B

weighted B
knot_tol BD, DXF 42
ctrl_tol BD, DXF 43
num_fit_pts
 BS, DXF 74
fit_pts 3DPOINT*, DXF 11
num_knots
 BL, DXF 72
knots BD*, DXF 40
num_ctrl_pts
 BL, DXF 73
ctrl_pts Dwg_SPLINE_control_point*

SWEPTSURFACE

parent struct _dwg_object_entity*
acis_empty
 B, DXF 290
unknown B
version BS, DXF 70
num_blocks
 BL
block_size
 BL*
encr_sat_data
 char **, DXF 1
sab_size BL
acis_data
 RC*
wireframe_data_present
 B
point_present
 B
point 3BD
isolines BL
isoline_present
 B
num_wires
 BL

```
wires      Dwg_3DSOLID_wire*
num_silhouettes
           BL
silhouettes
           Dwg_3DSOLID_silhouette*
_dxf_sab_converted
           B
acis_empty2
           B
extra_acis_data
           struct _dwg_entity_3DSOLID*
num_materials
           BL
materials
           Dwg_3DSOLID_material*
revision_guid[39]
           RC, DXF 2
revision_major
           BL
revision_minor1
           BS
revision_minor2
           BS
revision_bytes[9]
           RC
end_marker
           BL
history_id
           H, DXF 350
has_revision_guid
           B
acis_empty_bit
           B
modeler_format_version
           BS, DXF 70
u_isolines
           BS, DXF 71
v_isolines
           BS, DXF 72
```

class_version
BL, DXF 90

sweep_entity_id
BL, DXF 90

sweepdata_size
BL, DXF 90

sweepdata
TF, DXF 310

path_entity_id
BL, DXF 90

pathdata_size
BL, DXF 90

pathdata TF, DXF 310

draft_angle
BD, DXF 42

draft_start_distance
BD, DXF 43

draft_end_distance
BD, DXF 44

twist_angle
BD, DXF 45

scale_factor
BD, DXF 48

align_angle
BD, DXF 49

sweep_entity_transmatrix
BD*, DXF 46

path_entity_transmatrix
BD*, DXF 47

is_solid B, DXF 290

sweep_alignment_flags
BS, DXF 70

path_flags
BS, DXF 71

align_start
B, DXF 292

bank B, DXF 293

base_point_set
B, DXF 294

sweep_entity_transform_computed
B, DXF 295

path_entity_transform_computed
B, DXF 296

reference_vector_for_controlling_twist
3BD, DXF 11

sweep_entity
H

path_entity
H

TABLE

parent	struct _dwg_object_entity*
ldata	Dwg_LinkedData
tdata	Dwg_LinkedTableData
fdata	Dwg_FormattedTableData
tablestyle	H, DXF 342
unknown_rc	RC
unknown_h	H
unknown_bl	BL
unknown_b	B
unknown_bl1	BL
ins_pt	3BD, DXF 10
scale	3BD_1, DXF 41
scale_flag	BB
rotation	BD, DXF 50
extrusion	BE, DXF 210
has_attribs	B, DXF 66
num_owned	BL

flag_for_table_value
BS, DXF 90

horiz_direction
3BD, DXF 11

num_cols BL, DXF 92

num_rows BL, DXF 91

num_cells
unsigned long

col_widths
BD*, DXF 142

row_heights
BD*, DXF 141

cells Dwg-TABLE-Cell*

has_table_overrides
B

table_flag_override
BL, DXF 93

title_suppressed
B, DXF 280

header_suppressed
B, DXF 281

flow_direction
BS, DXF 70

horiz_cell_margin
BD, DXF 40

vert_cell_margin
BD, DXF 41

title_row_color
CMC, DXF 64

header_row_color
CMC, DXF 64

data_row_color
CMC, DXF 64

title_row_fill_none
B, DXF 283

header_row_fill_none
B, DXF 283

data_row_fill_none
B, DXF 283

title_row_fill_color
CMC, DXF 63

header_row_fill_color
CMC, DXF 63

data_row_fill_color
CMC, DXF 63

title_row_alignment
BS, DXF 170

header_row_alignment
BS, DXF 170

data_row_alignment
BS, DXF 170

title_text_style
H, DXF 7

header_text_style
H, DXF 7

data_text_style
H, DXF 7

title_row_height
BD, DXF 140

header_row_height
BD, DXF 140

data_row_height
BD, DXF 140

has_border_color_overrides
B

border_color_overrides_flag
BL, DXF 94

title_horiz_top_color
CMC, DXF 64

title_horiz_ins_color
CMC, DXF 65

title_horiz_bottom_color
CMC, DXF 66

title_vert_left_color
CMC, DXF 63

title_vert_ins_color
CMC, DXF 68

title_vert_right_color
CMC, DXF 69

header_horiz_top_color
CMC, DXF 64

header_horiz_ins_color
CMC, DXF 65

header_horiz_bottom_color
CMC, DXF 66

header_vert_left_color
CMC, DXF 63

header_vert_ins_color
CMC, DXF 68

header_vert_right_color
CMC, DXF 69

data_horiz_top_color
CMC, DXF 64

data_horiz_ins_color
CMC, DXF 65

data_horiz_bottom_color
CMC, DXF 66

data_vert_left_color
CMC, DXF 63

data_vert_ins_color
CMC, DXF 68

data_vert_right_color
CMC, DXF 69

has_border_lineweight_overrides
B

border_lineweight_overrides_flag
BL, DXF 95

title_horiz_top_linewt
BS

title_horiz_ins_linewt
BS

title_horiz_bottom_linewt
BS

title_vert_left_linewt
BS

title_vert_ins_linewt
BS

title_vert_right_linewt
BS

header_horiz_top_linewt
BS

header_horiz_ins_linewt
BS

header_horiz_bottom_linewt
BS

header_vert_left_linewt
BS

header_vert_ins_linewt
BS

header_vert_right_linewt
BS

data_horiz_top_linewt
BS

data_horiz_ins_linewt
BS

data_horiz_bottom_linewt
BS

data_vert_left_linewt
BS

data_vert_ins_linewt
BS

data_vert_right_linewt
BS

has_border_visibility_overrides
B

border_visibility_overrides_flag
BL, DXF 96

title_horiz_top_visibility
BS

title_horiz_ins_visibility
BS

title_horiz_bottom_visibility
BS


```
title_vert_left_visibility
    BS
title_vert_ins_visibility
    BS
title_vert_right_visibility
    BS
header_horiz_top_visibility
    BS
header_horiz_ins_visibility
    BS
header_horiz_bottom_visibility
    BS
header_vert_left_visibility
    BS
header_vert_ins_visibility
    BS
header_vert_right_visibility
    BS
data_horiz_top_visibility
    BS
data_horiz_ins_visibility
    BS
data_horiz_bottom_visibility
    BS
data_vert_left_visibility
    BS
data_vert_ins_visibility
    BS
data_vert_right_visibility
    BS
block_header
    H, DXF 2
first_attrib
    H
last_attrib
    H
attribs    H*
seqend    H
```

```

title_row_style_override
    H, DXF 7
header_row_style_override
    H
data_row_style_override
    H
unknown_bs
    BS
hor_dir    3BD, DXF 11
has_break_data
    BL
break_flag
    BL
break_flow_direction
    BL
break_spacing
    BD
break_unknown1
    BL
break_unknown2
    BL
num_break_heights
    BL
break_heights
    Dwg_TABLE_BreakHeight*
num_break_rows
    BL
break_rows
    Dwg_TABLE_BreakRow*

```

TEXT

```

parent    struct _dwg_object_entity*
dataflags
    RC
elevation
    RD, DXF 30
ins_pt    2DPOINT, DXF 10
alignment_pt
    2DPOINT, DXF 11

```

extrusion
 BE, DXF 210

thickness
 RD, DXF 39

oblique_angle
 RD, DXF 51

rotation RD, DXF 50

height RD, DXF 40

width_factor
 RD, DXF 41

text_value
 T, DXF 1

generation
 BS, DXF 71

horiz_alignment
 BS, DXF 72

vert_alignment
 BS, DXF 73

style H, DXF 7

TOLERANCE

parent struct _dwg_object_entity*

unknown_short
 BS

height BD

dingap BD

ins_pt 3BD, DXF 10

x_direction
 3BD, DXF 11

extrusion
 BE

text_value
 T, DXF 1

dimstyle H, DXF 3

TRACE

parent struct _dwg_object_entity*

thickness
 BT, DXF 39

elevation
BD, DXF 38

corner1 2RD, DXF 10

corner2 2RD, DXF 11

corner3 2RD, DXF 12

corner4 2RD, DXF 13

extrusion
BE, DXF 210

UNKNOWN_ENT

parent struct _dwg_object_entity*

VERTEX_2D

parent struct _dwg_object_entity*

flag RC, DXF 70

point 3BD, DXF 10

start_width
BD, DXF 40

end_width
BD, DXF 41

id BL, DXF 91

bulge BD, DXF 42

tangent_dir
BD, DXF 50

VERTEX_3D

parent struct _dwg_object_entity*

flag RC, DXF 70

point 3BD, DXF 10

VERTEX_MESH

See [VERTEX_3D], page 88,

VERTEX_PFACE

See [VERTEX_3D], page 88,

VERTEX_PFACE_FACE

parent struct _dwg_object_entity*

flag RC, DXF 70

vertind[4]
BS

VIEWPORT

parent struct _dwg_object_entity*
center 3BD, DXF 10
width BD, DXF 40
height BD, DXF 41
on_off RS, DXF 68
id RS, DXF 69
view_target
 3BD, DXF 17
VIEWDIR 3BD, DXF 16
twist_angle
 BD, DXF 51
VIEWSIZE BD, DXF 45
lens_length
 BD, DXF 42
front_clip_z
 BD, DXF 43
back_clip_z
 BD, DXF 44
SNAPANG BD, DXF 50
VIEWCTR 2RD, DXF 12
SNAPBASE 2RD, DXF 13
SNAPUNIT 2RD, DXF 14
GRIDUNIT 2RD, DXF 15
circle_zoom
 BS, DXF 72
grid_major
 BS, DXF 61
num_frozen_layers
 BL
status_flag
 BL, DXF 90
style_sheet
 T, DXF 1
render_mode
 RC, DXF 281

ucs_at_origin
 B, DXF 74

UCSVP B, DXF 71

ucsorg 3BD, DXF 110

ucsxdir 3BD, DXF 111

ucsydir 3BD, DXF 112

ucs_elevation
 BD, DXF 146

UCSORTHOVIEW
 BS, DXF 79

shadeplot_mode
 BS, DXF 170

use_default_lights
 B, DXF 292

default_lighting_type
 RC, DXF 282

brightness
 BD, DXF 141

contrast BD, DXF 142

ambient_color
 CMC, DXF 63

vport_entity_header
 H

frozen_layers
 H*, DXF 341

clip_boundary
 H, DXF 340

named_ucs
 H, DXF 345

base_ucs H, DXF 346

background
 H, DXF 332

visualstyle
 H, DXF 348

shadeplot
 H, DXF 333

sun H, DXF 361

VISIBILITYGRIPENTITY

parent struct _dwg_object_entity*

VISIBILITYPARAMETERENTITY

parent struct _dwg_object_entity*

WIPEOUT

parent struct _dwg_object_entity*

class_version

BL, DXF 90

pt0 3BD, DXF 10

uvec 3BD, DXF 11

vvec 3BD, DXF 12

size 2RD, DXF 13

display_props

BS, DXF 70

clipping B, DXF 280

brightness

RC, DXF 281

contrast RC, DXF 282

fade RC, DXF 283

clip_mode

B, DXF 290

clip_boundary_type

BS, DXF 71

num_clip_verts

BL, DXF 91

clip_verts

2RD*, DXF 14

imagedef H, DXF 340

imagedefreactor

H, DXF 360

XLINE

See [RAY], page 72,

XYPARAMETERENTITY

parent struct _dwg_object_entity*

4.3 OBJECTS

All non-graphical objects with its fields. See [Common Object fields], page 257,

ACMECOMMANDHISTORY

```
parent    struct _dwg_object_object*
class_version
          BS
```

ACMESCOPE

```
parent    struct _dwg_object_object*
class_version
          BS
```

ACMESTATEMGR

```
parent    struct _dwg_object_object*
class_version
          BS
```

ACSH_BOOLEAN_CLASS

```
parent    struct _dwg_object_object*
evalexpr  Dwg_EvalExpr
history_node
          Dwg_ACSH_HistoryNode
major     BL, DXF 90
minor     BL, DXF 91
operation
          RCd, DXF 280
operand1  BL, DXF 92
operand2  BL, DXF 93
```

ACSH_BOX_CLASS

```
parent    struct _dwg_object_object*
evalexpr  Dwg_EvalExpr
history_node
          Dwg_ACSH_HistoryNode
major     BL, DXF 90
minor     BL, DXF 91
length    BD, DXF 40
width     BD, DXF 41
height    BD, DXF 42
```


ACSH_BREP_CLASS

```
parent      struct _dwg_object_object*
acis_empty  B, DXF 290
unknown     B
version     BS, DXF 70
num_blocks  BL
block_size  BL*
encr_sat_data char **, DXF 1
sab_size    BL
acis_data   RC*
wireframe_data_present B
point_present B
point       3BD
isolines    BL
isoline_present B
num_wires   BL
wires       Dwg_3DSOLID_wire*
num_silhouettes BL
silhouettes Dwg_3DSOLID_silhouette*
_dxf_sab_converted B
acis_empty2 B
extra_acis_data struct _dwg_entity_3DSOLID*
num_materials BL
```

```

materials      Dwg_3DSOLID_material*
revision_guid[39]
                RC, DXF 2
revision_major
                BL
revision_minor1
                BS
revision_minor2
                BS
revision_bytes[9]
                RC
end_marker
                BL
history_id
                H, DXF 350
has_revision_guid
                B
acis_empty_bit
                B
evalexpr      Dwg_EvalExpr
history_node
                Dwg_ACSH_HistoryNode
major         BL, DXF 90
minor         BL, DXF 91

```

ACSH.CHAMFER.CLASS

```

parent        struct _dwg_object_object*
evalexpr      Dwg_EvalExpr
history_node
                Dwg_ACSH_HistoryNode
major         BL, DXF 90
minor         BL, DXF 91
b192         BL, DXF 92
base_dist
                BD, DXF 41
other_dist
                BD, DXF 42

```

num_edges BL, DXF 93
edges BL*, DXF 94
b195 BL, DXF 95

ACSH_CONE_CLASS

parent struct _dwg_object_object*
evalexpr Dwg_EvalExpr
history_node Dwg_ACSH_HistoryNode
major BL, DXF 90
minor BL, DXF 91
height BD, DXF 40
major_radius BD, DXF 41
minor_radius BD, DXF 42
x_radius BD, DXF 43

ACSH_CYLINDER_CLASS

parent struct _dwg_object_object*
evalexpr Dwg_EvalExpr
history_node Dwg_ACSH_HistoryNode
major BL, DXF 90
minor BL, DXF 91
height BD, DXF 40
major_radius BD, DXF 41
minor_radius BD, DXF 42
x_radius BD, DXF 43

ACSH_EXTRUSION_CLASS

parent struct _dwg_object_object*
evalexpr Dwg_EvalExpr
history_node Dwg_ACSH_HistoryNode

major	BL, DXF 90
minor	BL, DXF 91
direction	3BD, DXF 10
bl92	BL, DXF 92
shsw_text_size	BL, DXF 90
shsw_text	TF, DXF 310
shsw_bl93	BL, DXF 93
shsw_text2_size	BL, DXF 90
shsw_text2	TF, DXF 310
draft_angle	BD, DXF 42
start_draft_dist	BD, DXF 43
end_draft_dist	BD, DXF 44
scale_factor	BD, DXF 45
twist_angle	BD, DXF 48
align_angle	BD, DXF 49
sweepentity_transform	BD*, DXF 46
pathentity_transform	BD*, DXF 47
align_option	RC, DXF 70
miter_option	RC, DXF 71
has_align_start	B, DXF 290
bank	B, DXF 292

`check_intersections`
B, DXF 293

`shsw_b294`
B, DXF 294

`shsw_b295`
B, DXF 295

`shsw_b296`
B, DXF 296

`pt2` 3BD, DXF 11

ACSH_FILLET_CLASS

`parent` struct `_dwg_object_object*`

`evalexpr` `Dwg_EvalExpr`

`history_node`
`Dwg_ACSH_HistoryNode`

`major` BL, DXF 90

`minor` BL, DXF 91

`b192` BL, DXF 92

`num_edges`
BL, DXF 93

`edges` BL*, DXF 94

`num_radiuses`
BL, DXF 95

`num_startsetbacks`
BL, DXF 96

`num_endsetbacks`
BL, DXF 97

`radiuses` BD*, DXF 41

`startsetbacks`
BD*, DXF 42

`endsetbacks`
BD*, DXF 43

ACSH_HISTORY_CLASS

`parent` struct `_dwg_object_object*`

`major` BL, DXF 90

`minor` BL, DXF 91

`owner` H, DXF 360

h_nodeid BL, DXF 92

show_history
B, DXF 280

record_history
B, DXF 281

ACSH_LOFT_CLASS

parent struct _dwg_object_object*

evalexpr Dwg_EvalExpr

history_node
Dwg_ACSH_HistoryNode

major BL, DXF 90

minor BL, DXF 91

num_crosssects
BL, DXF 92

crosssects
H*

num_guides
BL, DXF 95

guides H*

ACSH_PYRAMID_CLASS

parent struct _dwg_object_object*

evalexpr Dwg_EvalExpr

history_node
Dwg_ACSH_HistoryNode

major BL, DXF 90

minor BL, DXF 91

height BD, DXF 40

sides BL, DXF 92

radius BD, DXF 41

topradius
BD, DXF 42

ACSH_REVOLVE_CLASS

parent struct _dwg_object_object*

evalexpr Dwg_EvalExpr

history_node
Dwg_ACSH_HistoryNode

major BL, DXF 90
 minor BL, DXF 91
 axis_pt 3BD, DXF 10
 direction
 2RD, DXF 11
 revolve_angle
 BD, DXF 40
 start_angle
 BD, DXF 41
 draft_angle
 BD, DXF 43
 bd44 BD, DXF 44
 bd45 BD, DXF 45
 twist_angle
 BD, DXF 46
 b290 B, DXF 290
 is_close_to_axis
 B, DXF 291
 sweep_entity
 H

ACSH_SPHERE_CLASS

parent struct _dwg_object_object*
 evalexpr Dwg_EvalExpr
 history_node
 Dwg_ACSH_HistoryNode
 major BL, DXF 90
 minor BL, DXF 91
 radius BD, DXF 40

ACSH_SWEEP_CLASS

parent struct _dwg_object_object*
 evalexpr Dwg_EvalExpr
 history_node
 Dwg_ACSH_HistoryNode
 major BL, DXF 90
 minor BL, DXF 91

direction
3BD, DXF 10

b192
BL, DXF 92

shsw_text_size
BL, DXF 90

shsw_text
TF, DXF 310

shsw_b193
BL, DXF 93

shsw_text2_size
BL, DXF 90

shsw_text2
TF, DXF 310

draft_angle
BD, DXF 42

start_draft_dist
BD, DXF 43

end_draft_dist
BD, DXF 44

scale_factor
BD, DXF 45

twist_angle
BD, DXF 48

align_angle
BD, DXF 49

sweepentity_transform
BD*, DXF 46

pathentity_transform
BD*, DXF 47

align_option
RC, DXF 70

miter_option
RC, DXF 71

has_align_start
B, DXF 290

bank
B, DXF 292

check_intersections
B, DXF 293

shsw_b294
B, DXF 294

shsw_b295
B, DXF 295

shsw_b296
B, DXF 296

pt2 3BD, DXF 11

ACSH_TORUS_CLASS

parent struct _dwg_object_object*

evalexpr Dwg_EvalExpr

history_node
Dwg_ACSH_HistoryNode

major BL, DXF 90

minor BL, DXF 91

major_radius
BD, DXF 40

minor_radius
BD, DXF 41

ACSH_WEDGE_CLASS

parent struct _dwg_object_object*

evalexpr Dwg_EvalExpr

history_node
Dwg_ACSH_HistoryNode

major BL, DXF 90

minor BL, DXF 91

length BD, DXF 40

width BD, DXF 41

height BD, DXF 42

ALDIMOBJECTCONTEXTDATA

parent struct _dwg_object_object*

class_version
BS, DXF 70

is_default
B, DXF 290

scale H, DXF 340

dimension
Dwg_OCD_Dimension

dimline_pt
3BD, DXF 11

ANGDIMOBJECTCONTEXTDATA

parent struct _dwg_object_object*

class_version
BS, DXF 70

is_default
B, DXF 290

scale H, DXF 340

dimension
Dwg_OCD_Dimension

arc_pt 3BD, DXF 11

ANNOTSCALEOBJECTCONTEXTDATA

parent struct _dwg_object_object*

class_version
BS, DXF 70

is_default
B, DXF 290

scale H, DXF 340

APPID

APPID is a table object.

parent struct _dwg_object_object*

flag RC

name TV

used RS

is_xref_ref
B

is_xref_resolved
BS

is_xref_dep
B

xref H

unknown RC, DXF 71

APPID_CONTROL

APPID_CONTROL is a table_control object.

```
parent    struct _dwg_object_object*
num_entries
          BS, DXF 70
entries   H*
```

ASSOC2DCONSTRAINTGROUP

```
parent    struct _dwg_object_object*
class_version
          BS, DXF 90
geometry_status
          BL, DXF 90
owningnetwork
          H, DXF 330
actionbody
          H, DXF 360
action_index
          BL, DXF 90
max_assoc_dep_index
          BL, DXF 90
num_deps  BL, DXF 90
deps      Dwg_ASSOCACTION_Deps*
num_owned_params
          BL
owned_params
          H*
num_values
          BL
values    struct _dwg_VALUEPARAM*
version   BL, DXF 90
b1        B, DXF 70
workplane[3]
          3BD
h1        H, DXF 360
num_actions
          BL, DXF 90
actions   H*, DXF 360
```

```

num_nodes      BL, DXF 90
nodes          Dwg_CONSTRAINTGROUPNODE*

```

ASSOC3POINTANGULARDIMACTIONBODY

```

parent        struct _dwg_object_object*
aaab_version  BS, DXF 90
assoc_dep     H, DXF 330
aab_version   BS, DXF 90
actionbody    H, DXF 360
pab           Dwg ASSOCPARAMBASEDACTIONBODY
class_version BS, DXF 90
r_node       H, DXF 330
d_node       H, DXF 330
assocdep     H, DXF 330

```

ASSOCACTION

```

parent        struct _dwg_object_object*
class_version BS, DXF 90
geometry_status BL, DXF 90
owningnetwork H, DXF 330
actionbody    H, DXF 360
action_index  BL, DXF 90
max_assoc_dep_index BL, DXF 90
num_deps     BL, DXF 90
deps         Dwg ASSOCACTION_Deps*
num_owned_params
BL

```

```

owned_params
    H*

num_values
    BL

values    struct _dwg_VALUEPARAM*

```

ASSOCACTIONPARAM

```

parent    struct _dwg_object_object*

is_r2013  BS, DXF 90

aap_version
    BL, DXF 90

name      T, DXF 1

```

ASSOCALIGNEDDIMACTIONBODY

```

parent    struct _dwg_object_object*

aaab_version
    BS, DXF 90

assoc_dep
    H, DXF 330

aab_version
    BS, DXF 90

actionbody
    H, DXF 360

pab      Dwg ASSOCPARAMBASEDACTIONBODY

class_version
    BL, DXF 90

r_node   H, DXF 330

d_node   H, DXF 330

```

ASSOCARRAYACTIONBODY

```

parent    struct _dwg_object_object*

aab_version
    BL, DXF 90

pab      Dwg ASSOCPARAMBASEDACTIONBODY

aaab_version
    BL, DXF 90

paramblock
    T, DXF 1

transmatrix
    BD*, DXF 40

```

ASSOCARRAYMODIFYACTIONBODY

```
parent    struct _dwg_object_object*
aab_version
           BL, DXF 90
pab       Dwg ASSOCPARAMBASEDACTIONBODY
aaab_version
           BL, DXF 90
paramblock
           T, DXF 1
transmatrix
           BD*, DXF 40
status    BS, DXF 70
num_items
           BL, DXF 90
items     Dwg_ARRAYITEMLOCATOR*
```

ASSOCASMBODYACTIONPARAM

```
parent    struct _dwg_object_object*
is_r2013  BS, DXF 90
aap_version
           BL, DXF 90
name      T, DXF 1
asdap_class_version
           BL, DXF 90
dep       H, DXF 330
class_version
           BL, DXF 90
acis_empty
           B
unknown   B
version   BS
num_blocks
           BL
block_size
           BL*
encr_sat_data
           char **
```

```
sab_size    BL
acis_data   RC*
wireframe_data_present
            B
point_present
            B
point       3BD
isolines    BL
isoline_present
            B
num_wires   BL
wires       Dwg_3DSOLID_wire*
num_silhouettes
            BL
silhouettes
            Dwg_3DSOLID_silhouette*
_dxf_sab_converted
            B
acis_empty2
            B
extra_acis_data
            struct _dwg_entity_3DSOLID*
num_materials
            BL
materials   Dwg_3DSOLID_material*
revision_guid[39]
            RC
revision_major
            BL
revision_minor1
            BS
revision_minor2
            BS
revision_bytes[9]
            RC
```

end_marker
BL

history_id
H

has_revision_guid
B

acis_empty_bit
B

ASSOCBLENDSURFACEACTIONBODY

parent struct _dwg_object_object*

aab_version
BL, DXF 90

pab Dwg ASSOCPARAMBASEDACTIONBODY

sab Dwg ASSOCSURFACEACTIONBODY

pbsab_status
BL, DXF 90

class_version
BL, DXF 90

b1 B, DXF 290

b2 B, DXF 291

b3 B, DXF 292

b4 B, DXF 293

b5 B, DXF 294

blend_options
BS, DXF 72

bs2 BS, DXF 73

ASSOCCOMPOUNDACTIONPARAM

parent struct _dwg_object_object*

is_r2013 BS, DXF 90

aap_version
BL, DXF 90

name T, DXF 1

class_version
BS, DXF 90

bs1 BS, DXF 90


```
num_params      BL, DXF 90
params          H*, DXF 360
has_child_param B
child_status    BS, DXF 90
child_id       BL, DXF 90
child_param     H, DXF 330
h330_2         H, DXF 330
b12            BL, DXF 90
h330_3         H, DXF 330
```

ASSOCDEPENDENCY

```
parent      struct _dwg_object_object*
class_version BS, DXF 90
status      BL, DXF 90
is_read_dep B, DXF 290
is_write_dep B, DXF 290
is_attached_to_object B, DXF 290
is_delegating_to_owning_action B, DXF 290
order       BLd, DXF 90
dep_on      H, DXF 330
has_name    B, DXF 290
name        T, DXF 1
depbodid    BLd, DXF 90
readdep     H, DXF 330
dep_body    H, DXF 360
node        H, DXF 330
```

ASSOCDIMDEPENDENCYBODY

```

parent    struct _dwg_object_object*
adb_version
          BS, DXF 90

dimbase_version
          BS, DXF 90

name      T, DXF 1

class_version
          BS, DXF 90

```

ASSOCEDGEACTIONPARAM

```

parent    struct _dwg_object_object*
is_r2013  BS, DXF 90

aap_version
          BL, DXF 90

name      T, DXF 1

asdap_class_version
          BL, DXF 90

dep       H, DXF 330

class_version
          BL, DXF 90

param     H, DXF 330

has_action
          B, DXF 290

action_type
          BL, DXF 90

subent    H

```

ASSOCEDGECHAMFERACTIONBODY

```

parent    struct _dwg_object_object*

aab_version
          BL, DXF 90

pab       Dwg_ASSOCPARAMBASEDACTIONBODY
sab       Dwg_ASSOCSURFACEACTIONBODY

pbsab_status
          BL, DXF 90

```

ASSOCEDGEFILLETACTIONBODY

```

parent    struct _dwg_object_object*

```

```
aab_version
    BL, DXF 90
pab      Dwg ASSOCPARAMBASEDACTIONBODY
sab      Dwg ASSOCSURFACEACTIONBODY
pbsab_status
    BL, DXF 90
```

ASSOCEXTENDSURFACEACTIONBODY

```
parent   struct _dwg_object_object*
aab_version
    BL, DXF 90
pab      Dwg ASSOCPARAMBASEDACTIONBODY
sab      Dwg ASSOCSURFACEACTIONBODY
pbsab_status
    BL, DXF 90
class_version
    BL, DXF 90
option   RC, DXF 280
```

ASSOCEXTRUDESURFACEACTIONBODY

```
parent   struct _dwg_object_object*
aab_version
    BL, DXF 90
pab      Dwg ASSOCPARAMBASEDACTIONBODY
sab      Dwg ASSOCSURFACEACTIONBODY
pbsab_status
    BL, DXF 90
class_version
    BL, DXF 90
```

ASSOCFACEACTIONPARAM

```
parent   struct _dwg_object_object*
is_r2013 BS, DXF 90
aab_version
    BL, DXF 90
name     T, DXF 1
asdap_class_version
    BL, DXF 90
dep     H, DXF 330
```

class_version
BL, DXF 90

index BL, DXF 90

ASSOCFILETSURFACEACTIONBODY

parent struct _dwg_object_object*

aab_version
BL, DXF 90

pab Dwg ASSOCPARAMBASEDACTIONBODY

sab Dwg ASSOCSURFACEACTIONBODY

pbsab_status
BL, DXF 90

class_version
BL, DXF 90

status BS, DXF 70

pt1 2RD, DXF 10

pt2 2RD, DXF 10

ASSOCGEOMDEPENDENCY

parent struct _dwg_object_object*

assocdep Dwg_Object_ASSOCDEPENDENCY

class_version
BS, DXF 90

enabled B, DXF 290

classname
T, DXF 1

dependent_on_compound_object
B, DXF 290

ASSOCLOFTEDSURFACEACTIONBODY

parent struct _dwg_object_object*

aab_version
BL, DXF 90

pab Dwg ASSOCPARAMBASEDACTIONBODY

sab Dwg ASSOCSURFACEACTIONBODY

pbsab_status
BL, DXF 90

class_version
BL, DXF 90

ASSOCMLEADERACTIONBODY

```
parent    struct _dwg_object_object*
aaab_version
          BS, DXF 90
assoc_dep
          H, DXF 330
aab_version
          BS, DXF 90
actionbody
          H, DXF 360
pab       Dwg ASSOCPARAMBASEDACTIONBODY
class_version
          BL, DXF 90
num_actions
          BL, DXF 90
actions   Dwg ASSOCACTIONBODY_action*
```

ASSOCNETWORK

```
parent    struct _dwg_object_object*
class_version
          BS, DXF 90
geometry_status
          BL, DXF 90
owningnetwork
          H, DXF 330
actionbody
          H, DXF 360
action_index
          BL, DXF 90
max_assoc_dep_index
          BL, DXF 90
num_deps   BL, DXF 90
deps       Dwg ASSOCACTION_Deps*
num_owned_params
          BL
owned_params
          H*
num_values
          BL
```

```

values      struct _dwg_VALUEPARAM*
network_version
            BS, DXF 90
network_action_index
            BL, DXF 90
num_actions
            BL, DXF 90
actions     Dwg_ASSOCACTION_Deps*
num_owned_actions
            BL, DXF 90
owned_actions
            H*, DXF 330

```

ASSOCNETWORKSURFACEACTIONBODY

```

parent      struct _dwg_object_object*
aab_version
            BL, DXF 90
pab         Dwg ASSOCPARAMBASEDACTIONBODY
sab         Dwg ASSOCSURFACEACTIONBODY
pbsab_status
            BL, DXF 90
class_version
            BL, DXF 90

```

ASSOCOBJECTACTIONPARAM

```

parent      struct _dwg_object_object*
is_r2013    BS, DXF 90
aap_version
            BL, DXF 90
name        T, DXF 1
asdap_class_version
            BL, DXF 90
dep         H, DXF 330
class_version
            BS, DXF 90

```

ASSOCOFFSETSURFACEACTIONBODY

```

parent      struct _dwg_object_object*
aab_version
            BL, DXF 90

```

```

pab      Dwg ASSOCPARAMBASEDACTIONBODY
sab      Dwg ASSOCSURFACEACTIONBODY

pbsab_status
          BL, DXF 90

class_version
          BL, DXF 90

b1       B, DXF 290

```

ASSOCORDINATEDIMACTIONBODY

```

parent    struct _dwg_object_object*

aaab_version
          BS, DXF 90

assoc_dep
          H, DXF 330

aab_version
          BS, DXF 90

actionbody
          H, DXF 360

pab      Dwg ASSOCPARAMBASEDACTIONBODY

class_version
          BL, DXF 90

r_node   H, DXF 330

d_node   H, DXF 330

```

ASSOCOSNAPPOINTREFACTIONPARAM

```

parent    struct _dwg_object_object*

is_r2013 BS, DXF 90

aap_version
          BL, DXF 90

name      T, DXF 1

class_version
          BS, DXF 90

bs1       BS, DXF 90

num_params
          BL, DXF 90

params    H*, DXF 360

has_child_param
          B

```

```

child_status
    BS, DXF 90
child_id    BL, DXF 90
child_param
    H, DXF 330
h330_2     H, DXF 330
b12        BL, DXF 90
h330_3     H, DXF 330
status     BS, DXF 90
osnap_mode
    RC, DXF 90
param      BD, DXF 40

```

ASSOCPATCHSURFACEACTIONBODY

```

parent      struct _dwg_object_object*
aab_version
    BL, DXF 90
pab         Dwg ASSOCPARAMBASEDACTIONBODY
sab         Dwg ASSOCSURFACEACTIONBODY
pbsab_status
    BL, DXF 90
class_version
    BL, DXF 90

```

ASSOCPATHACTIONPARAM

```

parent      struct _dwg_object_object*
is_r2013    BS, DXF 90
aap_version
    BL, DXF 90
name        T, DXF 1
class_version
    BS, DXF 90
bs1         BS, DXF 90
num_params
    BL, DXF 90
params      H*, DXF 360
has_child_param
    B

```



```
child_status
    BS, DXF 90
child_id    BL, DXF 90
child_param
    H, DXF 330
h330_2     H, DXF 330
b12        BL, DXF 90
h330_3     H, DXF 330
version    BL, DXF 90
```

ASSOCPERSSUBENTMANAGER

```
parent     struct _dwg_object_object*
class_version
    BL, DXF 90
unknown_3
    BL, DXF 90
unknown_0
    BL, DXF 90
unknown_2
    BL, DXF 90
num_steps
    BL, DXF 90
num_subents
    BL, DXF 90
steps      BL*, DXF 90
subents    BL*
unknown_b16
    BL, DXF 90
unknown_b16a
    BL, DXF 90
unknown_b17a
    BL, DXF 90
unknown_b17
    BL, DXF 90
unknown_b18
    BL, DXF 90
unknown_b19
    BL, DXF 90
```

unknown_b110
BL, DXF 90

unknown_b111
BL, DXF 90

unknown_b112
BL, DXF 90

unknown_b113
BL, DXF 90

unknown_b114
BL, DXF 90

unknown_b115
BL, DXF 90

unknown_b116
BL, DXF 90

unknown_b117
BL, DXF 90

unknown_b118
BL, DXF 90

unknown_b119
BL, DXF 90

unknown_b120
BL, DXF 90

unknown_b121
BL, DXF 90

unknown_b122
BL, DXF 90

unknown_b123
BL, DXF 90

unknown_b124
BL, DXF 90

unknown_b125
BL, DXF 90

unknown_b126
BL, DXF 90

unknown_b127
BL, DXF 90

unknown_b128
BL, DXF 90

unknown_b129
 BL, DXF 90
 unknown_b130
 BL, DXF 90
 unknown_b131
 BL, DXF 90
 unknown_b132
 BL, DXF 90
 unknown_b133
 BL, DXF 90
 unknown_b134
 BL, DXF 90
 unknown_b135
 BL, DXF 90
 unknown_b136
 BL, DXF 90
 unknown_b37
 B, DXF 290

ASSOCPLANESURFACEACTIONBODY

parent struct _dwg_object_object*
 aab_version
 BL, DXF 90
 pab Dwg ASSOCPARAMBASEDACTIONBODY
 sab Dwg ASSOCSURFACEACTIONBODY
 pbsab_status
 BL, DXF 90
 class_version
 BL, DXF 90

ASSOCPOINTREFACTIONPARAM

parent struct _dwg_object_object*
 is_r2013 BS, DXF 90
 aap_version
 BL, DXF 90
 name T, DXF 1
 class_version
 BS, DXF 90
 bs1 BS, DXF 90

```

num_params      BL, DXF 90
params          H*, DXF 360
has_child_param B
child_status    BS, DXF 90
child_id        BL, DXF 90
child_param     H, DXF 330
h330_2          H, DXF 330
b12             BL, DXF 90
h330_3          H, DXF 330

```

ASSOCRESTOREENTITYSTATEACTIONBODY

```

parent          struct _dwg_object_object*
aab_version     BL, DXF 90
class_version   BL, DXF 90
entity          H, DXF 330

```

ASSOCREVOLVEDSURFACEACTIONBODY

```

parent          struct _dwg_object_object*
aab_version     BL, DXF 90
pab             Dwg_ASSOCPARAMBASEDACTIONBODY
sab             Dwg_ASSOCSURFACEACTIONBODY
pbsab_status    BL, DXF 90
class_version   BL, DXF 90

```

ASSOCROTATEDDIMACTIONBODY

```

parent          struct _dwg_object_object*
aaab_version    BS, DXF 90
assoc_dep       H, DXF 330

```

```

aab_version      BS, DXF 90

actionbody      H, DXF 360

pab             Dwg ASSOCPARAMBASEDACTIONBODY

class_version   BS, DXF 90

r_node         H, DXF 330

d_node         H, DXF 330

```

ASSOCSWEPTSURFACEACTIONBODY

```

parent         struct _dwg_object_object*

aab_version    BL, DXF 90

pab           Dwg ASSOCPARAMBASEDACTIONBODY

sab           Dwg ASSOCSURFACEACTIONBODY

pbsab_status  BL, DXF 90

class_version BL, DXF 90

```

ASSOCTRIMSURFACEACTIONBODY

```

parent         struct _dwg_object_object*

aab_version    BL, DXF 90

pab           Dwg ASSOCPARAMBASEDACTIONBODY

sab           Dwg ASSOCSURFACEACTIONBODY

pbsab_status  BL, DXF 90

class_version BL, DXF 90

b1           B, DXF 290

b2           B, DXF 290

distance     BD, DXF 40

```

ASSOCVALUEDEPENDENCY

```

parent         struct _dwg_object_object*

assocdep      Dwg_Object_ASSOCDEPENDENCY

```

ASSOCVARIABLE

```

parent      struct _dwg_object_object*
av_class_version
            BS, DXF 90
class_version
            BS, DXF 90
geometry_status
            BL, DXF 90
owningnetwork
            H, DXF 330
actionbody
            H, DXF 360
action_index
            BL, DXF 90
max_assoc_dep_index
            BL, DXF 90
num_deps    BL, DXF 90
deps        Dwg_ASSOCACTION_Deps*
num_owned_params
            BL
owned_params
            H*
num_values
            BL
values      struct _dwg_VALUEPARAM*
name        T, DXF 1
t58         T, DXF 1
evaluator
            T, DXF 1
desc        T, DXF 1
value       Dwg_EvalVariant
has_t78     B, DXF 290
t78         T, DXF 1
b290       B, DXF 290

```

ASSOCVERTEXACTIONPARAM

```

parent      struct _dwg_object_object*

```

is_r2013 BS, DXF 90

aap_version
BL, DXF 90

name T, DXF 1

asdap_class_version
BL, DXF 90

dep H, DXF 330

class_version
BL, DXF 90

pt 3BD, DXF 10

BLKREFOBJECTCONTEXTDATA

parent struct _dwg_object_object*

class_version
BS, DXF 70

is_default
B, DXF 290

scale H, DXF 340

rotation BD, DXF 50

ins_pt 3BD, DXF 10

scale_factor
3BD_1, DXF 42

BLOCKALIGNEDCONSTRAINTPARAMETER

parent struct _dwg_object_object*

evalexpr Dwg_EvalExpr

name T, DXF 300

be_major BL, DXF 98

be_minor BL, DXF 99

eed1071 BL, DXF 1071

show_properties
B, DXF 280

chain_actions
B, DXF 281

def_basept
3BD, DXF 1010

def_endpt
3BD, DXF 1011

```

prop1      Dwg_BLOCKPARAMETER_PropInfo
prop2      Dwg_BLOCKPARAMETER_PropInfo
prop3      Dwg_BLOCKPARAMETER_PropInfo
prop4      Dwg_BLOCKPARAMETER_PropInfo
prop_states
            BL*, DXF 91
parameter_base_location
            BS, DXF 177

upd_basept
            3BD

basept     3BD

upd_endpt
            3BD

endpt      3BD

dependency
            H, DXF 330

expr_name
            T, DXF 305

expr_description
            T, DXF 306

value      BD, DXF 140

value_set
            Dwg_BLOCKPARAMVALUESET

```

BLOCKALIGNMENTGRIP

```

parent     struct _dwg_object_object*
evalexpr   Dwg_EvalExpr
name       T, DXF 300
be_major   BL, DXF 98
be_minor   BL, DXF 99
eed1071    BL, DXF 1071
bg_b191    BL, DXF 91
bg_b192    BL, DXF 92
bg_location
            3BD, DXF 1010

bg_insert_cycling
            B, DXF 280

```


`bg_insert_cycling_weight`
BLd, DXF 93

`orientation`
3BD_1, DXF 140

BLOCKALIGNMENTPARAMETER

`parent` struct `_dwg_object_object*`

`evalexpr` `Dwg_EvalExpr`

`name` T, DXF 300

`be_major` BL, DXF 98

`be_minor` BL, DXF 99

`eed1071` BL, DXF 1071

`show_properties`
B, DXF 280

`chain_actions`
B, DXF 281

`def_basept`
3BD, DXF 1010

`def_endpt`
3BD, DXF 1011

`prop1` `Dwg_BLOCKPARAMETER_PropInfo`

`prop2` `Dwg_BLOCKPARAMETER_PropInfo`

`prop3` `Dwg_BLOCKPARAMETER_PropInfo`

`prop4` `Dwg_BLOCKPARAMETER_PropInfo`

`prop_states`
BL*, DXF 91

`parameter_base_location`
BS, DXF 177

`upd_basept`
3BD

`basept` 3BD

`upd_endpt`
3BD

`endpt` 3BD

`align_perpendicular`
B, DXF 280

BLOCKANGULARCONSTRAINTPARAMETER

`parent` struct `_dwg_object_object*`

```
evalexpr  Dwg_EvalExpr
name      T, DXF 300
be_major  BL, DXF 98
be_minor  BL, DXF 99
eed1071   BL, DXF 1071
show_properties
          B, DXF 280

chain_actions
          B, DXF 281

def_basept
          3BD, DXF 1010

def_endpt
          3BD, DXF 1011

prop1     Dwg_BLOCKPARAMETER_PropInfo
prop2     Dwg_BLOCKPARAMETER_PropInfo
prop3     Dwg_BLOCKPARAMETER_PropInfo
prop4     Dwg_BLOCKPARAMETER_PropInfo

prop_states
          BL*, DXF 91

parameter_base_location
          BS, DXF 177

upd_basept
          3BD

basept    3BD

upd_endpt
          3BD

endpt     3BD

dependency
          H, DXF 330

center_pt
          3BD, DXF 1011

end_pt    3BD, DXF 1012

expr_name
          T, DXF 305

expr_description
          T, DXF 306
```

angle BD, DXF 140
 orientation_on_both_grips
 B, DXF 280
 value_set
 Dwg_BLOCKPARAMVALUESET

BLOCKARRAYACTION

parent struct _dwg_object_object*
 evalexpr Dwg_EvalExpr
 name T, DXF 300
 be_major BL, DXF 98
 be_minor BL, DXF 99
 eed1071 BL, DXF 1071
 display_location
 3BD, DXF 1010
 num_actions
 BL, DXF 70
 actions BL*, DXF 91
 num_deps BL, DXF 71
 deps H*, DXF 330
 conn_pts Dwg_BLOCKACTION_connectionpts
 column_offset
 BD, DXF 140
 row_offset
 BD, DXF 141

BLOCKBASEPOINTPARAMETER

parent struct _dwg_object_object*
 evalexpr Dwg_EvalExpr
 name T, DXF 300
 be_major BL, DXF 98
 be_minor BL, DXF 99
 eed1071 BL, DXF 1071
 show_properties
 B, DXF 280
 chain_actions
 B, DXF 281

```

def_pt      3BD, DXF 1010
num_propinfos
            BL, DXF 93
prop1      Dwg_BLOCKPARAMETER_PropInfo
prop2      Dwg_BLOCKPARAMETER_PropInfo
pt         3BD, DXF 1011
base_pt    3BD, DXF 1012

```

BLOCKDIAMETRICCONSTRAINTPARAMETER

```

parent      struct _dwg_object_object*
evalexpr   Dwg_EvalExpr
name       T, DXF 300
be_major   BL, DXF 98
be_minor   BL, DXF 99
eed1071    BL, DXF 1071
show_properties
            B, DXF 280
chain_actions
            B, DXF 281
def_basept 3BD, DXF 1010
def_endpt  3BD, DXF 1011
prop1      Dwg_BLOCKPARAMETER_PropInfo
prop2      Dwg_BLOCKPARAMETER_PropInfo
prop3      Dwg_BLOCKPARAMETER_PropInfo
prop4      Dwg_BLOCKPARAMETER_PropInfo
prop_states
            BL*, DXF 91
parameter_base_location
            BS, DXF 177
upd_basept 3BD
basept     3BD
upd_endpt  3BD

```

```

endpt      3BD
dependency H, DXF 330
expr_name  T, DXF 305
expr_description T, DXF 306
distance   BD, DXF 140
orientation_on_both_grips
          B
value_set  Dwg_BLOCKPARAMVALUESET

```

BLOCKFLIPACTION

```

parent     struct _dwg_object_object*
evalexpr   Dwg_EvalExpr
name       T, DXF 300
be_major   BL, DXF 98
be_minor   BL, DXF 99
eed1071    BL, DXF 1071
display_location
          3BD, DXF 1010
num_actions
          BL, DXF 70
actions    BL*, DXF 91
num_deps   BL, DXF 71
deps       H*, DXF 330
conn_pts   Dwg_BLOCKACTION_connectionpts
action_offset_x
          BD
action_offset_y
          BD
angle_offset
          BD

```

BLOCKFLIPGRIP

```

parent     struct _dwg_object_object*
evalexpr   Dwg_EvalExpr

```

```

name      T, DXF 300
be_major  BL, DXF 98
be_minor  BL, DXF 99
eed1071   BL, DXF 1071
bg_b191   BL, DXF 91
bg_b192   BL, DXF 92
bg_location
          3BD, DXF 1010
bg_insert_cycling
          B, DXF 280
bg_insert_cycling_weight
          BLd, DXF 93
combined_state
          BL, DXF 93
orientation
          3BD_1, DXF 140
upd_state
          BS
state     BS

```

BLOCKFLIPPARAMETER

```

parent    struct _dwg_object_object*
evalexpr  Dwg_EvalExpr
name      T, DXF 300
be_major  BL, DXF 98
be_minor  BL, DXF 99
eed1071   BL, DXF 1071
show_properties
          B, DXF 280
chain_actions
          B, DXF 281
def_basept
          3BD, DXF 1010
def_endpt
          3BD, DXF 1011
prop1     Dwg_BLOCKPARAMETER_PropInfo
prop2     Dwg_BLOCKPARAMETER_PropInfo

```

```

prop3      Dwg_BLOCKPARAMETER_PropInfo
prop4      Dwg_BLOCKPARAMETER_PropInfo
prop_states
            BL*, DXF 91
parameter_base_location
            BS, DXF 177

upd_basept
            3BD

basept     3BD

upd_endpt
            3BD

endpt      3BD

flip_label
            T, DXF 305

flip_label_desc
            T, DXF 306

base_state_label
            T, DXF 307

flipped_state_label
            T, DXF 308

def_label_pt
            3BD, DXF 1012

b196      BL, DXF 96

tooltip    T, DXF 309

```

BLOCKGRIPLOCATIONCOMPONENT

```

parent     struct _dwg_object_object*
evalexpr   Dwg_EvalExpr
grip_type
            BL, DXF 91

grip_expr
            T, DXF 300

```

BLOCKHORIZONTALCONSTRAINTPARAMETER

```

parent     struct _dwg_object_object*
evalexpr   Dwg_EvalExpr
name       T, DXF 300
be_major   BL, DXF 98

```

```

be_minor    BL, DXF 99
eed1071     BL, DXF 1071
show_properties
            B, DXF 280
chain_actions
            B, DXF 281
def_basept  3BD, DXF 1010
def_endpt   3BD, DXF 1011
prop1       Dwg_BLOCKPARAMETER_PropInfo
prop2       Dwg_BLOCKPARAMETER_PropInfo
prop3       Dwg_BLOCKPARAMETER_PropInfo
prop4       Dwg_BLOCKPARAMETER_PropInfo
prop_states BL*, DXF 91
parameter_base_location
            BS, DXF 177
upd_basept  3BD
basept      3BD
upd_endpt   3BD
endpt       3BD
dependency  H, DXF 330
expr_name   T, DXF 305
expr_description
            T, DXF 306
value       BD, DXF 140
value_set   Dwg_BLOCKPARAMVALUESET

```

BLOCKLINEARCONSTRAINTPARAMETER

```

parent      struct _dwg_object_object*
evalexpr    Dwg_EvalExpr

```



```

name      T, DXF 300
be_major  BL, DXF 98
be_minor  BL, DXF 99
eed1071   BL, DXF 1071
show_properties
          B, DXF 280
chain_actions
          B, DXF 281
def_basept
          3BD, DXF 1010
def_endpt
          3BD, DXF 1011
prop1     Dwg_BLOCKPARAMETER_PropInfo
prop2     Dwg_BLOCKPARAMETER_PropInfo
prop3     Dwg_BLOCKPARAMETER_PropInfo
prop4     Dwg_BLOCKPARAMETER_PropInfo
prop_states
          BL*, DXF 91
parameter_base_location
          BS, DXF 177
upd_basept
          3BD
basept    3BD
upd_endpt
          3BD
endpt     3BD
dependency
          H, DXF 330
expr_name
          T, DXF 305
expr_description
          T, DXF 306
value     BD, DXF 140
value_set
          Dwg_BLOCKPARAMVALUESET

```

BLOCKLINEARGRIP

```

parent    struct _dwg_object_object*

```

```

evalexpr  Dwg_EvalExpr
name      T, DXF 300
be_major  BL, DXF 98
be_minor  BL, DXF 99
eed1071   BL, DXF 1071
bg_b191   BL, DXF 91
bg_b192   BL, DXF 92
bg_location
          3BD, DXF 1010

bg_insert_cycling
          B, DXF 280

bg_insert_cycling_weight
          BLd, DXF 93

orientation
          3BD_1, DXF 140

```

BLOCKLINEARPARAMETER

```

parent    struct _dwg_object_object*
evalexpr  Dwg_EvalExpr
name      T, DXF 300
be_major  BL, DXF 98
be_minor  BL, DXF 99
eed1071   BL, DXF 1071
show_properties
          B, DXF 280

chain_actions
          B, DXF 281

def_basept
          3BD, DXF 1010

def_endpt
          3BD, DXF 1011

prop1     Dwg_BLOCKPARAMETER_PropInfo
prop2     Dwg_BLOCKPARAMETER_PropInfo
prop3     Dwg_BLOCKPARAMETER_PropInfo
prop4     Dwg_BLOCKPARAMETER_PropInfo

prop_states
          BL*, DXF 91

```

```

parameter_base_location
    BS, DXF 177

upd_basept
    3BD

basept    3BD

upd_endpt
    3BD

endpt    3BD

distance_name
    T, DXF 305

distance_desc
    T, DXF 306

distance    BD, DXF 140

value_set
    Dwg_BLOCKPARAMVALUESET

```

BLOCKLOOKUPACTION

```

parent    struct _dwg_object_object*

evalexpr  Dwg_EvalExpr

name      T, DXF 300

be_major  BL, DXF 98

be_minor  BL, DXF 99

eed1071   BL, DXF 1071

display_location
    3BD, DXF 1010

num_actions
    BL, DXF 70

actions   BL*, DXF 91

num_deps  BL, DXF 71

deps      H*, DXF 330

numelems  BL

numrows   BL, DXF 92

numcols   BL, DXF 93

lut       Dwg_BLOCKLOOKUPACTION_lut*

exprs     TV*, DXF 302

b280     B, DXF 280

```

BLOCKLOOKUPGRIP

```

parent      struct _dwg_object_object*
evalexpr    Dwg_EvalExpr
name        T, DXF 300
be_major    BL, DXF 98
be_minor    BL, DXF 99
eed1071     BL, DXF 1071
bg_b191     BL, DXF 91
bg_b192     BL, DXF 92
bg_location
            3BD, DXF 1010
bg_insert_cycling
            B, DXF 280
bg_insert_cycling_weight
            BLd, DXF 93

```

BLOCKLOOKUPPARAMETER

```

parent      struct _dwg_object_object*
evalexpr    Dwg_EvalExpr
name        T, DXF 300
be_major    BL, DXF 98
be_minor    BL, DXF 99
eed1071     BL, DXF 1071
show_properties
            B, DXF 280
chain_actions
            B, DXF 281
def_pt      3BD, DXF 1010
num_propinfos
            BL, DXF 93
prop1       Dwg_BLOCKPARAMETER_PropInfo
prop2       Dwg_BLOCKPARAMETER_PropInfo
lookup_name
            T, DXF 303
lookup_desc
            T, DXF 304

```

index BL, DXF 94

unknown_t
T

BLOCKMOVEACTION

parent struct _dwg_object_object*

evalexpr Dwg_EvalExpr

name T, DXF 300

be_major BL, DXF 98

be_minor BL, DXF 99

eed1071 BL, DXF 1071

display_location
3BD, DXF 1010

num_actions
BL, DXF 70

actions BL*, DXF 91

num_deps BL, DXF 71

deps H*, DXF 330

conn_pts Dwg_BLOCKACTION_connectionpts

action_offset_x
BD, DXF 140

action_offset_y
BD, DXF 141

angle_offset
BD

BLOCKPARAMDEPENDENCYBODY

parent struct _dwg_object_object*

adb_version
BS, DXF 90

dimbase_version
BS, DXF 90

name T, DXF 1

class_version
BS, DXF 90

BLOCKPOINTPARAMETER

parent struct _dwg_object_object*

```

evalexpr  Dwg_EvalExpr
name      T, DXF 300
be_major  BL, DXF 98
be_minor  BL, DXF 99
eed1071   BL, DXF 1071
show_properties
          B, DXF 280

chain_actions
          B, DXF 281

def_pt    3BD, DXF 1010

num_propinfos
          BL, DXF 93

prop1     Dwg_BLOCKPARAMETER_PropInfo
prop2     Dwg_BLOCKPARAMETER_PropInfo

position_name
          T, DXF 303

position_desc
          T, DXF 304

def_label_pt
          3BD, DXF 1011

```

BLOCKPOLARGRIP

```

parent    struct _dwg_object_object*
evalexpr  Dwg_EvalExpr
name      T, DXF 300
be_major  BL, DXF 98
be_minor  BL, DXF 99
eed1071   BL, DXF 1071
bg_b191   BL, DXF 91
bg_b192   BL, DXF 92
bg_location
          3BD, DXF 1010

bg_insert_cycling
          B, DXF 280

bg_insert_cycling_weight
          BLd, DXF 93

```

BLOCKPOLARPARAMETER

```
parent      struct _dwg_object_object*
evalexpr    Dwg_EvalExpr
name        T, DXF 300
be_major    BL, DXF 98
be_minor    BL, DXF 99
eed1071     BL, DXF 1071
show_properties
            B, DXF 280
chain_actions
            B, DXF 281
def_basept  3BD, DXF 1010
def_endpt   3BD, DXF 1011
prop1       Dwg_BLOCKPARAMETER_PropInfo
prop2       Dwg_BLOCKPARAMETER_PropInfo
prop3       Dwg_BLOCKPARAMETER_PropInfo
prop4       Dwg_BLOCKPARAMETER_PropInfo
prop_states BL*, DXF 91
parameter_base_location
            BS, DXF 177
upd_basept  3BD
basept      3BD
upd_endpt   3BD
endpt       3BD
angle_name  T, DXF 305
angle_desc  T, DXF 306
distance_name
            T, DXF 305
distance_desc
            T, DXF 306
```

```

offset    BD, DXF 140
angle_value_set
           Dwg_BLOCKPARAMVALUESET
distance_value_set
           Dwg_BLOCKPARAMVALUESET

```

BLOCKPOLARSTRETCHACTION

```

parent    struct _dwg_object_object*
evalexpr  Dwg_EvalExpr
name      T, DXF 300
be_major  BL, DXF 98
be_minor  BL, DXF 99
eed1071   BL, DXF 1071
display_location
           3BD, DXF 1010
num_actions
           BL, DXF 70
actions   BL*, DXF 91
num_deps  BL, DXF 71
deps      H*, DXF 330
conn_pts  Dwg_BLOCKACTION_connectionpts
num_pts   BL, DXF 72
pts       2RD*, DXF 10
num_hdls  BL, DXF 73
hdls      H*, DXF 331
shorts    BS*, DXF 74
num_codes
           BL, DXF 75
codes     BL*, DXF 76

```

BLOCKPROPERTIESTABLE

```

parent    struct _dwg_object_object*

```

BLOCKPROPERTIESTABLEGRIP

```

parent    struct _dwg_object_object*
evalexpr  Dwg_EvalExpr
name      T, DXF 300

```



```

be_major    BL, DXF 98
be_minor    BL, DXF 99
eed1071     BL, DXF 1071
bg_b191     BL, DXF 91
bg_b192     BL, DXF 92
bg_location
            3BD, DXF 1010
bg_insert_cycling
            B, DXF 280
bg_insert_cycling_weight
            BLd, DXF 93

```

BLOCKRADIALCONSTRAINTPARAMETER

```

parent      struct _dwg_object_object*
evalexpr    Dwg_EvalExpr
name        T, DXF 300
be_major    BL, DXF 98
be_minor    BL, DXF 99
eed1071     BL, DXF 1071
show_properties
            B, DXF 280
chain_actions
            B, DXF 281
def_basept
            3BD, DXF 1010
def_endpt
            3BD, DXF 1011
prop1       Dwg_BLOCKPARAMETER_PropInfo
prop2       Dwg_BLOCKPARAMETER_PropInfo
prop3       Dwg_BLOCKPARAMETER_PropInfo
prop4       Dwg_BLOCKPARAMETER_PropInfo
prop_states
            BL*, DXF 91
parameter_base_location
            BS, DXF 177
upd_basept
            3BD

```

```

basept      3BD
upd_endpt   3BD
endpt       3BD
dependency  H, DXF 330
expr_name   T, DXF 305
expr_description T, DXF 306
distance    BD, DXF 140
value_set   Dwg_BLOCKPARAMVALUESET

```

BLOCKREPRESENTATION

```

parent      struct _dwg_object_object*
flag        BS, DXF 70
block       H, DXF 340

```

BLOCKROTATEACTION

```

parent      struct _dwg_object_object*
evalexpr   Dwg_EvalExpr
name        T, DXF 300
be_major    BL, DXF 98
be_minor    BL, DXF 99
eed1071     BL, DXF 1071
display_location 3BD, DXF 1010
num_actions BL, DXF 70
actions     BL*, DXF 91
num_deps    BL, DXF 71
deps        H*, DXF 330
offset      3BD, DXF 1011
conn_pts    Dwg_BLOCKACTION_connectionpts
dependent   B, DXF 280

```

base_pt 3BD, DXF 1012

BLOCKROTATIONGRIP

parent struct _dwg_object_object*

evalexpr Dwg_EvalExpr

name T, DXF 300

be_major BL, DXF 98

be_minor BL, DXF 99

eed1071 BL, DXF 1071

bg_b191 BL, DXF 91

bg_b192 BL, DXF 92

bg_location
3BD, DXF 1010

bg_insert_cycling
B, DXF 280

bg_insert_cycling_weight
BLd, DXF 93

BLOCKROTATIONPARAMETER

parent struct _dwg_object_object*

evalexpr Dwg_EvalExpr

name T, DXF 300

be_major BL, DXF 98

be_minor BL, DXF 99

eed1071 BL, DXF 1071

show_properties
B, DXF 280

chain_actions
B, DXF 281

def_basept
3BD, DXF 1010

def_endpt
3BD, DXF 1011

prop1 Dwg_BLOCKPARAMETER_PropInfo

prop2 Dwg_BLOCKPARAMETER_PropInfo

prop3 Dwg_BLOCKPARAMETER_PropInfo

prop4 Dwg_BLOCKPARAMETER_PropInfo

```

prop_states      BL*, DXF 91

parameter_base_location  BS, DXF 177

upd_basept      3BD

basept          3BD

upd_endpt       3BD

endpt           3BD

def_base_angle_pt  3BD, DXF 1011

angle_name      T, DXF 305

angle_desc      T, DXF 306

angle           BD, DXF 140

angle_value_set Dwg_BLOCKPARAMVALUESET

```

BLOCKSCALEACTION

```

parent          struct _dwg_object_object*

evalexpr        Dwg_EvalExpr

name            T, DXF 300

be_major        BL, DXF 98

be_minor        BL, DXF 99

eed1071         BL, DXF 1071

display_location  3BD, DXF 1010

num_actions     BL, DXF 70

actions         BL*, DXF 91

num_deps        BL, DXF 71

deps            H*, DXF 330

offset          3BD, DXF 1011

conn_pts        Dwg_BLOCKACTION_connectionpts

```

dependent B, DXF 280
 base_pt 3BD, DXF 1012

BLOCKSTRETCHACTION

parent struct _dwg_object_object*
 evalexpr Dwg_EvalExpr
 name T, DXF 300
 be_major BL, DXF 98
 be_minor BL, DXF 99
 eed1071 BL, DXF 1071
 display_location
 3BD, DXF 1010
 num_actions
 BL, DXF 70
 actions BL*, DXF 91
 num_deps BL, DXF 71
 deps H*, DXF 330
 conn_pts Dwg_BLOCKACTION_connectionpts
 num_pts BL, DXF 72
 pts 2RD*, DXF 1011
 num_hdls BL, DXF 73
 hdls H*, DXF 331
 shorts BS*, DXF 74
 num_codes
 BL, DXF 75
 codes BL*, DXF 76
 action_offset_x
 BD, DXF 140
 action_offset_y
 BD, DXF 141
 angle_offset
 BD

BLOCKUSERPARAMETER

parent struct _dwg_object_object*
 evalexpr Dwg_EvalExpr

```

name      T, DXF 300
be_major  BL, DXF 98
be_minor  BL, DXF 99
eed1071   BL, DXF 1071

show_properties
          B, DXF 280

chain_actions
          B, DXF 281

def_pt    3BD, DXF 1010

num_propinfos
          BL, DXF 93

prop1     Dwg_BLOCKPARAMETER_PropInfo
prop2     Dwg_BLOCKPARAMETER_PropInfo
flag      BS, DXF 90

assocvariable
          H, DXF 330

expr      T, DXF 301

value     Dwg_EvalVariant

type      BS, DXF 170

```

BLOCKVERTICALCONSTRAINTPARAMETER

```

parent    struct _dwg_object_object*
evalexpr  Dwg_EvalExpr
name      T, DXF 300
be_major  BL, DXF 98
be_minor  BL, DXF 99
eed1071   BL, DXF 1071

show_properties
          B, DXF 280

chain_actions
          B, DXF 281

def_basept
          3BD, DXF 1010

def_endpt
          3BD, DXF 1011

prop1     Dwg_BLOCKPARAMETER_PropInfo

```

```

prop2      Dwg_BLOCKPARAMETER_PropInfo
prop3      Dwg_BLOCKPARAMETER_PropInfo
prop4      Dwg_BLOCKPARAMETER_PropInfo
prop_states
            BL*, DXF 91
parameter_base_location
            BS, DXF 177
upd_basept
            3BD
basept     3BD
upd_endpt
            3BD
endpt      3BD
dependency
            H, DXF 330
expr_name
            T, DXF 305
expr_description
            T, DXF 306
value      BD, DXF 140
value_set
            Dwg_BLOCKPARAMVALUESET

```

BLOCKVISIBILITYGRIP

```

parent     struct _dwg_object_object*
evalexpr   Dwg_EvalExpr
name       T, DXF 300
be_major   BL, DXF 98
be_minor   BL, DXF 99
eed1071    BL, DXF 1071
bg_b191    BL, DXF 91
bg_b192    BL, DXF 92
bg_location
            3BD, DXF 1010
bg_insert_cycling
            B, DXF 280

```

```

    bg_insert_cycling_weight
        BLd, DXF 93

```

BLOCKVISIBILITYPARAMETER

```

    parent      struct _dwg_object_object*
    evalexpr    Dwg_EvalExpr
    name        T, DXF 300
    be_major    BL, DXF 98
    be_minor    BL, DXF 99
    eed1071     BL, DXF 1071
    show_properties
        B, DXF 280
    chain_actions
        B, DXF 281
    def_pt      3BD, DXF 1010
    num_propinfos
        BL, DXF 93
    prop1       Dwg_BLOCKPARAMETER_PropInfo
    prop2       Dwg_BLOCKPARAMETER_PropInfo
    is_initialized
        B, DXF 281
    unknown_bool
        B, DXF 91
    blockvisi_name
        T, DXF 301
    blockvisi_desc
        T, DXF 302
    num_blocks
        BL, DXF 93
    blocks      H*, DXF 331
    num_states
        BL, DXF 92
    states      Dwg_BLOCKVISIBILITYPARAMETER_state*

```

BLOCKXYGRIP

```

    parent      struct _dwg_object_object*
    evalexpr    Dwg_EvalExpr
    name        T, DXF 300

```



```

be_major    BL, DXF 98
be_minor    BL, DXF 99
eed1071     BL, DXF 1071
bg_b191     BL, DXF 91
bg_b192     BL, DXF 92
bg_location
            3BD, DXF 1010
bg_insert_cycling
            B, DXF 280
bg_insert_cycling_weight
            BLd, DXF 93

```

BLOCKXYPARAMETER

```

parent      struct _dwg_object_object*
evalexpr    Dwg_EvalExpr
name        T, DXF 300
be_major    BL, DXF 98
be_minor    BL, DXF 99
eed1071     BL, DXF 1071
show_properties
            B, DXF 280
chain_actions
            B, DXF 281
def_basept
            3BD, DXF 1010
def_endpt
            3BD, DXF 1011
prop1       Dwg_BLOCKPARAMETER_PropInfo
prop2       Dwg_BLOCKPARAMETER_PropInfo
prop3       Dwg_BLOCKPARAMETER_PropInfo
prop4       Dwg_BLOCKPARAMETER_PropInfo
prop_states
            BL*, DXF 91
parameter_base_location
            BS, DXF 177
upd_basept
            3BD

```

```

basept      3BD
upd_endpt   3BD
endpt       3BD
x_label     T, DXF 305
x_label_desc
            T, DXF 306
y_label     T, DXF 307
y_label_desc
            T, DXF 308
x_value     BD, DXF 142
y_value     BD, DXF 141
x_value_set
            Dwg_BLOCKPARAMVALUESET
y_value_set
            Dwg_BLOCKPARAMVALUESET

```

BLOCK_CONTROL

BLOCK_CONTROL is a table_control object.

```

parent      struct _dwg_object_object*
num_entries
            BS, DXF 70
entries     H*
model_space
            H
paper_space
            H

```

BLOCK_HEADER

BLOCK_HEADER is a table object.

```

parent      struct _dwg_object_object*
flag        RC
name        TV
used        RS
is_xref_ref
            B
is_xref_resolved
            BS

```

```
is_xref_dep      B
xref             H
__iterator      BL
flag2           RC
flag3           RS
anonymous       B
hasattrs       B
blkisxref       B
xrefoverlaid    B
loaded_bit      B
num_owned       BL
base_pt         3DPOINT, DXF 10
xref_pname      T, DXF 1
num_inserts     RL
description     T, DXF 4
preview_size    BL
preview        TF, DXF 310
insert_units    BS, DXF 70
explodable     B, DXF 280
block_scaling   RC, DXF 281
block_entity    H
first_entity    H
```

last_entity
 H
entities H*
endblk_entity
 H
inserts H*, DXF 331
layout H, DXF 340

CELLSTYLEMAP

parent struct _dwg_object_object*
num_cells
 BL, DXF 90
cells Dwg_TABLESTYLE_CellStyle*

CONTEXTDATAMANAGER

parent struct _dwg_object_object*
objectcontext
 H
num_submgrs
 BL
submgrs Dwg_CONTEXTDATA_submgr*

CSACDOCUMENTOPTIONS

parent struct _dwg_object_object*
class_version
 BS

CURVEPATH

parent struct _dwg_object_object*
class_version
 BS, DXF 90
entity H, DXF 340

DATALINK

parent struct _dwg_object_object*
class_version
 BS
data_adapter
 T, DXF 1
description
 T, DXF 300

tooltip T, DXF 301
 connection_string
 T, DXF 302
 option BL, DXF 90
 update_option
 BL, DXF 91
 b192 BL, DXF 92
 year BS, DXF 170
 month BS, DXF 171
 day BS, DXF 172
 hour BS, DXF 173
 minute BS, DXF 174
 seconds BS, DXF 175
 msec BS, DXF 176
 path_option
 BS, DXF 177
 b193 BL, DXF 93
 update_status
 T, DXF 304
 num_customdata
 BL, DXF 94
 customdata
 Dwg_DATALINK_customdata*
 hardowner
 H, DXF 360

DATATABLE

parent struct _dwg_object_object*
 flags BS, DXF 70
 num_cols BL, DXF 90
 num_rows BL, DXF 91
 table_name
 T, DXF 1
 cols Dwg_DATATABLE_column*

DBCOLOR

parent struct _dwg_object_object*

color CMC, DXF 62

DETAILVIEWSTYLE

parent struct _dwg_object_object*

mdoc_class_version
BS, DXF 70

desc T, DXF 3

is_modified_for_recompute
B, DXF 290

display_name
T, DXF 300

viewstyle_flags
BL, DXF 90

class_version
BS, DXF 70

flags BL, DXF 90

identifier_style
H, DXF 340

identifier_color
CMC, DXF 62

identifier_height
BD, DXF 40

identifier_exclude_characters
T, DXF 300

identifier_offset
BD, DXF 40

identifier_placement
RC, DXF 280

arrow_symbol
H, DXF 340

arrow_symbol_color
CMC, DXF 62

arrow_symbol_size
BD, DXF 40

boundary_ltype
H, DXF 340

boundary_linewt
BLd, DXF 90

boundary_line_color
CMC, DXF 62

viewlabel_text_style
H, DXF 340

viewlabel_text_color
CMC, DXF 62

viewlabel_text_height
BD, DXF 40

viewlabel_attachment
BL, DXF 90

viewlabel_offset
BD, DXF 40

viewlabel_alignment
BL, DXF 90

viewlabel_pattern
T, DXF 300

connection_ltype
H, DXF 340

connection_linewt
BLd, DXF 90

connection_line_color
CMC, DXF 62

borderline_ltype
H, DXF 340

borderline_linewt
BLd, DXF 90

borderline_color
CMC, DXF 62

model_edge
RC, DXF 280

DICTIONARY

parent struct _dwg_object_object*

numitems BL

is_hardowner
RC, DXF 280

cloning BS, DXF 281

texts T*, DXF 3

itemhandles
H*, DXF 350

cloning_r14
RC

DICTIONARYVAR

parent struct _dwg_object_object*
schema RC, DXF 280
strvalue T, DXF 1

DICTIONARYWDFLT

parent struct _dwg_object_object*
numitems BL
is_hardowner
RC, DXF 280
cloning BS, DXF 281
texts T*, DXF 3
itemhandles
H*, DXF 350
cloning_r14
RL
defaultid
H, DXF 340

DIMASSOC

parent struct _dwg_object_object*
dimensionobj
H, DXF 330
associativity
BL, DXF 90
trans_space_flag
B, DXF 70
rotated_type
RC, DXF 71
ref Dwg_DIMASSOC_Ref*

DIMSTYLE

DIMSTYLE is a table object.

parent struct _dwg_object_object*
flag RC, DXF 70

name	T
used	RS
is_xref_ref	B
is_xref_resolved	BS
is_xref_dep	B
xref	H
DIMTOL	B, DXF 71
DIMLIM	B, DXF 72
DIMTIH	B, DXF 73
DIMTOH	B, DXF 74
DIMSE1	B, DXF 75
DIMSE2	B, DXF 76
DIMALT	B, DXF 170
DIMTOFL	B, DXF 172
DIMSAH	B, DXF 173
DIMTIX	B, DXF 174
DIMSOXD	B, DXF 175
DIMALTD	BS, DXF 171
DIMZIN	BS, DXF 78
DIMSD1	B, DXF 281
DIMSD2	B, DXF 282
DIMTOLJ	BS, DXF 283
DIMJUST	BS, DXF 280
DIMFIT	BS, DXF 287
DIMUPT	B, DXF 288
DIMTZIN	BS, DXF 284
DIMMALTZ	BS, DXF 285
DIMMALTZ	BS, DXF 286
DIMTAD	BS, DXF 77
DIMUNIT	BS, DXF 270

DIMAUNIT	BS, DXF 275
DIMDEC	BS, DXF 271
DIMTDEC	BS, DXF 272
DIMALTU	BS, DXF 273
DIMALTTD	BS, DXF 274
DIMSCALE	BD, DXF 40
DIMASZ	BD, DXF 41
DIMEXO	BD, DXF 42
DIMDLI	BD, DXF 43
DIMEXE	BD, DXF 44
DIMRND	BD, DXF 45
DIMDLE	BD, DXF 46
DIMTP	BD, DXF 47
DIMTM	BD, DXF 48
DIMFXL	BD, DXF 49
DIMJOGANG	
	BD, DXF 50
DIMTFILL	BS, DXF 69
DIMTFILLCLR	
	CMC, DXF 70
DIMAZIN	BS, DXF 79
DIMARCSYM	
	BS, DXF 90
DIMTXT	BD, DXF 140
DIMCEN	BD, DXF 141
DIMTSZ	BD, DXF 142
DIMALTF	BD, DXF 143
DIMLFAC	BD, DXF 144
DIMTVP	BD, DXF 145
DIMTFAC	BD, DXF 146
DIMGAP	BD, DXF 147
DIMPOST	T, DXF 3
DIMAPOST	T, DXF 4
DIMBLK_T	TV, DXF 5

DIMBLK1_T	TV, DXF 6
DIMBLK2_T	TV, DXF 7
DIMALTRND	BD, DXF 148
DIMCLRD_N	RS, DXF 176
DIMCLRE_N	RS, DXF 177
DIMCLRT_N	RS, DXF 178
DIMCLRD	CMC, DXF 176
DIMCLRE	CMC, DXF 177
DIMCLRT	CMC, DXF 178
DIMADEC	BS, DXF 179
DIMFRAC	BS, DXF 276
DIMLUNIT	BS, DXF 277
DIMDSEP	BS, DXF 278
DIMTMOVE	BS, DXF 279
DIMALTZ	BS, DXF 285
DIMALTTZ	BS, DXF 286
DIMATFIT	BS, DXF 289
DIMFXLON	B, DXF 290
DIMTXTDIRECTION	B, DXF 295
DIMALTMZF	BD
DIMALTMZS	T
DIMMZF	BD
DIMMZS	T
DIMLWD	BSd, DXF 371
DIMLWE	BSd, DXF 372
flag0	B

DIMTXSTY H, DXF 340
 DIMLDRBLK
 H, DXF 341
 DIMBLK H, DXF 342
 DIMBLK1 H, DXF 343
 DIMBLK2 H, DXF 344
 DIMLTYPE H, DXF 345
 DIMLTEX1 H, DXF 346
 DIMLTEX2 H, DXF 347

DIMSTYLE_CONTROL

DIMSTYLE_CONTROL is a table_control object.

parent struct _dwg_object_object*
 num_entries
 BS, DXF 70
 entries H*
 num_morehandles
 RC, DXF 71
 morehandles
 H*, DXF 340

DMDIMOBJECTCONTEXTDATA

parent struct _dwg_object_object*
 class_version
 BS, DXF 70
 is_default
 B, DXF 290
 scale H, DXF 340
 dimension
 Dwg_OCD_Dimension
 first_arc_pt
 3BD, DXF 11
 def_pt 3BD, DXF 12

DUMMY

parent struct _dwg_object_object*

DYNAMICBLOCKPROXYNODE

parent struct _dwg_object_object*

evalexpr Dwg_EvalExpr

DYNAMICBLOCKPURGEPREVENTER

parent struct _dwg_object_object*

flag BS, DXF 70

block H

EVALUATION_GRAPH

parent struct _dwg_object_object*

major BL

minor BL

first_nodeid
BLd, DXF 96

first_nodeid_copy
BLd, DXF 97

num_nodes
BL

nodes Dwg_EVAL_Node*

has_graph
B

num_edges
BL

edges Dwg_EVAL_Edge*

FCFOBJECTCONTEXTDATA

parent struct _dwg_object_object*

class_version
BS, DXF 70

is_default
B, DXF 290

scale H, DXF 340

location 3BD, DXF 10

horiz_dir
3BD, DXF 11

FIELD

parent struct _dwg_object_object*

id T, DXF 1

code T, DXF 2

```

num_childs
    BL, DXF 90
childs    H*, DXF 360
num_objects
    BL, DXF 97
objects   H*, DXF 331
format    TV, DXF 4
evaluation_option
    BL, DXF 91
filing_option
    BL, DXF 92
field_state
    BL, DXF 94
evaluation_status
    BL, DXF 95
evaluation_error_code
    BL, DXF 96
evaluation_error_msg
    T, DXF 300
value     Dwg_TABLE_value
value_string
    T, DXF 301
value_string_length
    BL, DXF 98
num_childval
    BL, DXF 93
childval  Dwg_FIELD_ChildValue*

```

FIELDLIST

```

parent    struct _dwg_object_object*
num_fields
    BL, DXF 90
unknown   B
fields    H*, DXF 330

```

GEODATA

```

parent    struct _dwg_object_object*
class_version
    BL, DXF 90

```

host_block
 H, DXF 330

coord_type
 BS, DXF 70

design_pt
 3BD, DXF 10

ref_pt 3BD_1, DXF 11

obs_pt 3BD, DXF 11

scale_vec
 3BD_1, DXF 43

unit_scale_horiz
 BD, DXF 40

units_value_horiz
 BL, DXF 91

unit_scale_vert
 BD, DXF 41

units_value_vert
 BL, DXF 92

up_dir 3BD, DXF 210

north_dir
 3BD, DXF 12

scale_est
 BL, DXF 95

user_scale_factor
 BD, DXF 141

do_sea_level_corr
 B, DXF 294

sea_level_elev
 BD, DXF 142

coord_proj_radius
 BD, DXF 143

coord_system_def
 T, DXF 301

geo_rss_tag
 T, DXF 302

coord_system_datum
 T, DXF 303

coord_system_wkt
 T, DXF 304

`observation_from_tag`
 T, DXF 305

`observation_to_tag`
 T, DXF 306

`observation_coverage_tag`
 T, DXF 307

`num_geomesh_pts`
 BL, DXF 93

`geomesh_pts`
 Dwg_GEODATA_meshpt*

`num_geomesh_faces`
 BL, DXF 96

`geomesh_faces`
 Dwg_GEODATA_meshface*

`has_civil_data`
 B

`obsolete_false`
 B, DXF 292

`ref_pt2d` 2RD, DXF 15

`zero1` 3BD, DXF 16

`unknown1` BL, DXF 93

`unknown2` BL, DXF 94

`unknown_b`
 B, DXF 293

`north_dir_angle_deg`
 BD, DXF 54

`north_dir_angle_rad`
 BD, DXF 140

GEOMAPIIMAGE

`parent` struct `_dwg_object_object*`

`class_version`
 BL, DXF 90

`pt0` 3BD, DXF 10

`size` 2RD, DXF 13

`display_props`
 BS, DXF 70

`clipping` B, DXF 280


```
brightness      RC, DXF 281
contrast       RC, DXF 282
fade           RC, DXF 283
rotation       BD
image_width    BD
image_height   BD
name           T
image_file     BD
image_visibility BD
transparency   BS
height         BD
width          BD
show_rotation  B
scale_factor   BD
geoimage_brightness BS
geoimage_contrast BS
geoimage_fade  BS
geoimage_position BS
geoimage_width BS
geoimage_height BS
```

GRADIENT_BACKGROUND

```
parent      struct _dwg_object_object*
class_version BL, DXF 90
```

```

color_top      BLx, DXF 90
color_middle   BLx, DXF 91
color_bottom   BLx, DXF 92
horizon        BD, DXF 140
height         BD, DXF 141
rotation       BD, DXF 142

```

GROUND_PLANE_BACKGROUND

```

parent         struct _dwg_object_object*
class_version   BL, DXF 90
color_sky_zenith BLx, DXF 90
color_sky_horizon BLx, DXF 91
color_underground_horizon BLx, DXF 92
color_underground_azimuth BLx, DXF 93
color_near      BLx, DXF 94
color_far       BLx, DXF 95

```

GROUP

```

parent         struct _dwg_object_object*
name           T, DXF 300
unnamed        BS, DXF 70
selectable     BS, DXF 71
num_groups     BL
groups         H*, DXF 340

```

IBL_BACKGROUND

```

parent         struct _dwg_object_object*

```

```
class_version
    BL, DXF 90
enable      B, DXF 290
name       T, DXF 1
rotation   BD, DXF 40
display_image
    B, DXF 290
secondary_background
    H, DXF 340
```

IDBUFFER

```
parent      struct _dwg_object_object*
unknown     RC
num_obj_ids
    BL
obj_ids     H*, DXF 330
```

IMAGEDEF

```
parent      struct _dwg_object_object*
class_version
    BL, DXF 90
image_size
    2RD, DXF 10
file_path   T, DXF 1
is_loaded   B, DXF 280
resunits    RC, DXF 281
pixel_size
    2RD, DXF 11
```

IMAGEDEF_REACTOR

```
parent      struct _dwg_object_object*
class_version
    BL, DXF 90
```

IMAGE_BACKGROUND

```
parent      struct _dwg_object_object*
class_version
    BL, DXF 90
```

filename T, DXF 300
 fit_to_screen
 B, DXF 290
 maintain_aspect_ratio
 B, DXF 291
 use_tiling
 B, DXF 292
 offset 2BD_1, DXF 140
 scale 2BD_1, DXF 142

INDEX

parent struct _dwg_object_object*
 last_updated
 TIMEBLL, DXF 40

LAYER

LAYER is a table object.

parent struct _dwg_object_object*
 flag BS
 name T
 used RS
 is_xref_ref
 B
 is_xref_resolved
 BS
 is_xref_dep
 B
 xref H
 frozen B
 on B
 frozen_in_new
 B
 locked B
 plotflag B, DXF 290
 linewt RC, DXF 370
 color CMC, DXF 62
 color_rs short, DXF 62

```

ltype_rs  RS, DXF 7
plotstyle
           H, DXF 390
material  H, DXF 347
ltype     H, DXF 6
visualstyle
           H, DXF 348

```

LAYERFILTER

```

parent    struct _dwg_object_object*
num_names
           BL
names     TV*, DXF 8

```

LAYER_CONTROL

LAYER_CONTROL is a table_control object.

```

parent    struct _dwg_object_object*
num_entries
           BS, DXF 70
entries   H*

```

LAYER_INDEX

```

parent    struct _dwg_object_object*
last_updated
           TIMEBLL, DXF 40
num_entries
           BL
entries   Dwg_LAYER_entry*

```

LAYOUT

```

parent    struct _dwg_object_object*
plotsettings
           Dwg_Object_PLOTSETTINGS
layout_name
           T, DXF 1
tab_order
           BS, DXF 71
layout_flags
           BS, DXF 70
INSBASE   3DPOINT, DXF 12

```

```

LIMMIN    2DPOINT, DXF 10
LIMMAX    2DPOINT, DXF 11
UCSORG    3DPOINT, DXF 13
UCSXDIR   3DPOINT, DXF 16
UCSYDIR   3DPOINT, DXF 17
ucs_elevation
          BD, DXF 146
UCSORTHOVIEW
          BS, DXF 76
EXTMIN    3DPOINT, DXF 14
EXTMAX    3DPOINT, DXF 15
block_header
          H, DXF 330
active_viewport
          H, DXF 331
base_ucs   H, DXF 346
named_ucs
          H, DXF 345
num_viewports
          BL
viewports
          H*

```

LAYOUTPRINTCONFIG

```

parent    struct _dwg_object_object*
class_version
          BS
flag      BS, DXF 93

```

LEADEROBJECTCONTEXTDATA

```

parent    struct _dwg_object_object*
class_version
          BS, DXF 70
is_default
          B, DXF 290
scale     H, DXF 340
num_points
          BL, DXF 70

```

```

points    3DPOINT*, DXF 10
b290     B, DXF 290
x_direction
          3DPOINT, DXF 11
inspt_offset
          3DPOINT, DXF 12
endptproj
          3DPOINT, DXF 13

```

LIGHTLIST

```

parent    struct _dwg_object_object*
class_version
          BL, DXF 90
num_lights
          BL, DXF 90
lights    Dwg_LIGHTLIST_light*

```

LONG_TRANSACTION

```

parent    struct _dwg_object_object*

```

LTYPE

LTYPE is a table object.

```

parent    struct _dwg_object_object*
flag      RC
name      TV
used      RS
is_xref_ref
          B
is_xref_resolved
          BS
is_xref_dep
          B
xref      H
description
          T, DXF 3
pattern_len
          BD, DXF 40
alignment
          RC, DXF 72

```

```

num_dashes      RC, DXF 73
dashes         Dwg_LTYPE_dash*
dashes_r11     RD*
has_strings_area B
strings_area    TF

```

LTYPE_CONTROL

LTYPE_CONTROL is a table_control object.

```

parent      struct _dwg_object_object*
num_entries BS, DXF 70
entries     H*
bylayer     H
byblock     H

```

MATERIAL

```

parent      struct _dwg_object_object*
name        T, DXF 1
description  T, DXF 2
ambient_color      Dwg_MATERIAL_color
diffuse_color      Dwg_MATERIAL_color
diffusemap         Dwg_MATERIAL_mapper
specular_gloss_factor BD, DXF 44
specular_color     Dwg_MATERIAL_color
specularmap        Dwg_MATERIAL_mapper
reflectionmap      Dwg_MATERIAL_mapper

```


opacity_percent
BD, DXF 140

opacitymap
Dwg_MATERIAL_mapper

bumpmap
Dwg_MATERIAL_mapper

refraction_index
BD, DXF 145

refractionmap
Dwg_MATERIAL_mapper

color_bleed_scale
BD, DXF 460

indirect_bump_scale
BD, DXF 461

reflectance_scale
BD, DXF 462

transmittance_scale
BD, DXF 463

two_sided_material
B, DXF 290

luminance
BD, DXF 464

luminance_mode
BS, DXF 270

translucence
BD, DXF 148

self_illumination
BD, DXF 149

reflectivity
BD, DXF 468

illumination_model
BL, DXF 93

channel_flags
BL, DXF 94

mode
BL, DXF 282

genprocname
T

genproctype
BS

```

genprocvalbool
    B
genprocvalint
    BS
genprocvalreal
    BD
genprocvaltext
    T
genprocvalcolor
    CMC
genproctableend
    B
num_gentextures
    BS
gentextures
    Dwg_MATERIAL_gentexture*

```

MENTALRAYRENDERSETTINGS

```

parent    struct _dwg_object_object*
class_version
    BL, DXF 90
name      T, DXF 1
fog_enabled
    B, DXF 290
fog_background_enabled
    B, DXF 290
backfaces_enabled
    B, DXF 290
environ_image_enabled
    B, DXF 290
environ_image_filename
    T, DXF 1
description
    T, DXF 1
display_index
    BL, DXF 90
has_predefined
    B, DXF 290
mr_version
    BL, DXF 90

```

sampling1
BL, DXF 90

sampling2
BL, DXF 90

sampling_mr_filter
BS, DXF 70

sampling_filter1
BD, DXF 40

sampling_filter2
BD, DXF 40

sampling_contrast_color1
BD, DXF 40

sampling_contrast_color2
BD, DXF 40

sampling_contrast_color3
BD, DXF 40

sampling_contrast_color4
BD, DXF 40

shadow_mode
BS, DXF 70

shadow_maps_enabled
B, DXF 290

ray_tracing_enabled
B, DXF 290

ray_trace_depth1
BL, DXF 90

ray_trace_depth2
BL, DXF 90

ray_trace_depth3
BL, DXF 90

global_illumination_enabled
B, DXF 290

gi_sample_count
BL, DXF 90

gi_sample_radius_enabled
B, DXF 290

gi_sample_radius
BD, DXF 40

gi_photons_per_light
BL, DXF 90

photon_trace_depth1
BL, DXF 90

photon_trace_depth2
BL, DXF 90

photon_trace_depth3
BL, DXF 90

final_gathering_enabled
B, DXF 290

fg_ray_count
BL, DXF 90

fg_sample_radius_state1
B, DXF 290

fg_sample_radius_state2
B, DXF 290

fg_sample_radius_state3
B, DXF 290

fg_sample_radius1
BD, DXF 40

fg_sample_radius2
BD, DXF 40

light_luminance_scale
BD, DXF 40

diagnostics_mode
BS, DXF 70

diagnostics_grid_mode
BS, DXF 70

diagnostics_grid_float
BD, DXF 40

diagnostics_photon_mode
BS, DXF 70

diagnostics_bsp_mode
BS, DXF 70

export_mi_enabled
B, DXF 290

mr_description
T, DXF 1

tile_size
BL, DXF 90

tile_order
BS, DXF 70

memory_limit
BL, DXF 90

diagnostics_samples_mode
B, DXF 290

energy_multiplier
BD, DXF 40

MLEADEROBJECTCONTEXTDATA

parent struct _dwg-object-object*

class_version
BS, DXF 70

is_default
B, DXF 290

scale H, DXF 340

MLEADERSTYLE

parent struct _dwg-object-object*

class_version
BS, DXF 179

content_type
BS, DXF 170

mleader_order
BS, DXF 171

leader_order
BS, DXF 172

max_points
BL, DXF 90

first_seg_angle
BD, DXF 40

second_seg_angle
BD, DXF 41

type BS, DXF 173

line_color
CMC, DXF 91

line_type
H, DXF 340

linewt BLd, DXF 92

has_landing
 B, DXF 290

has_dogleg
 B, DXF 291

landing_gap
 BD, DXF 42

landing_dist
 BD, DXF 43

description
 T, DXF 3

arrow_head
 H, DXF 341

arrow_head_size
 BD, DXF 44

text_default
 T, DXF 300

text_style
 H, DXF 342

attach_left
 BS, DXF 174

attach_right
 BS, DXF 178

text_angle_type
 BS, DXF 175

text_align_type
 BS, DXF 176

text_color
 CMC, DXF 93

text_height
 BD, DXF 45

has_text_frame
 B, DXF 292

text_always_left
 B, DXF 297

align_space
 BD, DXF 46

block H, DXF 343

block_color
 CMC, DXF 94

block_scale
 3BD

use_block_scale
 B, DXF 293

block_rotation
 BD, DXF 141

use_block_rotation
 B, DXF 294

block_connection
 BS, DXF 177

scale BD, DXF 142

is_changed
 B, DXF 295

is_annotative
 B, DXF 296

break_size
 BD, DXF 143

attach_dir
 BS, DXF 271

attach_top
 BS, DXF 273

attach_bottom
 BS, DXF 272

text_extended
 B, DXF 298

MLINESTYLE

parent struct _dwg_object_object*

name T, DXF 2

description
 T, DXF 3

flag BS, DXF 70

fill_color
 CMC, DXF 62

start_angle
 BD, DXF 51

```

end_angle      BD, DXF 52
num_lines      RC, DXF 71
lines          Dwg_MLINESTYLE_line*

```

MOTIONPATH

```

parent         struct _dwg_object_object*
class_version  BS, DXF 90
camera_path    H, DXF 340
target_path    H, DXF 340
viewtable     H, DXF 340
frames        BS, DXF 90
frame_rate     BS, DXF 90
corner_decel   B, DXF 290

```

MTEXTATTRIBUTEOBJECTCONTEXTDATA

```

parent         struct _dwg_object_object*
class_version  BS, DXF 70
is_default     B, DXF 290
scale         H, DXF 340
horizontal_mode BS, DXF 70
rotation      BD, DXF 50
ins_pt        2RD, DXF 10
alignment_pt   2RD, DXF 11
enable_context B, DXF 290
context       struct _dwg_object_object*

```


MTEXTOBJECTCONTEXTDATA

```
parent      struct _dwg_object_object*
class_version
            BS, DXF 70
is_default
            B, DXF 290
scale       H, DXF 340
attachment
            BL, DXF 70
ins_pt      3BD, DXF 10
x_axis_dir
            3BD, DXF 11
rect_height
            BD, DXF 41
rect_width
            BD, DXF 40
extents_width
            BD, DXF 42
extents_height
            BD, DXF 43
column_type
            BL, DXF 71
column_width
            BD, DXF 44
gutter      BD, DXF 45
auto_height
            B, DXF 73
flow_reversed
            B, DXF 74
num_column_heights
            BL, DXF 72
column_heights
            BD*, DXF 46
```

NAVISWORKSMODELDEF

```
parent      struct _dwg_object_object*
flags       BS, DXF 70
path        T, DXF 1
```

status B, DXF 290
 min_extent 3BD, DXF 10
 max_extent 3BD, DXF 11
 host_drawing_visibility B, DXF 290

OBJECT_PTR

parent struct _dwg_object_object*

ORDDIMOBJECTCONTEXTDATA

parent struct _dwg_object_object*
 class_version BS, DXF 70
 is_default B, DXF 290
 scale H, DXF 340
 dimension Dwg_OCD_Dimension
 feature_location_pt 3BD, DXF 11
 leader_endpt 3BD, DXF 12

PARTIAL_VIEWING_INDEX

parent struct _dwg_object_object*
 num_entries BL
 has_entries B
 entries Dwg_PARTIAL_VIEWING_INDEX_Entry*

PERSUBENTMGR

parent struct _dwg_object_object*
 class_version BL, DXF 90
 unknown_0 BL, DXF 90
 unknown_2 BL, DXF 90

numassocsteps
BL, DXF 90

numassocsubents
BL, DXF 90

num_steps
BL, DXF 90

steps BL*, DXF 90

num_subents
BL, DXF 90

subents BL*, DXF 90

PLACEHOLDER

parent struct _dwg_object_object*

PLOTSETTINGS

parent struct _dwg_object_object*

printer_cfg_file
T, DXF 1

paper_size
T, DXF 2

canonical_media_name
T, DXF 4

plot_flags
BS, DXF 70

plotview H, DXF 6

plotview_name
T, DXF 6

left_margin
BD, DXF 40

bottom_margin
BD, DXF 41

right_margin
BD, DXF 42

top_margin
BD, DXF 43

paper_width
BD, DXF 44

paper_height
BD, DXF 45

`plot_origin`
2BD.1, DXF 46

`plot_window_ll`
2BD.1, DXF 48

`plot_window_ur`
2BD.1, DXF 140

`plot_paper_unit`
BS, DXF 72

`plot_rotation_mode`
BS, DXF 73

`plot_type`
BS, DXF 74

`paper_units`
BD, DXF 142

`drawing_units`
BD, DXF 143

`stylesheet`
T, DXF 7

`std_scale_type`
BS, DXF 75

`std_scale_factor`
BD, DXF 147

`paper_image_origin`
2BD.1, DXF 148

`shadeplot_type`
BS, DXF 76

`shadeplot_reslevel`
BS, DXF 77

`shadeplot_customdpi`
BS, DXF 78

`shadeplot`
H, DXF 333

POINTCLOUDCOLORMAP

`parent` struct `_dwg_object_object*`

`class_version`
BS, DXF 70

`def_intensity_colorscheme`
T, DXF 1

```
def_elevation_colorscheme
    T, DXF 1

def_classification_colorscheme
    T, DXF 1

num_colorramps
    BL, DXF 90

colorramps
    Dwg_POINTCLOUDCOLORMAP_Ramp*

num_classification_colorramps
    BL, DXF 90

classification_colorramps
    Dwg_POINTCLOUDCOLORMAP_Ramp*
```

POINTCLOUDDEF

```
parent    struct _dwg_object_object*

class_version
    BL, DXF 90

source_filename
    T, DXF 1

is_loaded
    B, DXF 280

numpoints
    RLL, DXF 160

extents_min
    3BD, DXF 10

extents_max
    3BD, DXF 11
```

POINTCLOUDDEFEX

```
parent    struct _dwg_object_object*

class_version
    BL, DXF 90

source_filename
    T, DXF 1

is_loaded
    B, DXF 280

numpoints
    RLL, DXF 160

extents_min
    3BD, DXF 10
```

```
    extents_max
        3BD, DXF 11
```

POINTCLOUDDEF_REACTOR

```
    parent    struct _dwg_object_object*
    class_version
        BL, DXF 90
```

POINTCLOUDDEF_REACTOR_EX

```
    parent    struct _dwg_object_object*
    class_version
        BL, DXF 90
```

POINTPATH

```
    parent    struct _dwg_object_object*
    class_version
        BS, DXF 90
    point     3BD, DXF 10
```

PROXY_OBJECT

```
    parent    struct _dwg_object_object*
    class_id   BL, DXF 91
    version    BL, DXF 71
    maint_version
        BL, DXF 97
    from_dxf   B, DXF 70
    data_numbits
        BL
    data_size
        BL, DXF 93
    data       TF, DXF 310
    num_objids
        BL
    objids     H*, DXF 340
```

RADIMLGOBJECTCONTEXTDATA

```
    parent    struct _dwg_object_object*
    class_version
        BS, DXF 70
    is_default
        B, DXF 290
```

```

scale      H, DXF 340
dimension
            Dwg_OCD_Dimension

ovr_center
            3BD, DXF 12

jog_point
            3BD, DXF 13

```

RADIMOBJECTCONTEXTDATA

```

parent     struct _dwg_object_object*
class_version
            BS, DXF 70

is_default
            B, DXF 290

scale      H, DXF 340

dimension
            Dwg_OCD_Dimension

first_arc_pt
            3BD, DXF 11

```

RAPIDRTRENDERSETTINGS

```

parent     struct _dwg_object_object*
class_version
            BL, DXF 90

name       T, DXF 1

fog_enabled
            B, DXF 290

fog_background_enabled
            B, DXF 290

backfaces_enabled
            B, DXF 290

environ_image_enabled
            B, DXF 290

environ_image_filename
            T, DXF 1

description
            T, DXF 1

display_index
            BL, DXF 90

```

`has_predefined`
 B, DXF 290

`rapidrt_version`
 BL, DXF 90

`render_target`
 BL, DXF 70

`render_level`
 BL, DXF 90

`render_time`
 BL, DXF 90

`lighting_model`
 BL, DXF 70

`filter_type`
 BL, DXF 70

`filter_width`
 BD, DXF 40

`filter_height`
 BD, DXF 40

RASTERVARIABLES

`parent` struct `_dwg_object_object*`

`class_version`
 BL, DXF 90

`image_frame`
 BS, DXF 70

`image_quality`
 BS, DXF 71

`units` BS, DXF 72

RENDERENTRY

`parent` struct `_dwg_object_object*`

`class_version`
 BL, DXF 90

`image_file_name`
 T, DXF 1

`preset_name`
 T, DXF 1

`view_name`
 T, DXF 1

dimension_x
BL, DXF 90

dimension_y
BL, DXF 90

start_year
BS, DXF 70

start_month
BS, DXF 70

start_day
BS, DXF 70

start_minute
BS, DXF 70

start_second
BS, DXF 70

start_msec
BS, DXF 70

render_time
BD, DXF 40

memory_amount
BL, DXF 90

material_count
BL, DXF 90

light_count
BL, DXF 90

triangle_count
BL, DXF 90

display_index
BL, DXF 90

RENDERENVIRONMENT

parent struct _dwg_object_object*

class_version
BL, DXF 90

fog_enabled
B, DXF 290

fog_background_enabled
B, DXF 290

fog_color
CMC, DXF 280

`fog_density_near`
BD, DXF 40

`fog_density_far`
BD, DXF 40

`fog_distance_near`
BD, DXF 40

`fog_distance_far`
BD, DXF 40

`environ_image_enabled`
B, DXF 290

`environ_image_filename`
T, DXF 1

RENDERGLOBAL

`parent` struct `_dwg_object_object*`

`class_version`
BL, DXF 90

`procedure`
BL, DXF 90

`destination`
BL, DXF 90

`save_enabled`
B, DXF 290

`save_filename`
T, DXF 1

`image_width`
BL, DXF 90

`image_height`
BL, DXF 90

`predef_presets_first`
B, DXF 290

`highlevel_info`
B, DXF 290

RENDERSETTINGS

`parent` struct `_dwg_object_object*`

`class_version`
BL, DXF 90

`name` T, DXF 1

`fog_enabled`
B, DXF 290

`fog_background_enabled`
B, DXF 290

`backfaces_enabled`
B, DXF 290

`environ_image_enabled`
B, DXF 290

`environ_image_filename`
T, DXF 1

`description`
T, DXF 1

`display_index`
BL, DXF 90

`has_predefined`
B, DXF 290

SCALE

`parent` struct `_dwg_object_object*`

`flag` BS, DXF 70

`name` T, DXF 300

`paper_units`
BD, DXF 140

`drawing_units`
BD, DXF 141

`is_unit_scale`
B, DXF 290

SECTIONVIEWSTYLE

`parent` struct `_dwg_object_object*`

`mdoc_class_version`
BS, DXF 70

`desc` T, DXF 3

`is_modified_for_recompute`
B, DXF 290

`display_name`
T, DXF 300

`viewstyle_flags`
BL, DXF 90

```
class_version
    BS, DXF 70

flags
    BL, DXF 90

identifier_style
    H, DXF 340

identifier_color
    CMC, DXF 62

identifier_height
    BD, DXF 40

arrow_start_symbol
    H, DXF 340

arrow_end_symbol
    H, DXF 340

arrow_symbol_color
    CMC, DXF 62

arrow_symbol_size
    BD, DXF 40

identifier_exclude_characters
    T, DXF 300

identifier_position
    BLd, DXF 90

identifier_offset
    BD, DXF 40

arrow_position
    BLd, DXF 90

arrow_symbol_extension_length
    BD, DXF 40

plane_ltype
    H, DXF 340

plane_linewt
    BLd, DXF 90

plane_line_color
    CMC, DXF 62

bend_ltype
    H, DXF 340

bend_linewt
    BLd, DXF 90

bend_line_color
    CMC, DXF 62
```

`bend_line_length`
BD, DXF 40

`end_line_overshoot`
BD, DXF 40

`end_line_length`
BD, DXF 40

`viewlabel_text_style`
H, DXF 340

`viewlabel_text_color`
CMC, DXF 62

`viewlabel_text_height`
BD, DXF 40

`viewlabel_attachment`
BL, DXF 90

`viewlabel_offset`
BD, DXF 40

`viewlabel_alignment`
BL, DXF 90

`viewlabel_pattern`
T, DXF 300

`hatch_color`
CMC, DXF 62

`hatch_bg_color`
CMC, DXF 62

`hatch_pattern`
T, DXF 300

`hatch_scale`
BD, DXF 40

`hatch_transparency`
BLd, DXF 90

`unknown_b1`
B, DXF 290

`unknown_b2`
B, DXF 290

`num_hatch_angles`
BL, DXF 90

`hatch_angles`
BD*, DXF 40

SECTION_MANAGER

parent struct _dwg_object_object*
is_live B, DXF 70
num_sections
BS, DXF 90
sections H*, DXF 330

SECTION_SETTINGS

parent struct _dwg_object_object*
curr_type
BS, DXF 90
num_types
BL, DXF 91
types Dwg_SECTION_typesettings*

SKYLIGHT_BACKGROUND

parent struct _dwg_object_object*
class_version
BL, DXF 90
sunid H, DXF 340

SOLID_BACKGROUND

parent struct _dwg_object_object*
class_version
BL, DXF 90
color BLx, DXF 90

SORTENTSTABLE

parent struct _dwg_object_object*
num_ents BL
sort_ents
H*, DXF 5
block_owner
H
ents H*, DXF 331

SPATIAL_FILTER

parent struct _dwg_object_object*
num_clip_verts
BS, DXF 70

```

clip_verts      2RD*, DXF 10

extrusion      BE, DXF 210

origin        3BD, DXF 11

display_boundary_on
              BS, DXF 71

front_clip_on  BS, DXF 72

front_clip_z   BD, DXF 40

back_clip_on   BS, DXF 73

back_clip_z    BD, DXF 41

inverse_transform
              BD*, DXF 40

transform      BD*, DXF 40

```

SPATIAL_INDEX

```

parent      struct _dwg_object_object*

last_updated
           TIMEBLL, DXF 40

num1       BD, DXF 40

num_hdls   BL, DXF 90

hdls       H*, DXF 330

bindata_size
           BL, DXF 90

bindata    TF, DXF 310

```

STYLE

STYLE is a table object.

```

parent      struct _dwg_object_object*

flag        RC

name        TV

used        RS

is_xref_ref
           B

```

```

is_xref_resolved
    BS

is_xref_dep
    B

xref      H

is_shape  B

is_vertical
    B

text_size
    BD, DXF 40

width_factor
    BD, DXF 41

oblique_angle
    BD, DXF 50

generation
    RC, DXF 71

last_height
    BD, DXF 42

font_file
    T, DXF 3

bigfont_file
    T, DXF 4

```

STYLE_CONTROL

STYLE_CONTROL is a table_control object.

```

parent      struct _dwg_object_object*

num_entries
    BS, DXF 70

entries     H*

```

SUN

```

parent      struct _dwg_object_object*

class_version
    BL, DXF 90

is_on       B, DXF 290

color       CMC, DXF 63

intensity
    BD, DXF 40

```


has_shadow B, DXF 291

julian_day BL, DXF 91

msecs BL, DXF 92

is_dst B, DXF 292

shadow_type BL, DXF 70

shadow_mapsize BS, DXF 71

shadow_softness RC, DXF 280

SUNSTUDY

parent struct _dwg_object_object*

class_version BL, DXF 90

setup_name T, DXF 1

description T, DXF 2

output_type BL, DXF 70

sheet_set_name T, DXF 3

use_subset B, DXF 290

sheet_subset_name T, DXF 4

select_dates_from_calendar B, DXF 291

num_dates BL, DXF 91

dates Dwg_SUNSTUDY_Dates*

select_range_of_dates B, DXF 292

start_time BL, DXF 93

end_time BL, DXF 94

interval BL, DXF 95
 num_hours
 BL, DXF 91
 hours B*, DXF 290
 shade_plot_type
 BL, DXF 74
 numviewport
 BL, DXF 75
 numrows BL, DXF 76
 numcols BL, DXF 77
 spacing BD, DXF 40
 lock_viewports
 B, DXF 293
 label_viewports
 B, DXF 294
 page_setup_wizard
 H, DXF 340
 view H, DXF 341
 visualstyle
 H, DXF 342
 text_style
 H, DXF 343

TABLECONTENT

parent struct _dwg_object_object*
 ldata Dwg_LinkedData
 tdata Dwg_LinkedTableData
 fdata Dwg_FormattedTableData
 tablestyle
 H, DXF 340

TABLEGEOMETRY

parent struct _dwg_object_object*
 numrows BL, DXF 90
 numcols BL, DXF 91
 num_cells
 BL, DXF 92
 cells Dwg_TABLEGEOMETRY_Cell*

TABLESTYLE

```

parent      struct _dwg_object_object*
class_version
            BS
name        T, DXF 3
flags       BS, DXF 71
flow_direction
            BS, DXF 70
horiz_cell_margin
            BD, DXF 40
vert_cell_margin
            BD, DXF 41
is_title_suppressed
            B, DXF 280
is_header_suppressed
            B, DXF 281
unknown_rc
            RC, DXF 70
unknown_b11
            BL
unknown_b12
            BL
cellstyle
            H
sty         Dwg_TABLESTYLE_CellStyle
numoverrides
            BL
unknown_b13
            BL
ovr         Dwg_TABLESTYLE_CellStyle
num_rowstyles
            BL
rowstyles
            Dwg_TABLESTYLE_rowstyles*

```

TEXTOBJECTCONTEXTDATA

```

parent      struct _dwg_object_object*
class_version
            BS, DXF 70

```

```

is_default      B, DXF 290
scale           H, DXF 340
horizontal_mode  BS, DXF 70
rotation        BD, DXF 50
ins_pt          2RD, DXF 10
alignment_pt    2RD, DXF 11

```

TVDEVICEPROPERTIES

```

parent          struct _dwg_object_object*
flags           BL
max_regen_threads
                BS
use_lut_palette
                BL
alt_hlt         BLL
alt_hltcolor    BLL
geom_shader_usage
                BLL
blending_mode   BL
antialiasing_level
                BD
bd2             BD

```

UCS

UCS is a table object.

```

parent          struct _dwg_object_object*
flag            RC
name           TV
used           RS
is_xref_ref     B
is_xref_resolved
                BS

```

```

is_xref_dep
    B
xref        H
ucsorg      3BD, DXF 10
ucsxdir     3BD, DXF 11
ucsydir     3BD, DXF 12
ucs_elevation
    BD, DXF 146
UCSORTHOVIEW
    BS, DXF 79
base_ucs    H, DXF 346
named_ucs
    H
num_orthopts
    BS
orthopts    Dwg_UCS_orthopts*

```

UCS_CONTROL

UCS_CONTROL is a table_control object.

```

parent      struct _dwg_object_object*
num_entries
    BS, DXF 70
entries     H*

```

UNKNOWN_OBJ

```

parent      struct _dwg_object_object*

```

VBA_PROJECT

```

parent      struct _dwg_object_object*
data_size
    BL, DXF 90
data        TF, DXF 310

```

VIEW

VIEW is a table object.

```

parent      struct _dwg_object_object*
flag        RC
name        TV
used        RS

```

is_xref_ref
B

is_xref_resolved
BS

is_xref_dep
B

xref H

VIEWSIZE BD, DXF 40

view_width
BD, DXF 41

aspect_ratio
BD

VIEWCTR 2RD, DXF 10

view_target
3BD, DXF 12

VIEWDIR 3BD, DXF 11

twist_angle
BD, DXF 50

lens_length
BD, DXF 42

front_clip_z
BD, DXF 43

back_clip_z
BD, DXF 44

VIEWMODE 4BITS, DXF 71

render_mode
RC, DXF 281

use_default_lights
B, DXF 292

default_lightning_type
RC, DXF 282

brightness
BD, DXF 141

contrast BD, DXF 142

ambient_color
CMC, DXF 63

is_pspace
B

```

associated_ucs
    B, DXF 72

ucsorg    3BD, DXF 110
ucsxdir   3BD, DXF 111
ucsydir   3BD, DXF 112
ucs_elevation
    BD, DXF 146

UCSORTHOVIEW
    BS, DXF 79

is_camera_plottable
    B, DXF 73

background
    H, DXF 332

visualstyle
    H, DXF 348

sun       H, DXF 361

base_ucs  H, DXF 346

named_ucs
    H, DXF 345

livesection
    H, DXF 334

```

VIEW_CONTROL

VIEW_CONTROL is a table_control object.

```

parent    struct _dwg_object_object*

num_entries
    BS, DXF 70

entries   H*

```

VISUALSTYLE

```

parent    struct _dwg_object_object*

description
    T, DXF 2

style_type
    BL, DXF 70

ext_lighting_model
    BS, DXF 177

internal_only
    B, DXF 291

```

face_lighting_model
BL, DXF 71

face_lighting_model_int
BS, DXF 176

face_lighting_quality
BL, DXF 72

face_lighting_quality_int
BS, DXF 176

face_color_mode
BL, DXF 73

face_color_mode_int
BS, DXF 176

face_opacity
BD, DXF 40

face_opacity_int
BS, DXF 176

face_specular
BD, DXF 41

face_specular_int
BS, DXF 176

face_modifier
BL, DXF 90

face_modifier_int
BS, DXF 176

face_mono_color
CMC, DXF 63

face_mono_color_int
BS, DXF 176

edge_model
BS, DXF 74

edge_model_int
BS, DXF 176

edge_style
BL, DXF 91

edge_style_int
BS, DXF 176

edge_intersection_color
CMC, DXF 64

edge_intersection_color_int
BS, DXF 176

edge_obscurd_color
CMC, DXF 65

edge_obscurd_color_int
BS, DXF 176

edge_obscurd_ltype
BL, DXF 75

edge_obscurd_ltype_int
BS, DXF 176

edge_intersection_ltype
BL, DXF 175

edge_intersection_ltype_int
BS, DXF 176

edge_crease_angle
BD, DXF 42

edge_crease_angle_int
BS, DXF 176

edge_modifier
BL, DXF 92

edge_modifier_int
BS, DXF 176

edge_color
CMC, DXF 66

edge_color_int
BS, DXF 176

edge_opacity
BD, DXF 43

edge_opacity_int
BS, DXF 176

edge_width
BL, DXF 76

edge_width_int
BS, DXF 176

edge_overhang
BL, DXF 77

edge_overhang_int
BS, DXF 176

edge_jitter
BL, DXF 78

edge_jitter_int
BS, DXF 176

edge_silhouette_color
CMC, DXF 67

edge_silhouette_color_int
BS, DXF 176

edge_silhouette_width
BL, DXF 79

edge_silhouette_width_int
BS, DXF 176

edge_halo_gap
BL, DXF 170

edge_halo_gap_int
BS, DXF 176

edge_isolines
BL, DXF 171

edge_isolines_int
BS, DXF 176

edge_do_hide_precision
B, DXF 290

edge_do_hide_precision_int
BS, DXF 176

edge_style_apply
BL, DXF 174

edge_style_apply_int
BS

display_settings
BL, DXF 93

display_settings_int
BS, DXF 176

display_brightness_bl
BLd, DXF 44

display_brightness
BD, DXF 44

display_brightness_int
BS, DXF 176

display_shadow_type
BL, DXF 173

display_shadow_type_int
BS, DXF 176

bd2007_45
BD, DXF 45

num_props
BS, DXF 70

b_prop1c B, DXF 290

b_prop1c_int
BS, DXF 176

b_prop1d B, DXF 290

b_prop1d_int
BS, DXF 176

b_prop1e B, DXF 290

b_prop1e_int
BS, DXF 176

b_prop1f B, DXF 290

b_prop1f_int
BS, DXF 176

b_prop20 B, DXF 290

b_prop20_int
BS, DXF 176

b_prop21 B, DXF 290

b_prop21_int
BS, DXF 176

b_prop22 B, DXF 290

b_prop22_int
BS, DXF 176

b_prop23 B, DXF 290

b_prop23_int
BS, DXF 176

b_prop24 B, DXF 290

b_prop24_int
BS, DXF 176

bl_prop25
BL, DXF 90

bl_prop25_int
BS, DXF 176

bd_prop26
BD, DXF 40

bd_prop26_int
BS, DXF 176

bd_prop27
BD, DXF 40

bd_prop27_int
BS, DXF 176

bl_prop28
BL, DXF 90

bl_prop28_int
BS, DXF 176

c_prop29 CMC, DXF 62

c_prop29_int
BS, DXF 176

bl_prop2a
BL, DXF 90

bl_prop2a_int
BS, DXF 176

bl_prop2b
BL, DXF 90

bl_prop2b_int
BS, DXF 176

c_prop2c CMC, DXF 62

c_prop2c_int
BS, DXF 176

b_prop2d B, DXF 290

b_prop2d_int
BS, DXF 176

bl_prop2e
BL, DXF 90

bl_prop2e_int
BS, DXF 176

bl_prop2f
BL, DXF 90

bl_prop2f_int
BS, DXF 176

bl_prop30
 BL, DXF 90

bl_prop30_int
 BS, DXF 176

b_prop31 B, DXF 290

b_prop31_int
 BS, DXF 176

bl_prop32
 BL, DXF 90

bl_prop32_int
 BS, DXF 176

c_prop33 CMC, DXF 62

c_prop33_int
 BS, DXF 176

bd_prop34
 BD, DXF 40

bd_prop34_int
 BS, DXF 176

edge_wiggle
 BL, DXF 90

edge_wiggle_int
 BS, DXF 176

strokes T, DXF 1

strokes_int
 BS, DXF 176

b_prop37 B, DXF 290

b_prop37_int
 BS, DXF 176

bd_prop38
 BD, DXF 40

bd_prop38_int
 BS, DXF 176

bd_prop39
 BD, DXF 40

bd_prop39_int
 BS, DXF 176

VPORT

VPORT is a table object.

parent struct _dwg_object_object*

flag	RC
name	TV
used	RS
is_xref_ref	B
is_xref_resolved	BS
is_xref_dep	B
xref	H
VIEWSIZE	BD, DXF 40
view_width	BD
aspect_ratio	BD, DXF 41
VIEWCTR	2RD, DXF 12
view_target	3BD, DXF 17
VIEWDIR	3BD, DXF 16
view_twist	BD, DXF 51
lens_length	BD, DXF 42
front_clip_z	BD, DXF 43
back_clip_z	BD, DXF 44
VIEWMODE	4BITS, DXF 71
render_mode	RC, DXF 281
use_default_lights	B, DXF 292
default_lightning_type	RC, DXF 282
brightness	BD, DXF 141
contrast	BD, DXF 142

`ambient_color`
CMC, DXF 63

`lower_left`
2RD, DXF 10

`upper_right`
2RD, DXF 11

`UCSFOLLOW`
B, DXF 71

`circle_zoom`
BS, DXF 72

`FASTZOOM` B, DXF 73

`UCSICON` RC, DXF 74

`GRIDMODE` B, DXF 76

`GRIDUNIT` 2RD, DXF 15

`SNAPMODE` B, DXF 75

`SNAPSTYLE`
B, DXF 77

`SNAPISOPAIR`
BS, DXF 78

`SNAPANG` BD, DXF 50

`SNAPBASE` 2RD, DXF 13

`SNAPUNIT` 2RD, DXF 14

`ucs_at_origin`
B

`UCSVP` B, DXF 71

`ucsorg` 3BD, DXF 110

`ucsxdir` 3BD, DXF 111

`ucsydir` 3BD, DXF 112

`ucs_elevation`
BD, DXF 146

`UCSORTHOVIEW`
BS, DXF 79

`grid_flags`
BS, DXF 60

`grid_major`
BS, DXF 61

```

background      H, DXF 332
visualstyle     H, DXF 348
sun             H, DXF 361
named_ucs       H, DXF 345
base_ucs        H, DXF 346

```

VPORT_CONTROL

VPORT_CONTROL is a table_control object.

```

parent      struct _dwg_object_object*
num_entries BS, DXF 70
entries     H*

```

VX_CONTROL

VX_CONTROL is a table_control object.

```

parent      struct _dwg_object_object*
num_entries BS, DXF 70
entries     H*

```

VX_TABLE_RECORD

VX_TABLE_RECORD is a table object.

```

parent      struct _dwg_object_object*
flag        RC
name        TV
used        RS
is_xref_ref B
is_xref_resolved BS
is_xref_dep B
xref        H
is_on       B, DXF 290
viewport    H, DXF 338

```



```
prev_entry
    H, DXF 340
```

WIPEOUTVARIABLES

```
parent    struct _dwg_object_object*
display_frame
    BS, DXF 70
```

XRECORD

```
parent    struct _dwg_object_object*
cloning   BS, DXF 280
xdata_size
    BL
num_xdata
    BL
xdata     Dwg_Resbuf*
num_objid_handles
    BL
objid_handles
    H*, DXF 340
```

PDFDEFINITION

```
parent    struct _dwg_object_object*
filename  T, DXF 1
name     T, DXF 2
```

DGNDEFINITION

See [UNDERLAYDEFINITION], page 213,

DWFDEFINITION

See [UNDERLAYDEFINITION], page 213,

ASSOCARRAYMODIFYPARAMETERS

```
parent    struct _dwg_object_object*
aap_version
    BL
num_items
    BL
classname
    TV
items     Dwg_ASSOCARRAYITEM*
numitems  BL
```

numrows BL

numlevels
BL

ASSOCARRAYPATHPARAMETERS

See [ASSOCARRAYPARAMETERS], page 213,

ASSOCARRAYPOLARPARAMETERS

See [ASSOCARRAYPARAMETERS], page 213,

ASSOCARRAYRECTANGULARPARAMETERS

See [ASSOCARRAYPARAMETERS], page 213,

Dwg_3DSOLID_material

parent struct _dwg_entity_3DSOLID*

array_index
BL

mat_absref
BL

material_handle
H

Dwg_3DSOLID_silhouette

parent struct _dwg_entity_3DSOLID*

vp_id BL

vp_target
3BD

vp_dir_from_target
3BD

vp_up_dir
3BD

vp_perspective
B

has_wires
B

num_wires
BL

wires Dwg_3DSOLID_wire*

Dwg_3DSOLID_wire

parent struct _dwg_entity_3DSOLID*

type RC

```

selection_marker
    BLd
color    BL
acis_index
    BLd
num_points
    BL
points    3BD*
transform_present
    B
axis_x    3BD
axis_y    3BD
axis_z    3BD
translation
    3BD
scale    3BD
has_rotation
    B
has_reflection
    B
has_shear
    B

```

Dwg_ACSH_HistoryNode

```

major    BL
minor    BL
trans    BD*, DXF 40
color    CMC
step_id  BL
material H

```

Dwg_ACSH_SubentColor

```

major    BL
minor    BL
transparency
    BL
bl93    BL

```

```

    is_face_variable
        B

```

Dwg_ACSH_SubentMaterial

```

    major      BL
    minor      BL
    reflectance
                BL
    displacement
                BL

```

Dwg_ACTIONBODY

```

    parent      struct _dwg_object_ASSOCNETWORK*
    evaluatorid
                T
    expression
                T
    value       BL

```

Dwg_ARRAYITEMLOCATOR

```

    parent      struct _dwg_object_ASSOCARRAYMODIFYACTIONBODY*
    itemloc1    BL, DXF 90
    itemloc2    BL, DXF 90
    itemloc3    BL, DXF 90

```

Dwg_ASSOCACTIONBODY_action

```

    parent      struct _dwg_object_ASSOCMLEADERACTIONBODY*
    depid       BL
    dep         H, DXF 330

```

Dwg_ASSOCACTION_Deps

```

    parent      struct _dwg_object_ASSOCACTION*
    is_owned    B
    dep         H

```

Dwg_ASSOCARRAYITEM

```

    parent      struct _dwg_abstractobject_ASSOCARRAYPARAMETERS*
    class_version
                BL, DXF 90
    itemloc[3]
                BL

```

```

flags      BL
is_default_transmatrix
           int
x_dir      3BD
transmatrix
           BD*
rel_transform
           BD*
has_h1     int
h1         H
h2         H

```

Dwg ASSOCPARAMBASEDACTIONBODY

```

parent     struct _dwg_object_object*
version    BL
minor      BL
num_deps   BL, DXF 90
deps       H*
14         BL
15         BL
assocdep   H
num_values
           BL
values     struct _dwg_VALUEPARAM*

```

Dwg ASSOCSURFACEACTIONBODY

```

parent     struct _dwg_object_object*
version    BL
is_semi_assoc
           B
12         BL
is_semi_ovr
           B
grip_status
           BS
assocdep   H

```

Dwg_AcDs

file_signature	RL
file_header_size	RL
unknown_1	RL
version	RL
unknown_2	RL
ds_version	RL
segidx_offset	RL
segidx_unknown	RL
num_segidx	RL
schidx_segidx	RL
datidx_segidx	RL
search_segidx	RL
prvsav_segidx	RL
file_size	RL
total_segments	BL
segidx	Dwg_AcDs_SegmentIndex*
datidx	Dwg_AcDs_DataIndex
data	Dwg_AcDs_Data*
blob01	Dwg_AcDs_DataBlob
schidx	Dwg_AcDs_SchemaIndex
schat	Dwg_AcDs_SchemaData
search	Dwg_AcDs_Search

segments Dwg_AcDs_Segment*

Dwg_AcDs_Data

record_hdrs
Dwg_AcDs_Data_RecordHdr*

records Dwg_AcDs_Data_Record*

Dwg_AcDs_DataBlob

data_size
RLL

page_count
RL

record_size
RL

page_size
RL

unknown_1
RL

unknown_2
RL

ref Dwg_AcDs_DataBlobRef*

Dwg_AcDs_DataBlob01

total_data_size
RLL

page_start_offset
RLL

page_index
int32_t

page_count
int32_t

page_data_size
RLL

page_data
RC*

Dwg_AcDs_DataBlobRef

total_data_size
RLL

num_pages
RL

```

record_size      RL
page_size       RL
unknown_1       RL
unknown_2       RL
pages           Dwg_AcDs_DataBlobRef_Page*

```

Dwg_AcDs_DataBlobRef_Page

```

segidx          RL
size           RL

```

Dwg_AcDs_DataIndex

```

num_entries     RL
di_unknown      RL
entries         Dwg_AcDs_DataIndex_Entry*

```

Dwg_AcDs_DataIndex_Entry

```

segidx          RL
offset          RL
schidx         RL

```

Dwg_AcDs_Data_Record

```

data_size      RL
blob           RC*

```

Dwg_AcDs_Data_RecordHdr

```

entry_size     RL
unknown        RL
handle         RLL
offset         RL

```

Dwg_AcDs_Schema

```

num_index      RS

```



```

index      RLL*
num_props
           RS
props      Dwg_AcDs_Schema_Prop*

```

Dwg_AcDs_SchemaData

```

num_uprops
           RL
uprops     Dwg_AcDs_SchemaData_UProp*
num_schemas
           RL
schemas    Dwg_AcDs_Schema*
num_propnames
           RL
propnames
           TV*

```

Dwg_AcDs_SchemaData_UProp

```

size      RL
flags     RL

```

Dwg_AcDs_SchemaIndex

```

num_props
           RL
si_unknown_1
           RL
props      Dwg_AcDs_SchemaIndex_Prop*
si_tag     RLL
num_prop_entries
           RL
si_unknown_2
           RL
prop_entries
           Dwg_AcDs_SchemaIndex_Prop*

```

Dwg_AcDs_SchemaIndex_Prop

```

index     RL
segidx    RL
offset    RL

```

Dwg_AcDs_Schema_Prop

flags RL
 namidx RL
 type RL
 type_size RL
 unknown_1 RL
 unknown_2 RL
 num_values RS
 values RC*

Dwg_AcDs_Search

num_search RL
 search Dwg_AcDs_Search_Data*

Dwg_AcDs_Search_Data

schema_namidx RL
 num_sortedidx RL
 sortedidx RLL*
 num_ididxs RL
 unknown RL
 ididxs Dwg_AcDs_Search_IdIdxs*

Dwg_AcDs_Search_IdIdx

handle RLL
 num_ididx RL
 ididx RLL*

Dwg_AcDs_Search_IdIdxs

num_ididx RL

ididx Dwg_AcDs_Search_IdIdx*

Dwg_AcDs_Segment

signature RL
 name[7] RC
 type RCd
 segment_idx RL
 is_blob01 RL
 segsize RL
 unknown_2 RL
 ds_version RL
 unknown_3 RL
 data_algn_offset RL
 objdata_algn_offset RL
 padding[9] RC

Dwg_AcDs_SegmentIndex

offset RLL
 size RL

Dwg_BLOCKACTION_connectionpts

code BL
 name TV

Dwg_BLOCKLOOKUPACTION_lut

parent struct _dwg_object_BLOCKLOOKUPACTION*
 conn_pts Dwg_BLOCKACTION_connectionpts
 b282 B, DXF 282
 b281 B, DXF 281

Dwg_BLOCKPARAMETER_PropInfo

num_connections BL

```

connections
    Dwg_BLOCKPARAMETER_connection*

```

Dwg_BLOCKPARAMETER_connection

```

code      BL
name      T

```

Dwg_BLOCKPARAMVALUESET

```

desc      TV
flags     BL
minimum   BD
maximum   BD
increment
          BD
num_valuelist
          BS
valuelist
          BD*

```

Dwg_BLOCKVISIBILITYPARAMETER_state

```

parent    struct _dwg_object_BLOCKVISIBILITYPARAMETER*
name      T, DXF 303
num_blocks
          BL, DXF 94
blocks    H*, DXF 332
num_params
          BL, DXF 95
params    H*, DXF 333

```

Dwg_COMPOUNDOBJECTID

```

parent    struct _dwg_object_object*
has_object
          B
name      T
object    H

```

Dwg_CONSTRAINTGROUPNODE

```

parent    struct _dwg_object_ASSOC2DCONSTRAINTGROUP*
nodeid    BL
status    RC

```

num_connections
BL

connections
BL*

Dwg_CONTEXTDATA_dict

parent struct _dwg_CONTEXTDATA_submgr*

text T, DXF 3

itemhandle
H, DXF 350

Dwg_CONTEXTDATA_submgr

parent struct _dwg_object_CONTEXTDATAMANAGER*

handle H

num_entries
BL, DXF 90

entries Dwg_CONTEXTDATA_dict*

Dwg_CellContentGeometry

dist_top_left
3BD, DXF 10

dist_center
3BD, DXF 11

content_width
BD, DXF 43

content_height
BD, DXF 44

width BD, DXF 45

height BD, DXF 46

unknown BL, DXF 95

cell_parent
struct _dwg_TableCell*

geom_parent
struct _dwg_TABLEGEOMETRY_Cell*

Dwg_CellStyle

type BL, DXF 90

data_flags
BS, DXF 170

property_override_flags
BL, DXF 91

```

merge_flags
    BL, DXF 92
bg_color    CMC, DXF 62
content_layout
    BL, DXF 93
content_format
    Dwg_ContentFormat
margin_override_flags
    BS, DXF 171
vert_margin
    BD, DXF 40
horiz_margin
    BD, DXF 40
bottom_margin
    BD, DXF 40
right_margin
    BD, DXF 40
margin_horiz_spacing
    BD, DXF 40
margin_vert_spacing
    BD, DXF 40
num_borders
    BL, DXF 94
borders     Dwg_GridFormat*
tablerow_parent
    struct _dwg_TableRow*
tabledatacolumn_parent
    struct _dwg_TableDataColumn*

```

Dwg_ColorRamp

```

parent     struct _dwg_POINTCLOUDCOLORMAP_Ramp*
colorscheme
    T, DXF 1
unknown_b1
    BL, DXF 91
unknown_b
    B, DXF 290

```

Dwg_ContentFormat

```

property_override_flags
    BL, DXF 90

```

property_flags
 BL, DXF 91

 value_data_type
 BL, DXF 92

 value_unit_type
 BL, DXF 93

 value_format_string
 T, DXF 300

 rotation BD, DXF 40

 block_scale
 BD, DXF 140

 cell_alignment
 BL, DXF 94

 content_color
 CMC, DXF 62

 text_style
 H

 text_height
 BD, DXF 144

Dwg-DATALINK_customdata

parent struct _dwg_object_DATALINK*
 target H
 text T, DXF 304

Dwg-DATATABLE_column

parent struct _dwg_object_DATATABLE*
 type BL, DXF 92
 text T, DXF 2
 rows Dwg-DATATABLE_row*

Dwg-DATATABLE_row

parent struct _dwg_DATATABLE_column*
 value Dwg_TABLE_value

Dwg-DIMASSOC_Ref

parent struct _dwg_object_DIMASSOC*
 classname
 T, DXF 1

```
osnap_type      RC, DXF 72
osnap_dist      BD, DXF 40
osnap_pt        3BD, DXF 10
num_xrefs       BS
xrefs           H*, DXF 331
main_subent_type BS, DXF 73
main_gsmarker   BL, DXF 91
num_xrefpaths   BS
xrefpaths       TV*, DXF 301
has_lastpt_ref  B, DXF 75
lastpt_ref      3BD
num_intsectobj  BL, DXF 74
intsectobj      H*, DXF 332
Dwg_DIMENSION_common
parent          struct _dwg_object_entity*
class_version   RC, DXF 280
extrusion       BE, DXF 210
def_pt          3BD, DXF 10
text_midpt      2RD, DXF 11
elevation       BD, DXF 31
flag            RC, DXF 70
flag1          RC
```



```

user_text      TV, DXF 1
text_rotation  BD, DXF 53
horiz_dir      BD, DXF 51
ins_scale      3BD
ins_rotation   BD, DXF 54
attachment     BS, DXF 71
lspace_style   BS, DXF 72
lspace_factor  BD, DXF 41
act_measurement BD, DXF 42
unknown       B, DXF 73
flip_arrow1    B, DXF 74
flip_arrow2    B, DXF 75
clone_ins_pt   2RD, DXF 12
dimstyle      H, DXF 3
block         H

```

Dwg_EVAL_Edge

```

parent      struct _dwg_object_EVALUATION_GRAPH*
id          BL, DXF 92
nextid     BLd, DXF 93
e1         BLd, DXF 94
e2         BLd, DXF 91
e3         BLd, DXF 91
out_edge[5] BLd

```

Dwg_EVAL_Node

```

parent    struct _dwg_object_EVALUATION_GRAPH*
id        BL, DXF 91
edge_flags
          BL, DXF 93
nextid    BLd, DXF 95
evalexpr  H, DXF 360
node[4]   BLd
active_cycles
          B

```

Dwg_EvalExpr

```

parentid  BLd
major     BL
minor     BL
value_code
          BSd
value.num40
          BD
value.pt2d
          2RD
value.pt3d
          3BD
value.text1
          TV
value.long90
          BL
value.handle91
          H
value.short70
          BS
nodeid    BL

```

Dwg_EvalVariant

```

code      BS
u.bd      BD
u.bl      BL
u.bs      BS

```

```

u.rc      RC
u.text    TV
u.handle  H

```

Dwg_FIELD_ChildValue

```

parent    struct _dwg_object_FIELD*
key       TV, DXF 6
value     Dwg_TABLE_value

```

Dwg_FileDepList_Files

```

filename  T32
filepath  T32
fingerprint
          T32
version   T32
feature_index
          RL
timestamp
          RL
filesize  RL
affects_graphics
          RS
refcount  RL

```

Dwg_FormattedTableData

```

parent    struct _dwg_object_TABLECONTENT*
cellstyle
          Dwg_CellStyle
num_merged_cells
          BL, DXF 90
merged_cells
          Dwg_FormattedTableMerged*

```

Dwg_FormattedTableMerged

```

parent    struct _dwg_FormattedTableData*
top_row   BL, DXF 91
left_col  BL, DXF 92
bottom_row
          BL, DXF 93

```

right_col
BL, DXF 94

Dwg_GEODATA_meshface

face1 BL
face2 BL
face3 BL

Dwg_GEODATA_meshpt

source_pt 2RD
dest_pt 2RD

Dwg_GridFormat

parent struct _dwg_CellStyle*
index_mask
BL, DXF 95
border_overrides
BL, DXF 90
border_type
BL, DXF 91
color CMC, DXF 62
linewt BLd, DXF 92
ltype H, DXF 340
visible B, DXF 93
double_line_spacing
BD, DXF 40

Dwg_HATCH_Color

parent struct _dwg_entity_HATCH*
shift_value
BD, DXF 463
color CMC, DXF 63

Dwg_HATCH_ControlPoint

parent struct _dwg_HATCH_PathSeg*
point 2RD, DXF 10
weight BD, DXF 40

Dwg_HATCH_DefLine

parent struct _dwg_entity_HATCH*

angle BD, DXF 53
pt0 2BD, DXF 43
offset 2BD, DXF 45
num_dashes
 BS, DXF 79
dashes BD*

Dwg_HATCH_Path

parent struct _dwg_entity_HATCH*
flag BL, DXF 92
num_segs_or_paths
 BL, DXF 93
segs Dwg_HATCH_PathSeg*
bulges_present
 B, DXF 72
closed B, DXF 73
polyline_paths
 Dwg_HATCH_PolylinePath*
num_boundary_handles
 BL, DXF 97
boundary_handles
 H*, DXF 330

Dwg_HATCH_PathSeg

parent struct _dwg_HATCH_Path*
curve_type
 RC, DXF 72
first_endpoint
 2RD, DXF 10
second_endpoint
 2RD, DXF 11
center 2RD, DXF 10
radius BD, DXF 40
start_angle
 BD, DXF 50
end_angle
 BD, DXF 51
is_ccw B, DXF 73

```

endpoint  2RD, DXF 11
minor_major_ratio
            BD, DXF 40
degree    BL, DXF 94
is_rational
            B, DXF 73
is_periodic
            B, DXF 74
num_knots
            BL, DXF 95
num_control_points
            BL, DXF 96
knots     BD*
control_points
            Dwg_HATCH_ControlPoint*
num_fitpts
            BL, DXF 97
fitpts    2RD*
start_tangent
            2RD
end_tangent
            2RD

```

Dwg_HATCH_PolylinePath

```

parent    struct _dwg_HATCH_Path*
point     2RD, DXF 10
bulge     BD, DXF 42

```

Dwg_LAYER_entry

```

parent    struct _dwg_object_LAYER_INDEX*
numlayers
            BL, DXF 90
name      T, DXF 8
handle    H, DXF 360

```

Dwg_LEADER_ArrowHead

```

parent    struct _dwg_entity_MULTILEADER*
is_default
            B, DXF 94

```

arrowhead
H, DXF 345

Dwg_LEADER_BlockLabel

parent struct _dwg_entity_MULTILEADER*
attdef H, DXF 330
label_text
TV, DXF 302
ui_index BS, DXF 177
width BD, DXF 44

Dwg_LEADER_Break

parent struct _dwg_LEADER_Line*
start 3BD, DXF 11
end 3BD, DXF 12

Dwg_LEADER_Line

parent struct _dwg_LEADER_Node*
num_points
BL
points 3DPOINT*
num_breaks
BL
breaks Dwg_LEADER_Break*
line_index
BL, DXF 91
type BS, DXF 170
color CMC, DXF 92
ltype H, DXF 340
linewt BLd, DXF 171
arrow_size
BD, DXF 40
arrow_handle
H, DXF 341
flags BL, DXF 93

Dwg_LEADER_Node

parent struct _dwg_entity_MULTILEADER*

```

has_lastleaderlinepoint
    B, DXF 290

has_dogleg
    B, DXF 291

lastleaderlinepoint
    3BD, DXF 10

dogleg_vector
    3BD, DXF 11

branch_index
    BL, DXF 90

dogleg_length
    BD, DXF 40

num_lines
    BL

lines    Dwg_LEADER_Line*

num_breaks
    BL

breaks   Dwg_LEADER_Break*

attach_dir
    BS, DXF 271

```

Dwg_LIGHTLIST_light

```

parent    struct _dwg_object_LIGHTLIST*
name      T, DXF 1
handle    H, DXF 5

```

Dwg_LTYPE_dash

```

parent    struct _dwg_object_LTYPE*
length    BD, DXF 49
complex_shapecode
    BS, DXF 75

style     H, DXF 340
x_offset  RD, DXF 44
y_offset  RD, DXF 45
scale     BD, DXF 46
rotation  BD, DXF 50

shape_flag
    BS, DXF 74

```


text T, DXF 9

Dwg_LWPOLYLINE_width

start BD, DXF 40

end BD, DXF 41

Dwg_LinkedData

name T, DXF 1

description
T, DXF 300

Dwg_LinkedTableData

num_cols BL, DXF 90

cols Dwg_TableDataColumn*

num_rows BL, DXF 90

rows Dwg_TableRow*

num_field_refs
BL

field_refs
H*

Dwg_MATERIAL_color

parent struct _dwg_object_object*

flag RC

factor BD

rgb BL

Dwg_MATERIAL_gentexture

parent struct _dwg_object_MATERIAL*

genprocname
T

material struct _dwg_object_MATERIAL*

Dwg_MATERIAL_mapper

parent struct _dwg_object_object*

blendfactor
BD

transmatrix
BD*

filename T

color1 Dwg_MATERIAL_color

```
color2    Dwg_MATERIAL_color
source    RC
projection
          RC
tiling     RC
autotransform
          RC
texturemode
          BS
```

Dwg_MESH_edge

```
parent    struct _dwg_entity_MESH*
idxfrom   BL, DXF 90
idxto     BL, DXF 90
```

Dwg_MLEADER_AnnotContext

```
num_leaders
          BL
leaders    Dwg_LEADER_Node*
attach_dir
          BS
scale_factor
          BD, DXF 40
content_base
          3BD, DXF 10
text_height
          BD, DXF 41
arrow_size
          BD, DXF 140
landing_gap
          BD, DXF 145
text_left
          BS, DXF 174
text_right
          BS, DXF 175
text_angletype
          BS, DXF 176
text_alignment
          BS, DXF 177
```

has_content_txt
 B, DXF 290

has_content_blk
 B, DXF 296

content Dwg_MLEADER_Content

base 3BD, DXF 110

base_dir 3BD, DXF 111

base_vert
 3BD, DXF 112

is_normal_reversed
 B, DXF 297

text_top BS, DXF 273

text_bottom
 BS, DXF 272

Dwg_MLEADER_Content_Block

type RC

normal 3BD

location 3BD

rotation BD

block_table
 H

scale 3BD

color CMC

transform
 BD*

Dwg_MLEADER_Content_MText

type RC

normal 3BD

location 3BD

rotation BD

default_text
 T

style H

direction
 3BD

```

width      BD
height     BD
line_spacing_factor
           BD
line_spacing_style
           BS
color      CMC
alignment
           BS
flow       BS
bg_color   CMC
bg_scale   BD
bg_transparency
           BL
is_bg_fill
           B
is_bg_mask_fill
           B
col_type   BS
is_height_auto
           B
col_width
           BD
col_gutter
           BD
is_col_flow_reversed
           B
num_col_sizes
           BL
col_sizes
           BD*
word_break
           B
unknown    B

```

Dwg_MLINESSTYLE_line

```

parent     struct _dwg_object_MLINESSTYLE*
offset     BD, DXF 49

```

color CMC, DXF 62
lt_index BSd, DXF 6
lt_ltype H, DXF 6

Dwg_MLINE_line

parent struct _dwg_MLINE_vertex*
num_segparms
BS, DXF 74
segparms BD*
num_areafillparms
BS, DXF 75
areafillparms
BD*

Dwg_MLINE_vertex

parent struct _dwg_entity_MLINE*
vertex 3BD, DXF 11
vertex_direction
3BD, DXF 12
miter_direction
3BD, DXF 13
num_lines
RC
lines Dwg_MLINE_line*

Dwg_OCD_Dimension

b293 B, DXF 293
def_pt 2RD, DXF 10
is_def_textloc
B, DXF 294
text_rotation
BD, DXF 140
block H, DXF 2
dimtofl B, DXF 298
dimosxd B, DXF 291
dimatfit B, DXF 70
dimtix B, DXF 292
dimtmove B, DXF 71

override_code
RC, DXF 280

has_arrow2
B, DXF 295

flip_arrow2
B, DXF 296

flip_arrow1
B, DXF 297

Dwg_PARTIAL_VIEWING_INDEX_Entry

parent struct _dwg_object_PARTIAL_VIEWING_INDEX*

extents_min
3BD

extents_max
3BD

object H

Dwg_POINTCLOUDCOLORMAP_Ramp

parent struct _dwg_object_POINTCLOUDCOLORMAP*

class_version
BS, DXF 70

num_ramps
BL, DXF 90

ramps Dwg_ColorRamp*

Dwg_POINTCLOUDEX_Croppings

parent struct _dwg_entity_POINTCLOUDEX*

type BS, DXF 280

is_inside
B, DXF 290

is_inverted
B, DXF 290

crop_plane
3BD, DXF 13

crop_x_dir
3BD, DXF 213

crop_y_dir
3BD, DXF 213

num_pts BL, DXF 93

pts 3BD*

Dwg_POINTCLOUD_Clippings

```
parent    struct _dwg_entity_POINTCLOUD*
is_inverted
          B
type      BS
num_vertices
          BL
vertices  2RD*
z_min     BD
z_max     BD
```

Dwg_POINTCLOUD_IntensityStyle

```
parent    struct _dwg_entity_POINTCLOUD*
min_intensity
          BD
max_intensity
          BD
intensity_low_treshold
          BD
intensity_high_treshold
          BD
```

Dwg_PROXY_LWPOLYLINE

```
parent    struct _dwg_entity_PROXY_ENTITY*
size      RL
flags     BS
const_width
          BD
elevation
          BD
thickness
          BD
extrusion
          BE
num_points
          BL
points    2RD*
num_bulges
          BL
```

```

bulges      BD*
num_widths
            BL
widths      Dwg_LWPOLYLINE_width*
unknown_1
            RC
unknown_2
            RC
unknown_3
            RC

```

Dwg_R2004_Header

```

file_ID_string[12]
            RC
header_address
            RLx
header_size
            RL
x04         RL
root_tree_node_gap
            RLd
lowermost_left_tree_node_gap
            RLd
lowermost_right_tree_node_gap
            RLd
unknown_long
            RL
last_section_id
            RL
last_section_address
            RLL
second_header_address
            RLL
numgaps     RL
numsections
            RL
x20        RL
x80        RL

```



```

x40      RL
section_map_id
          RL
section_map_address
          RLL
section_info_id
          RLd
section_array_size
          RL
gap_array_size
          RL
crc32    RLx
padding[12]
          RC
section_type
          RL
decomp_data_size
          RL
comp_data_size
          RL
compression_type
          RL
checksum  RLx

```

Dwg_SECTION_geometrysettings

```

parent    struct _dwg_SECTION_typesettings*
num_geoms
          BL, DXF 90
hexindex  BL, DXF 91
flags     BL, DXF 92
color     CMC, DXF 62
layer     T, DXF 8
ltype     T, DXF 6
ltype_scale
          BD, DXF 40
plotstyle
          T, DXF 1
linewt    BLd, DXF 370

```

face_transparency
BS, DXF 70

edge_transparency
BS, DXF 71

hatch_type
BS, DXF 72

hatch_pattern
T, DXF 2

hatch_angle
BD, DXF 41

hatch_spacing
BD, DXF 42

hatch_scale
BD, DXF 43

Dwg_SECTION_typesettings

parent struct _dwg_object_SECTION_SETTINGS*

type BS, DXF 90

generation
BS, DXF 91

num_sources
BL, DXF 92

sources H*, DXF 330

destblock
H, DXF 331

destfile T, DXF 1

num_geom BL, DXF 93

geom Dwg_SECTION_geometrysettings*

Dwg_SPLINE_control_point

parent struct _dwg_entity_SPLINE*

x BD

y BD

z BD

w BD, DXF 41

Dwg_SUNSTUDY_Dates

julian_day
BL, DXF 90

msecs BL, DXF 90

Dwg_SummaryInfo_Property

tag TU

value TU

Dwg_TABLEGEOMETRY_Cell

parent struct _dwg_object_TABLEGEOMETRY*

geom_data_flag
BL, DXF 93

width_w_gap
BD, DXF 40

height_w_gap
BD, DXF 41

tablegeometry
H, DXF 330

num_geometry
BL, DXF 94

geometry Dwg_CellContentGeometry*

Dwg_TABLESTYLE_CellStyle

parent struct _dwg_object_TABLESTYLE*

id BL, DXF 90

type BL, DXF 91

name T, DXF 300

cellstyle.type
BL

cellstyle.data_flags
BS

cellstyle.property_override_flags
BL

cellstyle.merge_flags
BL

cellstyle.bg_color
CMC

cellstyle.content_layout
BL

cellstyle.content_format
Dwg_ContentFormat

```

cellstyle.margin_override_flags
    BS
cellstyle.vert_margin
    BD
cellstyle.horiz_margin
    BD
cellstyle.bottom_margin
    BD
cellstyle.right_margin
    BD
cellstyle.margin_horiz_spacing
    BD
cellstyle.margin_vert_spacing
    BD
cellstyle.num_borders
    BL
cellstyle.borders
    Dwg_GridFormat*
cellstyle.tablerow_parent
    struct _dwg_TableRow*
cellstyle.tabledatacolumn_parent
    struct _dwg_TableDataColumn*
cellstyle
    struct _dwg_CellStyle

```

Dwg_TABLESTYLE_border

```

linewt    BSd
visible   B
color     CMC

```

Dwg_TABLESTYLE_rowstyles

```

parent    struct _dwg_object_TABLESTYLE*
text_style
    H, DXF 7
text_height
    BD, DXF 140
text_alignment
    BS, DXF 170
text_color
    CMC, DXF 62

```

```

fill_color      CMC, DXF 63

has_bgcolor     B, DXF 283

num_borders     BL

borders        Dwg_TABLESTYLE_border*

data_type       BL, DXF 90

unit_type       BL, DXF 91

format_string   TU, DXF 1

```

Dwg_TABLE_AttrDef

```

parent          struct _dwg_TABLE_Cell*

attdef          H, DXF 331

index           BS, DXF 179

text            T, DXF 300

```

Dwg_TABLE_BreakHeight

```

parent          struct _dwg_entity_TABLE*

position        3BD

height          BD

flag            BL

```

Dwg_TABLE_BreakRow

```

parent          struct _dwg_entity_TABLE*

position        3BD

start           BL

end             BL

```

Dwg_TABLE_Cell

```

parent          struct _dwg_entity_TABLE*

type            BS, DXF 171

flags           RC, DXF 172

is_merged_value B, DXF 173

```

`is_autofit_flag`
B, DXF 174

`merged_width_flag`
BL, DXF 175

`merged_height_flag`
BL, DXF 176

`rotation` BD, DXF 145

`text_value`
T, DXF 1

`text_style`
H, DXF 7

`block_handle`
H, DXF 340

`block_scale`
BD, DXF 144

`additional_data_flag`
B

`cell_flag_override`
BL, DXF 177

`virtual_edge_flag`
RC, DXF 178

`cell_alignment`
RS, DXF 170

`bg_fill_none`
B, DXF 283

`bg_color` CMC, DXF 63

`content_color`
CMC, DXF 64

`text_height`
BD, DXF 140

`top_grid_color`
CMC, DXF 69

`top_grid_linewt`
BS, DXF 279

`top_visibility`
BS, DXF 289

`right_grid_color`
CMC, DXF 65

```

right_grid_linewt
    BS, DXF 275

right_visibility
    BS, DXF 285

bottom_grid_color
    CMC, DXF 66

bottom_grid_linewt
    BS, DXF 276

bottom_visibility
    BS, DXF 286

left_grid_color
    CMC, DXF 68

left_grid_linewt
    BS, DXF 278

left_visibility
    BS, DXF 288

unknown    BL

value      Dwg_TABLE_value

num_attr_defs
    BL

attr_defs
    Dwg_TABLE_AttrDef*

```

Dwg_TABLE_CustomDataItem

```

name      T, DXF 300

value     Dwg_TABLE_value

cell_parent
    struct _dwg_TableCell*

row_parent
    struct _dwg_TableRow*

```

Dwg_TABLE_value

```

flags     BL

format_flags
    BL

data_type
    BL, DXF 90

data_size
    BL, DXF 92

```

`data_long` BL, DXF 91
`data_double` BD, DXF 140
`data_string` T, DXF 1
`data_date` TF
`data_point` 2RD, DXF 11
`data_3dpoint` 3RD, DXF 11
`data_handle` H
`unit_type` BL, DXF 94
`format_string` T, DXF 300
`value_string` T, DXF 302

Dwg_TableCell

`flag` BL, DXF 90
`tooltip` TV, DXF 300
`customdata` BL, DXF 91
`num_customdata_items` BL, DXF 90
`customdata_items` Dwg_TABLE_CustomDataItem*
`has_linked_data` BL
`data_link` H
`num_rows` BL
`num_cols` BL
`unknown` BL
`num_cell_contents` BL


```

cell_contents
    Dwg_TableCellContent*

style_id  BL

has_geom_data
    BL

geom_data_flag
    BL

width_w_gap
    BD

height_w_gap
    BD

tablegeometry
    H

num_geometry
    BL

geometry  Dwg_CellContentGeometry*

style_parent
    struct _dwg_CellStyle*

row_parent
    struct _dwg_TableRow*

```

Dwg_TableCellContent

```

parent    struct _dwg_TableCell*

type      BL, DXF 90

value     Dwg_TABLE_value

handle    H, DXF 340

num_attrs
    BL, DXF 91

attrs     Dwg_TableCellContent_Attr*

has_content_format_overrides
    BS

content_format
    Dwg_ContentFormat

```

Dwg_TableCellContent_Attr

```

parent    struct _dwg_TableCellContent*

attdef    H, DXF 330

value     TV, DXF 301

```

index BL, DXF 92

Dwg_TableDataColumn

parent struct _dwg_LinkedTableData*

name T, DXF 300

custom_data
BL, DXF 91

cellstyle
Dwg_CellStyle

cellstyle_id
BL

width BL

Dwg_TableRow

parent struct _dwg_LinkedTableData*

num_cells
BL

cells Dwg_TableCell*

custom_data
BL

num_customdata_items
BL

customdata_items
Dwg_TABLE_CustomDataItem*

cellstyle
Dwg_CellStyle

style_id BL

height BL

Dwg_UCS_orthopts

parent struct _dwg_object_UCS*

type BS, DXF 71

pt 3BD, DXF 13

Dwg_VALUEPARAM

parent struct _dwg_object_object*

class_version
BL

name T

```

unit_type      BL
num_vars      BL
vars          Dwg_VALUEPARAM_vars*
controlled_objdep
              H

```

Dwg_VALUEPARAM_vars

```

value         Dwg_EvalVariant
handle       H

```

Dwg_MLEADER_Content

```

txt          Dwg_MLEADER_Content_MText
blk          Dwg_MLEADER_Content_Block

```

Common Entity fields

```

__iterator    BL
color         CMC, DXF 62
color_r11     RC, DXF 62
dwg           struct _dwg_struct*
edge_visualstyle
              H, DXF 348
eed          Dwg_Eed*
elevation_r11
              RD
entmode      BB, DXF 67
extra_r11     RC
face_visualstyle
              H, DXF 348
flag_r11     RC
full_visualstyle
              H, DXF 348
has_ds_data   B
has_edge_visualstyle
              B

```

has_face_visualstyle
 B

has_full_visualstyle
 B

invisible
 BS, DXF 60

is_xdic_missing
 B

isbylayerlt
 B

kind_r11 RS

layer H, DXF 8

layer_r11
 RS

linewt RC, DXF 370

ltype H, DXF 6

ltype_flags
 BB

ltype_r11
 RS

ltype_scale
 BD, DXF 48

material H, DXF 347

material_flags
 BB

next_entity
 H

nolinks B

num_eed BL

num_reactors
 BL

objid BL

opts_r11 RS

ownerhandle
 H, DXF 330

paper_r11
 RS, DXF 67

plotstyle
H, DXF 390

plotstyle_flags
BB

prev_entity
H

preview TF, DXF 310

preview_exists
B

preview_is_proxy
B

preview_size
BLL, DXF 160

reactors H*, DXF 330

shadow H

shadow_flags
RC, DXF 284

thickness_r11
RD

xdicobjhandle
H, DXF 360

Common Object fields

dwg struct _dwg_struct*

eed Dwg_Eed*

hdleref
Dwg_Handle*

has_ds_data
B

is_xdic_missing
B

num_eed BL

num_reactors
BL

objid BL

ownerhandle
H, DXF 330

reactors H*, DXF 330

`xdicobjhandle`
H, DXF 360

SummaryInfo fields

see Section 5.7 [SummaryInfo], page 260,

TITLE TU16, DXF 1

SUBJECT TU16, DXF 1

AUTHOR TU16, DXF 1

KEYWORDS TU16, DXF 1

COMMENTS TU16, DXF 1

LASTSAVEDBY
TU16, DXF 1

REVISIONNUMBER
TU16, DXF 1

HYPERLINKBASE
TU16, DXF 1

TDINDWG TIMERLL

TDCREATE TIMERLL

TDUPDATE TIMERLL

num_props
RS

props Dwg_SummaryInfo_Property*

unknown1 RL

unknown2 RL

5 Sections

The r2000 format (used for r13-r2000) knows the following 6 sections:

HEADER CLASSES HANDLES 2NDHEADER MEASUREMENT AUXHEADER
(only r2000)

The r2004 and r2007 format (used for r2004-r2018) knows the following sections:

R2004_Header UNKNOWN SUMMARYINFO PREVIEW VBAPROJECT APPINFO
APPINFOHISTORY FILEDEPLIST ACDS REVHISTORY SECURITY OBJECTS
OBJFREESPACE TEMPLATE HANDLES CLASSES AUXHEADER HEADER
SIGNATURE INFO SYSTEM_MAP

5.1 HEADER Section

See Chapter 4 [Objects], page 8.

5.2 OBJECTS Section

The OBJECTS Section is usually split up into multiple pages (seperate sections of type AcDbObjects) and contains all entities and objects. It is indexed by Section 5.4 [HANDLES], page 260.

See Chapter 4 [Objects], page 8.

5.3 CLASSES Section

The **Classes** Section contains the basic info for all dynamically loaded types for entities and objects. It's types start with 500, and are variable. An entity which has no class loaded is displayed as proxy.

LibreDWG contains support for many classes, but not all. See `src/classes.inc` and `src/classes.c`. We define a stability for each class, one of stable, unstable, debugging and unhandled.

Objects in **stable** classes are treated as the fixed-type objects with full support. Changes are treated as API breaking.

Objects in **unstable** classes are sometimes written to DXF or JSON, but not to DWG. Changes are not treated as API breaking. Usually such objects are converted to UNKNOWN_OBJ or UNKNOWN_ENT objects, and when written to DWG converted to PLACEHOLDER, DUMMY or POINT objects with EED pointing to the original class and content. Only when rewriting from-to the very same version with the full known unknown_bits blob (e.g. `dwgrewrite` or `json`) such classes can persist as such.

Objects in **debugging** classes are only handled with the developer `configure --enable-debug` flag, otherwise ignored. See unstable above.

Objects in **unhandled** classes are always ignored. There are no fields known, only it's type.

5.4 HANDLES Section

The Handles section contains a sorted list of all object handles and it's position in the Objects stream. All values are stored relatively, as offsets. Handles only increase and can contain holes when an object is deleted, offsets can jump back also.

5.5 R2004_Header

The R2004_Header section at fixed position 0x100 in the DWG contains some meta-data for r2004 sections to find the two important sections INFO and SYSTEM_MAP.

5.6 UNKNOWN Section

The content of the UNKNOWN section with type 0 is unknown and does not always exist.

5.7 SummaryInfo

All Section SummaryInfo fields:

TITLE	TU16, DXF 1
SUBJECT	TU16, DXF 1
AUTHOR	TU16, DXF 1
KEYWORDS	TU16, DXF 1
COMMENTS	TU16, DXF 1
LASTSAVEDBY	TU16, DXF 1
REVISIONNUMBER	TU16, DXF 1
HYPERLINKBASE	TU16, DXF 1
TDINDWG	TIMERLL
TDCREATE	TIMERLL
TDUPDATE	TIMERLL
num_props	RS
props	Dwg_SummaryInfo_Property*
unknown1	RL
unknown2	RL

See [Dwg_SummaryInfo_Property], page 247,

5.8 Preview

The optional Preview section contains the thumbnail stream of BMP or WMF data of the drawing. Note that blocks or proxy objects can also contain it's own preview fields. The program **dwgbmp** can extract the bitmap from this section.

5.9 VBAProject

5.10 AppInfo

Which product and version exactly created that DWG.

5.11 AppInfoHistory

5.12 FileDepList

Features and File Dependencies. Image files, fonts, xrefs, plotconfigs.

5.13 AcDS

The AcDsPrototype_1b DataStorage, used mostly for binary ACIS blobs, embedded fonts, ...

5.14 RevHistory

Revision History

5.15 Security

Password Info

5.16 ObjFreeSpace

Some Objects meta-data

5.17 Template

Contains one Measurement Header variable.

5.18 AuxHeader

In case the original Header gets lost.

5.19 Signature

5.20 INFO

The info of all used sections.

5.21 SYSTEM_MAP

The map of all used sections and its chunked pages.

6 Structures

6.1 EED

“Extended Entity Data” (EED) may be optionally attached to each object. They consist of a handle to the registered APPID, and a list of typed data. Each block is preceded with a size, the processing stops with size 0.

Internally libredwg stores each eed line as an array of num_eed structs. If the size > 0, then new block starts with a handle, an optional raw string (when reading from a DWG), and a number of typed data entries. Only the first eed struct of each block has a size, all subsequent eed structs have size 0.

Example:

```
EED[0] size: 109 [BS]
EED[0] handle: 5.2.762
EED[0] code: 70 [RC] short: 2 [RS]
EED[1] code: 70 [RC] short: 0 [RS]
EED[2] code: 70 [RC] short: 0 [RS]
EED[3] code: 11 [RC] 3dpoint: (0.000000, 0.000000, 0.000000) [3RD]
EED[4] code: 11 [RC] 3dpoint: (1.000000, 0.000000, 0.000000) [3RD]
EED[5] code: 11 [RC] 3dpoint: (0.000000, 1.000000, 0.000000) [3RD]
EED[6] code: 11 [RC] 3dpoint: (0.000000, 0.000000, 1.000000) [3RD]
EED[7] size: 6 [BS]
EED[7] handle: 5.2.763
EED[7] code: 70 [RC] short: 0 [RS]
EED[8] code: 70 [RC] short: 0 [RS]
EED[9] size: 23 [BS]
EED[9] handle: 5.1.12
EED[9] code: 0 [RC] string: "RTMaterial" len=10 cp=30
EED[10] code: 5 [RC] entity: 0x6507000000000000 [RLL]
- size: 0 [BS]
```

These 10 num_eed structs consist of 3 blocks with 3 size and handle entries. EED[0] starts with size 109, the handle pointing to object 762, 3 shorts and 4 points. The next block at EED[7] has size 6, the handle pointing to object 763 and 2 shorts. The last block at EED[9] has size 9, the handle pointing to object 12 (the APPID.ACAD application) and a string and an entity reference. The size is calculated by the needed room for all data code + values, without the handle. E.g. EED[7] size: 6 is 1 + 2 for EED[7] RC + RS, and 1 + 2 for EED[8] RC + RS.

Each data block consists of a RC code, and a variable value. A string may be a an old pre-r2007 ASCII string with a RC length (max 255 chars), a codepage and the string. Or a r2007+ wide string with a RS length (max 32767 chars) and a UCS-2 wide string.

decode stores both, the raw data, and the structured data. in_dxf just the data. encode prefers raw over the data.

6.2 XDATA

XRECORD XDATA are very similar to the EED array, but internally it is a single linked-list, consisting of something like the EED data code + value pairs. There's only one size, `xdata_size`, and only one handle to the APPID, which handles this XRECORD XDATA.

7 Functions

You can use LibreDWG immediately upon loading, without any particular initialization. Only when using some see Section 7.4 [dynapi], page 267, functions you might need to initialize the version via `dwg_api_init_version(&dwg)`, when you need other formats than r2000 and you call an API function which does not store the version internally. Most do. This limitation will soon be fixed.

You usually use one set of functions - either decoding or encoding - at a time. All functions use the common data types (see Chapter 3 [Types], page 6). All functions return an error code, and the high-level functions for multiple objects add the error bitmask, which is sorted by severity. When the error exceeds `DWG_ERR_CRITICAL`, processing is stopped.

The new see Section 7.4 [dynapi], page 267, has dynamic get and set functions for all objects and its fields. You can get and set a property value from any object pointer by the object name and the field name.

7.1 Decoding

The highest level function for decoding a file is `dwg_read_file`.

```
int dwg_read_file (char *filename, Dwg_Data *dwg) [Function]
    Open filename and decode it, saving information into dwg. Return 0 if successful.
```

You can then iterate over the entities in model space or paper space via two ways:

1. by using the `dwg.h` data structures. Via `dwg->object[0]`, which is of type `Dwg_Object_BLOCK_CONTROL`, and a custom void `process_BLOCK_HEADER(Dwg_Object_Ref* ref)`:

```
Dwg_Object_BLOCK_CONTROL* block_control = dwg->block_control;
// first all entities in the model space
process_BLOCK_HEADER(dwg->header_vars.BLOCK_RECORD_MSPACE);
// then all entities in the blocks
for (i=0; i < block_control->num_entries; i++)
{
    process_BLOCK_HEADER(block_control->block_headers[i]);
}
// and last all entities in the paper space
process_BLOCK_HEADER(dwg->header_vars.BLOCK_RECORD_PSPACE);
```

or 2. by using the API functions from `dwg_api.h`:

```
Dwg_Object_BLOCK_CONTROL* block_control = dwg_block_control(dwg);
process_BLOCK_HEADER(dwg_model_space_ref(dwg));
for (i=0; i < block_control->num_entries; i++)
{
    process_BLOCK_HEADER(block_control->block_headers[i]);
}
process_BLOCK_HEADER(dwg_paper_space_ref(dwg));
```

and inside the `process_BLOCK_HEADER` function, you iterate over the entities from the `block_header` via:

```
Dwg_Object* obj = get_first_owned_entity(ref->obj);
while (obj)
{
    process_object(obj);
    obj = get_next_owned_entity(ref->obj, obj);
}
```

where `process_object` checks the type of each entity under the *Dwg_Object** `obj`.

For each entity or object type (i.e. a non-graphical dwg object, also tables) there also exist the simple and expensive `dwg_getall_ENTITY` and `dwg_getall_OBJECT` functions:

```
int dwg_getall_ENTITY (Dwg_Object_Ref *block_header_ref)      [Function]
    Return a malloc'ed NULL-terminated array of all such entities for Model Space, Paper Space or an individual block.
```

```
int dwg_getall_OBJECT (Dwg_Data *dwg)                        [Function]
    Return a malloc'ed NULL-terminated array of all such DWG objects.
```

The decoder is driven by the fields definition in the `src/dwg.spec`, which adds each field to the object. This is done in the `src/decode.c` or `src/decode_r2007.c`.

```
int dwg_decode_OBJECT (Bit_Chain *dat, Dwg_Object *obj)      [Function]
    Sets the fields for the object from the DWG bitstream.
```

7.2 Encoding

Encoding DWG files, i.e. DWG write support, can be disabled via `./configure --disable-write`. The default format and only useful one is currently `r13-r2000`. Experimentally work is ongoing for the `r2004` format, which is also used for `r2010`, `r2013`, and `r2018`. Only the pre-`r13` and `r2007` versions are not covered yet.

See `src/in_dxf.c` for a high-level usage example. The default codepage is Latin-1, 30.

The highest level function for encoding a bitstream to a file is `dwg_write_file`, which dumps the dwg to a file.

```
int dwg_write_file (char *filename, Dwg_Data *dwg)           [Function]
    Open filename and write the dwg to it. Return 0 if successful.
```

See Section 7.3 [add api], page 266, for:

```
Dwg_Data* dwg_add_Document (const Dwg_Version_Type version, [Function]
    const int imperial, const int loglevel) Creates an initial template dwg structure in memory, suitable to be written to a DWG or DXF file, without any additional table records or entities. Creates ModelSpace, PaperSpace and most Tables and basic Dictionaries.
```

and how to add entities and objects from scratch.

Low level-functions:

```
int dwg_add_object (Dwg_Data *dwg) [Function]
    Adds a new uninitialized object to the dwg->object[] array. Return 0 or -1 if successful,
    otherwise DWG_ERR_OUTOFMEM. -1 is the array was re-allocated.
```

Then for each object or entity type there is a

```
int dwg_setup_<OBJECT> (Dwg_Object *obj) [Function]
    Initializes an object for the given OBJECT or ENTITY type, with all fields being
    zero'ed. This does not initialize the obj size, type, address, handlestream_size, bitsize
    fields.
```

The encoder is driven by the fields definition in the `src/dwg.spec` and the generated `src/dynapi.c`, which adds each field to the object. This is done by `src/encode.c` or any `src/in_*.c` import module.

```
int dwg_encode_<OBJECT> (Bit_Chain *dat, Dwg_Object *obj) [Function]
    Encodes the DWG bitstream from the fields of the object.
```

The iterator is similar to above, but you want to encode all data structures, not just the entities. But note that you need many helper functions, such as the Section 7.4 [dynapi], page 267, to create all needed sections to store a DWG if you didn't read a DWG into the right a `Dwg_Data* dwg` struct already. This is especially important when importing from DXF or from an earlier or later DWG version.

7.3 add api

The add api functions are useful for CAD programs which want to write DWG. All the other API's are mostly to convert from and to DWG, so the main structures and links already do exist. With the add api you can easily create an empty DWG from scratch, add table entries (into fixed Tables or variables Dictionaries), and add entities. To set more entity fields use the Section 7.4 [dynapi], page 267.

For each almost each entity and table exists a function at to add it, with arguments to initialize some fields as in the VBA object model. The other objects are either created automatically, or handled separately.

All BITCODE_T strings are encoded as UTF-8, as with the dynapi. See Section 7.5 [strings], page 269. Most names are copied, since most names are considered to be constant. If not, you need to free them by yourself. Exceptions are `dxfname` (there exists a separate `dxfname_u` variant), the `VX` name, which does not exists anymore since `r2000`.

A very simple example using the add API is the example program See [dwgadd], page 274.

```
Dwg_Data dwg_add_Document (const Dwg_Version_Type version, [Function]
    const int imperial, const int loglevel))
```

Creates an initial template dwg structure in memory, suitable to be written to a DWG or DXF file, without any additional table records or entities. Creates ModelSpace, PaperSpace and most Tables and basic Dictionaries.

When writing DWG, a *version* of `R_2000` is recommended, only `R_13` - `R_2000` are supported yet. For DXF you can try all versions `>= R_13`.

For each OBJECT and ENTITY type there exists a specific `dwg_add_<OBJECT>` function, which takes the owner and some default arguments. Entities are normally added to a block header, like `modelspace`, `paperspace` or any block. Objects are normally added to the `dwg`, or to some other object or entity. E.g.

```
Dwg_Entity_LINE *line = dwg_add_LINE [Function]
    (Dwg_Object_BLOCK_HEADER *modelspace,
     dwg_point_3d *start_pt, dwg_point_3d *end_pt)
```

```
Dwg_Entity_TEXT* dwg_add_TEXT (Dwg_Object_BLOCK_HEADER [Function]
    *restrict blkhdr, const char* restrict text_value, const dwg_point_3d
    *restrict ins_pt, const double height)
```

Adds a TEXT entity to the ModelSpace, PaperSpace or a Block. Entity specific arguments are here the text, the point (as pointer to the struct of 3 doubles), and the text height.

```
Dwg_Object_LAYER *layer = dwg_add_LAYER (Dwg_Data *dwg, [Function]
    const char *name)
```

Adds a new layer the Layer Table, i.e. creates the new LAYER object, and adds it to LAYER_CONTROL object, the list of layers.

Names and strings are encoded as UTF-8 and will be translated to type BITCODE_T (i.e. versions specific TU or TV types, either UCS-2 unicode or single-byte codepage) internally, as with the **dynapi**. Only internally you will have to deal with 2 different DWG text representations: UCS-2 since r2007, single-byte before. see Section 7.5 [strings], page 269.

To understand the object model for the add API see some VBA Object model documentation, such as e.g. <http://entercad.ru/acadauto.en/>.

The new add API mostly handles the direct `Dwg_Entity_ENTITY` structs, not all the generic `Dwg_Object` structs. Thus you can access the object specific fields directly, the common fields, not so easily.

The DWG Document consists of 3 basic entity containers `ModelSpace`, `PaperSpace` and `Blocks`, plus `Tables` (`Layers`, `Linetypes`, ...), `Dictionaries` as generic replacements of `Tables` with a root Dictionary, the `NOD` ("Named Object Dictionary"), and more support objects and complex entity groups.

Helper functions:

```
dwg_add_u8_input (Dwg_Data *restrict dwg, const char *restrict [Function]
    u8str)
```

Convert UTF-8 strings to BITCODE_T fields. Returns a copy of the string. All external API's only deal with UTF-8 strings.

7.4 dynapi

The new `dynapi` replaced the old `dwg_api` functions to access each object field. The old `dwg_api` functions were deprecated, and need to be re-enabled by defining `CFLAGS="-DUSE_DEPRECATED_API"`. See see Chapter 4 [Objects], page 8, for an description of each object and its fields..

For each of header, entity, common or subclass there is a function to get and set the value of any type, or converted utf8 string.

`bool dwg_dynapi_entity_value (void *entity, const char [Function]
 *dxfname, const char *fieldname, void *out, Dwg_DYNAPI_field *fp)`
entity is of type `dwg_ent_generic`, that is the pointer to the object specific struct.
dxfname is the *dxfname* of the object, *fieldname* is the field or property name of the
 field to be read from, **out* the result pointer and the optional **fp* is filled by the
 information for this field.

`bool dwg_dynapi_common_value (void *entity, const char [Function]
 *fieldname, void *out, Dwg_DYNAPI_field *fp)`
 This accesses the common `Dwg_Object_Object*` or `Dwg_Object_Entity*` fields.

`bool dwg_dynapi_header_value (void *dwg, const char *fieldname, [Function]
 void *out, Dwg_DYNAPI_field *fp)`
 This accesses the Header (or sometimes also called Database) fields.

`bool dwg_dynapi_subclass_value (void *ptr, const char [Function]
 *subclass, const char *fieldname, void *out, Dwg_DYNAPI_field *fp)`
 This accesses a subclass, a structure within the object.

The `utf8text` functions convert version-specific text strings to UTF-8 strings. Internally
 the `dwg` stores strings as TU (unicode) or TV (single-byte codepage). The API treats all
 strings as UTF-8, as with JSON, DXF or the add API.

`bool dwg_dynapi_entity_utf8text (void *entity, const char [Function]
 *dxfname, const char *fieldname, char *textp, int *isnewp,
 Dwg_DYNAPI_field *fp)`
isnewp is set to 1 if the string is a fresh copy, for unicode strings.

`bool dwg_dynapi_common_utf8text (void *entity, const char [Function]
 *fieldname, char *textp, int *isnewp, Dwg_DYNAPI_field *fp)`

`bool dwg_dynapi_header_utf8text (void *dwg, const char [Function]
 *fieldname, char *textp, int *isnewp, Dwg_DYNAPI_field *fp)`
 This accesses the Header (or sometimes also called Database) fields.

`bool dwg_dynapi_subclass_utf8text (void *ptr, const char [Function]
 *subclass, const char *fieldname, char *textp, int *isnewp,
 Dwg_DYNAPI_field *fp)`
 This accesses a subclass, a structure within the object.

The setters don't differentiate between common values and strings.

`bool dwg_dynapi_entity_set_value (dwg_ent_generic *_obj, const [Function]
 char *fieldname, const void *value, const bool is_utf8)`
 Sets the `ENTITY.fieldname` to a value. A malloc'ed struct is passed by `ptr`, not by
 the content. A non-alloc'ed struct is set by content. Arrays or strings must be
 malloced before. We just set the new pointer, the old value will be freed. If `is_utf8`
 is set, the given value is a UTF-8 string, and will be converted to TV or TU


```
bool dwg_dynapi_header_set_value (Dwg_Data *dwg, const char      [Function]
                                *fieldname, const void *value, const bool is_utf8)
```

```
bool dwg_dynapi_common_set_value (dwg_ent_generic *_obj, const  [Function]
                                char *fieldname, const void *value, const bool is_utf8)
```

See the sourcecode of the importers or programs for the usage of the API's.

7.5 strings

Internally the DWG consists of multiple different string formats, see Chapter 3 [Types], page 6. The most important are BITCODE_TV (i.e. `char*`) encoded according to `dwg->header.codepage`, and BITCODE_TU (i.e. `wchar_t` on Windows, UCS-2).

Externally most functions get and set strings as UTF-8, as in DXF or JSON.

Before r2007 DWG's the TV and T strings are encoded in its codepage, they are not yet converted from and to their proper codepage to UTF-8, but will eventually. Not via `libiconv`, just via the locale specific `libc btowc()`. To encode unicode characters special `\U+XXXX` sequences are used, and with japanese shift-jis for Katagana and Hiregana `\M+1XXXX` sequences.

On DWG's r2007 and later most strings (T and TU) are encoded in the Microsoft specific two-byte UCS-2 Unicode encoding, without proper support for surrogate pairs and the upper planes (i.e. emojis).

Fixed TF strings are not encoded and have a length stored also. Normal strings are all zero-delimited. EED and XDATA strings do have a length though, but have length limitations.

Strings in DXF and JSON also have quoting rules for special characters, like `\r`, `\n`, `\"` and so on.

Transformations:

DWG to DWG: `decode` reads the T and TU strings in its natural format into the field. `encode` translate it to TV or TU. `encode` needs `header.from_version` and how it was read, from DWG or from an importer (`in_dxf` or `in_json`) or the Section 7.3 [add api], page 266, (`DWG_OPTS_IN`).

DXF/JSON to DWG: `in_dxf/json` keeps the T and TU strings as TV. `encode` to <r2007 keeps it as TV, r2007+ translates it to TU. it sets `DWG_OPTS_IN`.

DWG to DXF/JSON: `decode` keeps the T and TU strings as TV or TU. `out_dxf/json` translate them to TV or UTF-8 and quote them via `\U+XXXX`

`add api` to DWG/DXF: `add` reads strings as UTF-8, and encodes it from UTF-8 to TV or TU. (TU not yet, as we don't encode R2004+ yet). `add` sets `DWG_OPTS_IN`.

7.6 Other Formats

7.6.1 DXF

We can write ASCII DXF files in various versions, with much more data than other free DWG libraries, but not as stable as the unfree Teigha library yet. AutoCAD fails to import some of our files still (~10% failure rate).

Options: `--minimal` (see `dwg2dxf` or `dwgread`) creates only a short header with a `ACAD-VER` and `HANDSEED` element, and the entities, without any subclass markers, reactors or handles.

Reading DXF is under construction and works for most entities.

7.6.2 DXFB

We can almost write Binary DXF files in various versions.

Reading DXFB is under construction and un-tested.

7.6.3 JSON

We write to and read back from our own JSON format, which is a readable 1:1 mapping of the DWG structures, and carries much more information than the DXF format. The idea is to dump a DWG to JSON and filter/query or postprocess it with more powerful JSON query tools such as `jq` (<https://stedolan.github.io/jq/>), and optionally import it back in. See Chapter 9 [Programs: `dwgfilter`], page 272. JSON is much better structured than DXF.

The current first level objects are all the section names, like “HEADER”, “CLASSES”, “OBJECTS”. For more see the specs.

7.6.4 GeoJSON

`dwgread` supports writing to the GeoJSON format as specified at <http://geojson.org/geojson-spec.html>. See `dwgread` with the `--fmt GeoJSON` option.

We write in the RFC7946 format, the new GeoJSON format since 2016, which means smaller, less precision, and normalized polygons with proper right-hand rule orientation.

We write all coordinates as `[x, y]`, not `[y, x]`. z-coordinates are optional, and only written if not 0.0. Colors are either written as palette index as integer if not 256 (ByLayer), or as TrueColor RGB hex string values for all r2004+ DWG’s.

Missing entities: No 3D entities, HATCH by definition. ELLIPSE, ARC, CIRCLE would need segmentation into lines. MLINE, SPLINE, MINSERT, SOLID, TRACE, RAY(?), XLINE(?)

Due to implementation quirks with ending commas in JSON, we mostly add an empty dummy feature at the very end, with null properties and null geometry.

8 Errors

LibreDWG is mostly a library, and as such collects error codes from the highest level function down to the lowest level functions. The error codes are sorted by severity, and only if the error exceeds *DWG_ERR_CRITICAL*, i.e. *DWG_ERR_CLASSESNOTFOUND*, processing is stopped.

All error bitmasks are collected during read or write and returned at the end.

```

DWG_ERR_WRONGCRC
    1

DWG_ERR_NOTYETSUPPORTED
    2

DWG_ERR_UNHANDLEDCLASS
    4

DWG_ERR_INVALIDIDTYPE
    8

DWG_ERR_INVALIDHANDLE
    16

DWG_ERR_INVALIDEED
    32

DWG_ERR_VALUEOUTOFBOUNDS
    64

DWG_ERR_CLASSESNOTFOUND
    128 = DWG_ERR_CRITICAL

DWG_ERR_SECTIONNOTFOUND
    256

DWG_ERR_PAGENOTFOUND
    512

DWG_ERR_INTERNALERROR
    1024

DWG_ERR_INVALIDDDWG
    2048

DWG_ERR_IOERROR
    4096

DWG_ERR_OUTOFMEM
    8192

```

Additionally, verbose warning and error messages are printed to `stderr`.

Unhandled class and Invalid type errors of objects are not severe. A DWG format can store a serialization of many third party classes and objects, and thus we will never be able read all possible types. Unknown types are just stored as binary blob without any DXF codes.

9 Programs

LibreDWG installs some binary programs to read or write DWG files.

dwgread

This reads a DWG file, and optionally converts its content to some output formats: JSON, GeoJSON, DXF, DXFB (i.e. Binary DXF), SVG.

`dwgread [OPTION] ... DWGFILE`

Options:

`-v[0-9]`, `-verbose [0-9]` verbosity

`-O fmt`, `-format fmt` `fmt`: JSON, DXF, DXFB, GeoJSON.

More planned formats: YAML, XML/OGR, GPX, SVG, PS.

`-o outfile`, `-file outfile` also defines the output `fmt`. Default: `stdout`

`-a rNNNN`, `-as rNNNN` writes the output format as another version. Valid versions are `r13`, `r14`, `r2000`, `r2004`, `r2007`, `r2010`, `r2013`, `r2018`.

`-help` display this help and exit

`-version` output version information and exit

dwgwrite

Create a DWG from a given input file (see Section 7.6.1 [DXF], page 269, see Section 7.6.2 [DXFB], page 270, see Section 7.6.3 [JSON], page 270), optionally via `--as=rNNNN` as another version. For now can only create `r13`-`r2018`, but not `r2007` DWG files.

dxfwrite

Create a DXF from a given input file (DWG, see Section 7.6.1 [DXF], page 269, see Section 7.6.2 [DXFB], page 270, see Section 7.6.3 [JSON], page 270), optionally via `--as=rNNNN` as another version. Highly experimental. Supports the same options as `dwg2dxf`.

dwg2dxf

Converts DWG files to DXF, optionally via `--as=rNNNN` as another version, an earlier or later version, or via `-m` or `--minimal` as a minimal DXF version, skipping most headers vars, classes, tables and objects.

`--binary` as a binary DXF file, with full precision, under construction.

The DXF files are created in the current directory and not overwritten, unless the option `--overwrite` or `-y` is given.

dx2dwg

Converts DXF (or Binary DXF) files to DWG, optionally via `--as=rVER` as another version, an earlier or later version.

The DWG files are created in the current directory and not overwritten, unless the option `--overwrite` or `-y` is given.

This program is experimental and AutoCAD may fail to import it. For now can only create `r13`-`r2018`, but not `r2007` DWG files. Currently the default is writing as `r2000`.

dwgrewrite

Read and write the DWG, optionally via `--as=rNNNN` as another version, an earlier or later version. The default is writing as r2000. Pre-r13 and r2007 DWG files cannot be written yet.

dwglayers

Prints all layers in a DWG. With `-x` or `--extnames` prints the extended displayed layer name with spaces, not the internally stored old-style name with `_` instead. Only relevant with old r13 and r14 DWGs, after that layers are always stored in the extended format. With `-f` or `--flags` also the status of frozen, on/off and locked. With `--on` only the visible layers, which are on and not frozen.

You can get the same effect via this json filter:

```
dwgfilter '.OBJECTS[]' example.dwg | \
  grep -A22 '"object": "LAYER"' | grep name
```

dwggrep

Search regex pattern in all text values in a list of DWGs. `dwggrep` uses PCRE. With `-i` searches case-insensitive. With `-c` prints only the count of found texts. With `-h` or `--no-filename` does not print the filename. With `--type NAME` search only NAME entities or objects. With `--dxf NUM` search only in DXF group NUM fields. With `--text` searches only TEXT-like entities: TEXT, MTEXT, ATTRIB, ATTDEF.

dwgfilter

Search and modify a single DWG file via `jq`, using the powerful JQ query expression language on a temporary json file. See `man jq`.

With `-i` replaces the DWG in-place. This only makes sense with an JQ expression which changes values.

dwg2SVG

Convert a DWG to a limited SVG. All paperspace or modelspace entities of type: TEXT, LINE, CIRCLE, ARC, POLYLINE_2D, LWPOLYLINE, INSERT, ELLIPSE (unrotated), SOLID, 3DFACE, RAY, XLINE.

With `-m` or `--mspace` all paper-space entities are ignored, and only model-space is printed. The default is to print all paper-space entities. But if there are none, print all model-space entities instead.

Limitations: Many other graphical entities and some properties are still missing.

dwg2ps

Convert a DWG to a very limited Postscript file. All paperspace and modelspace entities of type LINE, POLYLINE_2D, LWPOLYLINE, ARC and CIRCLE.

This requires installation of `pslib` <http://pslib.sourceforge.net/doc/pslib.html>.

Note that the graphical representation for PS and SVG output is severely lacking, block references (insert entities) are not yet exploded, UCS and paper space transformations per entity are not yet done.

Planned is **dwgplot**, via GNU Plotutils <https://www.gnu.org/software/plotutils/>, to replace **dwg2SVG** and **dwg2ps**. This supports much more bitmap and vector formats.

There are also some more examples in the source distribution:

- load_dwg** loads a DWG and adds some entities.
- dwg2svg2** converts a DWG to SVG similar to **dwg2SVG**, but via the `dwg_api.h` only. The graphical representation for PS and SVG output is severely lacking, block references (insert entities) are not yet exploded, UCS and paper space transformations per entity are not yet done.
- unknown** lists the not yet reverse-engineered blobs from our examples files, and is the framework to guess the field layout for these. It is optionally using `picat` (<http://picat-lang.org/>) to solve some of the field-packing problems.
- dwgfuzz** afl++ fuzzing frontend, to test and debug various fast shared-memory options for afl-clang-fast, with the following runtime options: `-indxf`, `-injson`, `-rw`, `-dwg`, `-dxg`, `-dxfb`, `-json`, `-geojson`. All other output formats, like BMP, SVG, PS need to be fuzzed via their programs, which is the recommended way. The now default and fastest method INMEM does not need the 2nd file argument `@@`, the 2nd method STDIN neither.
See also <https://github.com/LibreDWG/libredwg-fuzz> for our fuzzing setup to test new fuzzing campaigns automatically and find regressions.
- dwgadd** is the easiest way to create DWG's (or DXF, JSON) from scratch or add entities to an existing DWG. It accepts a very simple file with commands to create entities or objects. See `man 1 dwgadd` and `man 5 dwgadd`.

10 Bindings

LibreDWG generates library bindings to python and perl5 via swig. These can be quite huge, and it is recommended to use `ccache`. You can easily add bindings to other swig-supported languages, like Go, C#, ruby, php, D, lua, tcl, common lisp, ocaml, or others by yourself. Patches accepted.

Bindings for gambas (which looks very close to VBA) are at GitHub (<https://github.com/LibreDWG/gambas3-bindings>) and will soon be added to gambas3 as `gb.dwg` component. This is in development and about 80% finished.

11 Reference API

See the separate refman (<https://www.gnu.org/software/libredwg/refman/>) manual (in pdf or html format, the pdf has ~1800 pages) for a detailed API description, or see the relevant `dwg.h`, `dwg_api.h` or the `*.spec` files.

For reference you might also want to check the public AutoCAD DXF reference manuals, the VBA object model and the ODA `OpenDesign_Specification_for_dwg_files.pdf`.

12 Reporting bugs

To report bugs or suggest enhancements for GNU LibreDWG, please “submit a bug” at Savannah (<http://savannah.gnu.org/projects/libredwg>) or send electronic mail to libredwg@gnu.org. (If you use the web interface, you don’t need to also send email, since that is done automatically.) Pull requests at the github mirror (<https://github.com/LibreDWG/libredwg>) are also accepted for now.

For bug reports, please include enough information for the maintainers to reproduce the problem. Generally speaking, that means:

- The version numbers of LibreDWG and any other program(s) or manual(s) involved.
- Hardware and operating system names and versions.
- The contents of any input files necessary to reproduce the bug.
- The expected behavior and/or output.
- A description of the problem and samples of any erroneous output.
- Options you gave to `configure` other than specifying installation directories.
- Anything else that you think would be helpful. Usually that’s the failing part of the object processed with `dwgread -v5`, but only the failing part, not the whole output.

When in doubt whether something is needed or not, include it. It’s better to include too much than to leave out something important.

Patches are welcome; if possible, please make them with ‘`git format-patch`’ and include `ChangeLog` entries (see Section “Change Log” in *The GNU Emacs Manual*). Please follow the existing GNU coding conventions. See `CONTRIBUTING` in the source distribution.

Appendix A GNU Free Documentation License

Version 1.3, 3 November 2008

Copyright © 2000, 2001, 2002, 2007, 2008 Free Software Foundation, Inc.

<http://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. Secondly, 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, LaTeX 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

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 <http://www.gnu.org/copyleft/>.

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.

13 Index

13.1 General Index

- (
 (Dwg_Data..... 267
- *
- *layer..... 267
 *line..... 267
- B**
 bug reporting..... 277
- C**
 checklist for bug reports..... 277
 code, error..... 7
 code, return..... 7
 Common Entity fields..... 255
 Common Object fields..... 257
 compilation..... 5
 coverage..... 1
- D**
 data types..... 6
 dwg file format..... 1
 dwg_add_Document..... 265, 266
 dwg_add_object..... 266
 dwg_add_TEXT..... 267
 dwg_decode_OBJECT..... 265
 dwg_dynapi_common_set_value..... 269
 dwg_dynapi_common_utf8text..... 268
 dwg_dynapi_common_value..... 268
 dwg_dynapi_entity_set_value..... 268
 dwg_dynapi_entity_utf8text..... 268
 dwg_dynapi_entity_value..... 268
 dwg_dynapi_header_set_value..... 269
 dwg_dynapi_header_utf8text..... 268
 dwg_dynapi_header_value..... 268
 dwg_dynapi_subclass_utf8text..... 268
 dwg_dynapi_subclass_value..... 268
 dwg_encode_OBJECT..... 266
 dwg_getall_ENTITY..... 265
 dwg_getall_OBJECT..... 265
 dwg_read_file..... 264
 dwg_setup_OBJECT..... 266
 dwg_write_file..... 265
 dwg2dxf..... 272
 dwg2ps..... 273
 dwg2svg2..... 274
 dwg2SVG..... 273
- dwgadd..... 274
 dwgfilter..... 273
 dwgfuzz..... 274
 dwggrep..... 273
 dwglayers..... 273
 dwgplot..... 274
 dwgread..... 272
 dwgrewrite..... 273
 dwgwrite..... 272
 dxf2dwg..... 272
 DXF, ASCII DXF..... 269
 DXFB, Binary DXF..... 270
 dxfwrite..... 272
- E**
 EED..... 262
 ENTITIES..... 22
 entity, 3DFACE..... 22
 entity, 3DSOLID..... 22
 entity, ALIGNMENTPARAMETERENTITY... 24
 entity, ARC..... 24
 entity, ARC_DIMENSION..... 25
 entity, ARCALIGNEDTEXT..... 24
 entity, ATTDEF..... 27
 entity, ATTRIB..... 28
 entity, BASEPOINTPARAMETERENTITY... 29
 entity, BLOCK..... 29
 entity, BODY..... 30
 entity, CAMERA..... 30
 entity, CIRCLE..... 30
 entity, DGNUNDERLAY..... 30
 entity, DIMENSION_ALIGNED..... 31
 entity, DIMENSION_ANG2LN..... 32
 entity, DIMENSION_ANG3PT..... 33
 entity, DIMENSION_DIAMETER..... 34
 entity, DIMENSION_LINEAR..... 35
 entity, DIMENSION_ORDINATE..... 37
 entity, DIMENSION_RADIUS..... 38
 entity, DWFUNDERLAY..... 39
 entity, ELLIPSE..... 39
 entity, ENDBLK..... 39
 entity, EXTRUDESURFACE..... 39
 entity, FLIPPARAMETERENTITY..... 42
 entity, GEOPOSITIONMARKER..... 42
 entity, HATCH..... 43
 entity, HELIX..... 44
 entity, IMAGE..... 45
 entity, INSERT..... 46
 entity, LARGE_RADIAL_DIMENSION..... 47
 entity, LEADER..... 48
 entity, LIGHT..... 49

- entity, LINE 51
 - entity, LINEARPARAMETERENTITY 52
 - entity, LOFTEDSURFACE 52
 - entity, LWPOLYLINE 54
 - entity, MESH 55
 - entity, MINSERT 56
 - entity, MLINE 56
 - entity, MPOLYGON 57
 - entity, MTEXT 58
 - entity, MULTILEADER 60
 - entity, NAVISWORKSMODEL 62
 - entity, NURBSURFACE 62
 - entity, OLE2FRAME 64
 - entity, OLEFRAME 64
 - entity, PDFUNDERLAY 64
 - entity, PLANESURFACE 64
 - entity, POINT 66
 - entity, POINTCLOUD 66
 - entity, POINTCLOUDEX 68
 - entity, POINTPARAMETERENTITY 69
 - entity, POLARGRIPENTITY 69
 - entity, POLYLINE_2D 69
 - entity, POLYLINE_3D 70
 - entity, POLYLINE_MESH 70
 - entity, POLYLINE_PFACE 71
 - entity, PROXY_ENTITY 71
 - entity, RAY 72
 - entity, REGION 72
 - entity, REVOLVEDSURFACE 72
 - entity, ROTATIONPARAMETERENTITY 74
 - entity, RTEXT 74
 - entity, SECTIONOBJECT 75
 - entity, SEQEND 75
 - entity, SHAPE 75
 - entity, SOLID 76
 - entity, SPLINE 76
 - entity, SWEPTSURFACE 77
 - entity, TABLE 80
 - entity, TEXT 86
 - entity, TOLERANCE 87
 - entity, TRACE 87
 - entity, UNKNOWN_ENT 88
 - entity, VERTEX_2D 88
 - entity, VERTEX_3D 88
 - entity, VERTEX_MESH 88
 - entity, VERTEX_PFACE 88
 - entity, VERTEX_PFACE_FACE 88
 - entity, VIEWPORT 89
 - entity, VISIBILITYGRIPENTITY 91
 - entity, VISIBILITYPARAMETERENTITY 91
 - entity, WIPEOUT 91
 - entity, XLINE 91
 - entity, XYPARAMETERENTITY 91
 - enums 6
 - error 271
 - error code 7
- ## F
- features, still missing 1
 - functions 264
 - functions, create 266
 - functions, decoding 264
 - functions, dynamic field access 267
 - functions, encoding 265
 - functions, other formats 269
 - functions, read path 264
 - functions, write path 265
- ## G
- gambas 275
 - GeoJSON 270
- ## H
- header 5
 - HEADER 8
- ## J
- JSON 270
- ## L
- license 1
 - linking 5
 - load_dwg 274
- ## O
- object, ACMECOMMANDHISTORY 92
 - object, ACMESCOPE 92
 - object, ACMESTATEMGR 92
 - object, ACSH_BOOLEAN_CLASS 92
 - object, ACSH_BOX_CLASS 92
 - object, ACSH_BREP_CLASS 93
 - object, ACSH_CHAMFER_CLASS 94
 - object, ACSH_CONE_CLASS 95
 - object, ACSH_CYLINDER_CLASS 95
 - object, ACSH_EXTRUSION_CLASS 95
 - object, ACSH_FILLET_CLASS 97
 - object, ACSH_HISTORY_CLASS 97
 - object, ACSH_LOFT_CLASS 98
 - object, ACSH_PYRAMID_CLASS 98
 - object, ACSH_REVOLVE_CLASS 98
 - object, ACSH_SPHERE_CLASS 99
 - object, ACSH_SWEEP_CLASS 99
 - object, ACSH_TORUS_CLASS 101
 - object, ACSH_WEDGE_CLASS 101
 - object, ALDIMOBJECTCONTEXTDATA 101
 - object, ANGDIMOBJECTCONTEXTDATA .. 102
 - object, ANNOTSCALEOBJECTCONTEXTDATA .. 102
 - object, APPID 102
 - object, APPID_CONTROL 103

- object, ASSOC2DCONSTRAINTGROUP 103
- object,
 - ASSOC3POINTANGULARDIMACTIONBODY 104
- object, ASSOC ACTION 104
- object, ASSOC ACTION PARAM 105
- object,
 - ASSOCALIGNEDDIMACTIONBODY 105
- object, ASSOC ARRAY ACTION BODY 105
- object,
 - ASSOCARRAYMODIFYACTIONBODY 106
- object,
 - ASSOCARRAYMODIFYPARAMETERS 213
- object,
 - ASSOCARRAYPATHPARAMETERS 214
- object,
 - ASSOCARRAYPOLARPARAMETERS 214
- object,
 - ASSOCARRAYRECTANGULARPARAMETERS 214
- object, ASSOC ASMBODY ACTION PARAM 106
- object,
 - ASSOCBLEND SURFACE ACTION BODY 108
- object,
 - ASSOC COMPOUND ACTION PARAM 108
- object, ASSOC DEPENDENCY 109
- object, ASSOC DIM DEPENDENCY BODY 110
- object, ASSOC EDGE ACTION PARAM 110
- object,
 - ASSOC EDGE CHAMFER ACTION BODY 110
- object,
 - ASSOC EDGE FILLET ACTION BODY 110
- object,
 - ASSOC EXTENDS SURFACE ACTION BODY 111
- object,
 - ASSOC EXTRUDED SURFACE ACTION BODY 111
- object, ASSOC FACE ACTION PARAM 111
- object,
 - ASSOC FILLET SURFACE ACTION BODY 112
- object, ASSOC GEOM DEPENDENCY 112
- object,
 - ASSOC LOFTED SURFACE ACTION BODY 112
- object, ASSOC M LEADER ACTION BODY 113
- object, ASSOC NETWORK 113
- object,
 - ASSOC NETWORK SURFACE ACTION BODY 114
- object, ASSOC OBJECT ACTION PARAM 114
- object,
 - ASSOC OFFSET SURFACE ACTION BODY 114
- object,
 - ASSOC COORDINATED DIM ACTION BODY 115
- object,
 - ASSOC COSNAP POINT REF ACTION PARAM 115
- object,
 - ASSOC PATCH SURFACE ACTION BODY 116
- object, ASSOC PATH ACTION PARAM 116
- object, ASSOC PERSSUBENT MANAGER 117
- object,
 - ASSOC PLANES SURFACE ACTION BODY 119
- object, ASSOC POINT REF ACTION PARAM 119
- object,
 - ASSOC RESTORE ENTITY STATE ACTION BODY 120
- object,
 - ASSOC REVOLVED SURFACE ACTION BODY 120
- object,
 - ASSOC ROTATED DIM ACTION BODY 120
- object,
 - ASSOC SWEEP SURFACE ACTION BODY 121
- object,
 - ASSOC TRIM SURFACE ACTION BODY 121
- object, ASSOC VALUE DEPENDENCY 121
- object, ASSOC VARIABLE 122
- object, ASSOC VERTEX ACTION PARAM 122
- object, BLK REF OBJECT CONTEXT DATA 123
- object, BLOCK_CONTROL 150
- object, BLOCK_HEADER 150
- object,
 - BLOCK ALIGNED CONSTRAINT PARAMETER 123
- object, BLOCK ALIGNMENT GRIP 124
- object,
 - BLOCK ALIGNMENT PARAMETER 125
- object,
 - BLOCK ANGULAR CONSTRAINT PARAMETER 125
- object, BLOCK ARRAY ACTION 127
- object, BLOCK BASE POINT PARAMETER 127
- object,
 - BLOCK DIAMETRIC CONSTRAINT PARAMETER 128
- object, BLOCK FLIP ACTION 129
- object, BLOCK FLIP GRIP 129
- object, BLOCK FLIP PARAMETER 130
- object,
 - BLOCK GRIP LOCATION COMPONENT 131
- object,
 - BLOCK HORIZONTAL CONSTRAINT PARAMETER 131
- object,
 - BLOCK LINEAR CONSTRAINT PARAMETER 132
- object, BLOCK LINEAR GRIP 133
- object, BLOCK LINEAR PARAMETER 134
- object, BLOCK LOOKUP ACTION 135
- object, BLOCK LOOKUP GRIP 136
- object, BLOCK LOOKUP PARAMETER 136
- object, BLOCK MOVE ACTION 137
- object,
 - BLOCK PARAM DEPENDENCY BODY 137
- object, BLOCK POINT PARAMETER 137
- object, BLOCK POLAR GRIP 138
- object, BLOCK POLAR PARAMETER 139
- object, BLOCK POLAR STRETCH ACTION 140
- object, BLOCK PROPERTY ESTABLE 140
- object, BLOCK PROPERTY ESTABLE GRIP 140
- object,
 - BLOCK RADIAL CONSTRAINT PARAMETER 141
- object, BLOCK REPRESENTATION 142
- object, BLOCK ROTATE ACTION 142
- object, BLOCK ROTATION GRIP 143
- object, BLOCK ROTATION PARAMETER 143
- object, BLOCK SCALE ACTION 144
- object, BLOCK STRETCH ACTION 145

- object, BLOCKUSERPARAMETER..... 145
- object,
 - BLOCKVERTICALCONSTRAINTPARAMETER..... 145
- object, BLOCKVISIBILITYGRIP 147
- object, BLOCKVISIBILITYPARAMETER ... 148
- object, BLOCKXYGRIP 148
- object, BLOCKXYPARAMETER..... 149
- object, CELLSTYLEMAP 152
- object, CONTEXTDATAMANAGER 152
- object, CSACDOCUMENTOPTIONS 152
- object, CURVEPATH 152
- object, DATALINK 152
- object, DATATABLE 153
- object, DBCOLOR 153
- object, DETAILVIEWSTYLE 154
- object, DGNDEFINITION 213
- object, DICTIONARY 155
- object, DICTIONARYVAR 156
- object, DICTIONARYWDFLT 156
- object, DIMASSOC 156
- object, DIMSTYLE 156
- object, DIMSTYLE_CONTROL 160
- object, DMDIMOBJECTCONTEXTDATA ... 160
- object, DUMMY 160
- object, DWFDEFINITION 213
- object, DYNAMICBLOCKPROXYNODE 160
- object,
 - DYNAMICBLOCKPURGEPREVENTER .. 161
- object, EVALUATION_GRAPH 161
- object, FCFOBJECTCONTEXTDATA 161
- object, FIELD 161
- object, FIELDLIST 162
- object, GEODATA 162
- object, GEOMAPIIMAGE 164
- object, GRADIENT_BACKGROUND 165
- object, GROUND_PLANE_BACKGROUND .. 166
- object, GROUP 166
- object, IBL_BACKGROUND 166
- object, IDBUFFER 167
- object, IMAGE_BACKGROUND 167
- object, IMAGEDEF 167
- object, IMAGEDEF_REACTOR 167
- object, INDEX 168
- object, LAYER 168
- object, LAYER_CONTROL 169
- object, LAYER_INDEX 169
- object, LAYERFILTER 169
- object, LAYOUT 169
- object, LAYOUTPRINTCONFIG 170
- object, LEADEROBJECTCONTEXTDATA .. 170
- object, LIGHTLIST 171
- object, LONG_TRANSACTION 171
- object, LTYPE 171
- object, LTYPE_CONTROL 172
- object, MATERIAL 172
- object, MENTALRAYRENDERSETTINGS ... 174
- object,
 - MLEADEROBJECTCONTEXTDATA 177
- object, MLEADERSTYLE 177
- object, MLINestyle 179
- object, MOTIONPATH 180
- object,
 - MTEXTATTRIBUTEOBJECTCONTEXTDATA .. 180
- object, MTEXTOBJECTCONTEXTDATA ... 181
- object, NAVISWORKSMODELDEF 181
- object, OBJECT_PTR 182
- object, ORDDIMOBJECTCONTEXTDATA .. 182
- object, PARTIAL_VIEWING_INDEX 182
- object, PDFDEFINITION 213
- object, PERSUBENTMGR 182
- object, PLACEHOLDER 183
- object, PLOTSETTINGS 183
- object, POINTCLOUDCOLORMAP 184
- object, POINTCLOUDDEF 185
- object, POINTCLOUDDEF_REACTOR 186
- object, POINTCLOUDDEF_REACTOR_EX .. 186
- object, POINTCLOUDDEFEX 185
- object, POINTPATH 186
- object, PROXY_OBJECT 186
- object,
 - RADIMLGOBJECTCONTEXTDATA 186
- object, RADIMOBJECTCONTEXTDATA 187
- object, RAPIDRTRENDERSETTINGS 187
- object, RASTERVARIABLES 188
- object, RENDERENTRY 188
- object, RENDERENVIRONMENT 189
- object, RENDERGLOBAL 190
- object, RENDERSETTINGS 190
- object, SCALE 191
- object, SECTION_MANAGER 194
- object, SECTION_SETTINGS 194
- object, SECTIONVIEWSTYLE 191
- object, SKYLIGHT_BACKGROUND 194
- object, SOLID_BACKGROUND 194
- object, SORTENTSTABLE 194
- object, SPATIAL_FILTER 194
- object, SPATIAL_INDEX 195
- object, STYLE 195
- object, STYLE_CONTROL 196
- object, SUN 196
- object, SUNSTUDY 197
- object, TABLECONTENT 198
- object, TABLEGEOMETRY 198
- object, TABLESTYLE 199
- object, TEXTOBJECTCONTEXTDATA 199
- object, TVDEVICEPROPERTIES 200
- object, UCS 200
- object, UCS_CONTROL 201
- object, UNKNOWN_OBJ 201
- object, VBA_PROJECT 201
- object, VIEW 201
- object, VIEW_CONTROL 203
- object, VISUALSTYLE 203
- object, VPORT 209
- object, VPORT_CONTROL 212
- object, VX_CONTROL 212

object, VX_TABLE_RECORD 212
 object, WIPEOUTVARIABLES 213
 object, XRECORD 213
 OBJECTS 92
 OCS 7
 overview 1

P

patches, contributing 277
 perl 275
 problems 277
 programs 272
 projects, related 3
 python 275

R

Reference API 276
 reporting bugs 277
 return code 7

S

Sections 259
 strings 269
 structs 6
 structures 262
 SummaryInfo 260
 SummaryInfo fields 258

13.2 Object and Field Index

—
 __iterator 151, 255
 _3DDWFPREC 20
 _dxf_sab_converted 23, 40, 53, 63, 65, 73, 78,
 93, 107

3

3DFACE 22
 3DSOLID 22

A

aaab_version 104, 105, 106, 113, 115, 120
 aab_version 104, 105, 106, 108, 110, 111, 112,
 113, 114, 115, 116, 119, 120, 121
 aap_version 105, 106, 108, 110, 111, 114, 115,
 116, 119, 123, 213
 ACADMAINTVER 8

T

table, APPID 102
 table, BLOCK_HEADER 150
 table, DIMSTYLE 156
 table, LAYER 168
 table, LTYPE 171
 table, STYLE 195
 table, UCS 200
 table, VIEW 201
 table, VPORT 209
 table, VX_TABLE_RECORD 212
 table_control, APPID_CONTROL 103
 table_control, BLOCK_CONTROL 150
 table_control, DIMSTYLE_CONTROL 160
 table_control, LAYER_CONTROL 169
 table_control, LTYPE_CONTROL 172
 table_control, STYLE_CONTROL 196
 table_control, UCS_CONTROL 201
 table_control, VIEW_CONTROL 203
 table_control, VPORT_CONTROL 212
 table_control, VX_CONTROL 212

U

unknown 274

V

version, API/ABI 1

X

XDATA 263

acis_data 22, 40, 52, 62, 65, 72, 77, 93, 107
 acis_empty 22, 40, 52, 62, 64, 72, 77, 93, 106
 acis_empty_bit .. 24, 41, 53, 63, 66, 73, 78, 94, 108
 acis_empty2 23, 40, 53, 63, 65, 73, 78, 93, 107
 acis_index 215
 ACMECOMMANDHISTORY 92
 ACMESCOPE 92
 ACMESTATEMGR 92
 ACSH_BOOLEAN_CLASS 92
 ACSH_BOX_CLASS 92
 ACSH_BREP_CLASS 93
 ACSH_CHAMFER_CLASS 94
 ACSH_CONE_CLASS 95
 ACSH_CYLINDER_CLASS 95
 ACSH_EXTRUSION_CLASS 95
 ACSH_FILLET_CLASS 97
 ACSH_HISTORY_CLASS 97
 ACSH_LOFT_CLASS 98
 ACSH_PYRAMID_CLASS 98
 ACSH_REVOLVE_CLASS 98

- ACSH_SPHERE_CLASS 99
 ACSH_SWEEP_CLASS 99
 ACSH_TORUS_CLASS 101
 ACSH_WEDGE_CLASS 101
 act_measurement 26, 31, 33, 34, 35, 36, 37, 39,
 47, 229
 action_index 103, 104, 113, 122
 action_offset_x 129, 137, 145
 action_offset_y 129, 137, 145
 action_type 110
 actionbody 103, 104, 105, 113, 115, 121, 122
 actions 103, 113, 114, 127, 129, 135, 137, 140,
 142, 144, 145
 active_cycles 230
 active_viewport 170
 adb_version 110, 137
 additional_data_flag 250
 affects_graphics 231
 ALDIMOBJECTCONTEXTDATA 101
 align_angle 42, 79, 96, 100
 align_direction 54
 align_option 96, 100
 align_perpendicular 125
 align_space 178
 align_start 42, 79
 alignment 25, 171, 240
 alignment_pt 27, 28, 86, 180, 200
 ALIGNMENTPARAMETERENTITY 24
 alt_hlt 200
 alt_hltcolor 200
 ambient_color 90, 172, 202, 211
 ANGBASE 8
 ANGDIMOBJECTCONTEXTDATA 102
 ANGDIR 8
 angle 30, 44, 58, 127, 144, 233
 angle_desc 139, 144
 angle_name 139, 144
 angle_offset 129, 137, 145
 angle_value_set 140, 144
 annot_type 48
 annotative_app 28, 29
 annotative_data_bytes 28, 29
 annotative_data_size 28, 29
 annotative_short 28, 29
 ANNOTSCALEOBJECTCONTEXTDATA 102
 anonymous 151
 antialiasing_level 200
 appid 59
 APPID 102
 APPID_CONTROL 103
 APPID_CONTROL_OBJECT 8
 arc_end_param 27
 arc_handle 25
 arc_length_parameterization 54
 arc_pt 102
 arc_start_param 27
 ARC 24
 ARC_DIMENSION 25
 ARCALIGNEDTEXT 24
 areafillparms 241
 array_index 214
 arrow_end_symbol 192
 arrow_handle 60, 235
 arrow_head 178
 arrow_head_size 178
 arrow_position 192
 arrow_size 60, 235, 238
 arrow_start_symbol 192
 arrow_symbol 154
 arrow_symbol_color 154, 192
 arrow_symbol_extension_length 192
 arrow_symbol_size 154, 192
 arrowhead 235
 arrowhead_on 49
 arrowhead_type 49
 arrowheads 61
 asdap_class_version 106, 110, 111, 114, 123
 aspect_ratio 202, 210
 assoc_dep 104, 105, 113, 115, 120
 ASSOC2DCONSTRAINTGROUP 103
 ASSOC3POINTANGULARDIMACTIONBODY 104
 ASSOC ACTION 104
 ASSOC ACTION PARAM 105
 ASSOCALIGNEDDIMACTIONBODY 105
 ASSOCARRAYACTIONBODY 105
 ASSOCARRAYMODIFYACTIONBODY 106
 ASSOCARRAYMODIFYPARAMETERS 213
 ASSOCARRAYPARAMETERS 213
 ASSOCARRAYPATHPARAMETERS 214
 ASSOCARRAYPOLARPARAMETERS 214
 ASSOCARRAYRECTANGULARPARAMETERS 214
 ASSOCASMBODYACTIONPARAM 106
 ASSOCBLENDSURFACEACTIONBODY 108
 ASSOC COMPOUND ACTION PARAM 108
 assocdep 104, 112, 121, 217
 ASSOCDEPENDENCY 109
 ASSOCDIMDEPENDENCYBODY 110
 ASSOC EDGE ACTION PARAM 110
 ASSOC EDGE CHAMFER ACTION BODY 110
 ASSOC EDGE FILLET ACTION BODY 110
 ASSOC EXTENDS SURFACE ACTION BODY 111
 ASSOC EXTRUDED SURFACE ACTION BODY 111
 ASSOC FACE ACTION PARAM 111
 ASSOC FILLET SURFACE ACTION BODY 112
 ASSOC GEOM DEPENDENCY 112
 associated_annotation 49
 associated_ucs 203
 associativity 156
 ASSOCLOFTEDSURFACEACTIONBODY 112
 ASSOC LEADER ACTION BODY 113
 ASSOC NETWORK 113
 ASSOC NETWORK SURFACE ACTION BODY 114
 ASSOC OBJECT ACTION PARAM 114
 ASSOC OFFSET SURFACE ACTION BODY 114
 ASSOC ORDINATED DIM ACTION BODY 115
 ASSOC OSNAP POINT REF ACTION PARAM 115

- be_major ... 123, 124, 125, 126, 127, 128, 129, 130, 131, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149
- be_minor ... 123, 124, 125, 126, 127, 128, 129, 130, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149
- beg_tan_vec 44, 76
- bend_line_color 192
- bend_line_length 193
- bend_linewt 192
- bend_ltype 192
- bg_b191 .. 124, 130, 134, 136, 138, 141, 143, 147, 149
- bg_b192 .. 124, 130, 134, 136, 138, 141, 143, 147, 149
- bg_color 226, 240, 250
- bg_fill_color 59
- bg_fill_flag 59
- bg_fill_none 250
- bg_fill_scale 59
- bg_fill_trans 59
- bg_insert_cycling .. 124, 130, 134, 136, 138, 141, 143, 147, 149
- bg_insert_cycling_weight 125, 130, 134, 136, 138, 141, 143, 148, 149
- bg_location 124, 130, 134, 136, 138, 141, 143, 147, 149
- bg_scale 240
- bg_transparency 240
- bigfont_file 196
- bindata 41, 195
- bindata_size 41, 195
- bitsize 20
- bitsize_hi 20
- bl_prop25 207
- bl_prop25_int 208
- bl_prop28 208
- bl_prop28_int 208
- bl_prop2a 208
- bl_prop2a_int 208
- bl_prop2b 208
- bl_prop2b_int 208
- bl_prop2e 208
- bl_prop2e_int 208
- bl_prop2f 208
- bl_prop2f_int 208
- bl_prop30 209
- bl_prop30_int 209
- bl_prop32 209
- bl_prop32_int 209
- bl2 109, 116, 117, 120
- bl92 94, 96, 97, 100, 153
- bl93 153, 215
- bl95 95
- bl96 131
- blend_options 108
- blendfactor 237
- blending_mode 200
- BLIPMODE 8
- blk 255
- blkisxref 151
- BLKREFOBJECTCONTEXTDATA 123
- blob 220
- blob01 218
- block... 26, 32, 33, 34, 35, 36, 38, 39, 48, 142, 161, 178, 229, 241
- block_color 61, 179
- block_connection 179
- block_entity 151
- block_handle 250
- block_header 46, 56, 85, 170
- block_owner 194
- block_rotation 61, 179
- block_scale 61, 179, 227, 250
- block_scaling 151
- block_size 22, 40, 52, 62, 65, 72, 77, 93, 106
- block_style 61
- block_table 239
- BLOCK 29
- BLOCK_CONTROL 150
- BLOCK_CONTROL_OBJECT 8
- BLOCK_HEADER 150
- BLOCK_RECORD_MSPACE 8
- BLOCK_RECORD_PSPACE 8
- BLOCKALIGNEDCONSTRAINTPARAMETER 123
- BLOCKALIGNMENTGRIP 124
- BLOCKALIGNMENTPARAMETER 125
- BLOCKANGULARCONSTRAINTPARAMETER 125
- BLOCKARRAYACTION 127
- BLOCKBASEPOINTPARAMETER 127
- BLOCKDIAMETRICCONSTRAINTPARAMETER 128
- BLOCKFLIPACTION 129
- BLOCKFLIPGRIP 129
- BLOCKFLIPPARAMETER 130
- BLOCKGRIPLOCATIONCOMPONENT 131
- BLOCKHORIZONTALCONSTRAINTPARAMETER 131
- blocklabels 61
- BLOCKLINEARCONSTRAINTPARAMETER 132
- BLOCKLINEARGRIP 133
- BLOCKLINEARPARAMETER 134
- BLOCKLOOKUPACTION 135
- BLOCKLOOKUPGRIP 136
- BLOCKLOOKUPPARAMETER 136
- BLOCKMOVEACTION 137
- BLOCKPARAMDEPENDENCYBODY 137
- BLOCKPOINTPARAMETER 137
- BLOCKPOLARGRIP 138
- BLOCKPOLARPARAMETER 139
- BLOCKPOLARSTRETCHACTION 140
- BLOCKPROPERTIESTABLE 140
- BLOCKPROPERTIESTABLEGRIP 140
- BLOCKRADIALCONSTRAINTPARAMETER 141
- BLOCKREPRESENTATION 142
- BLOCKROTATEACTION 142
- BLOCKROTATIONGRIP 143
- BLOCKROTATIONPARAMETER 143
- blocks 148, 224
- BLOCKSCALEACTION 144

- BLOCKSTRETCHACTION..... 145
 - BLOCKUSERPARAMETER..... 145
 - BLOCKVERTICALCONSTRAINTPARAMETER..... 146
 - blockvisi_desc..... 148
 - blockvisi_name..... 148
 - BLOCKVISIBILITYGRIP..... 147
 - BLOCKVISIBILITYPARAMETER..... 148
 - BLOCKXYGRIP..... 148
 - BLOCKXYPARAMETER..... 149
 - blverts..... 75
 - BODY..... 30
 - border_color_overrides_flag..... 82
 - border_lineweight_overrides_flag..... 83
 - border_overrides..... 232
 - border_type..... 232
 - border_visibility_overrides_flag..... 84
 - borderline_color..... 155
 - borderline_linewt..... 155
 - borderline_ltype..... 155
 - borders..... 226, 249
 - bottom_grid_color..... 251
 - bottom_grid_linewt..... 251
 - bottom_height..... 75
 - bottom_margin..... 183, 226
 - bottom_row..... 231
 - bottom_visibility..... 251
 - boundary_handles..... 233
 - boundary_line_color..... 155
 - boundary_linewt..... 154
 - boundary_ltype..... 154
 - box_height..... 49
 - box_width..... 49
 - branch_index..... 236
 - break_flag..... 86
 - break_flow_direction..... 86
 - break_heights..... 86
 - break_rows..... 86
 - break_size..... 179
 - break_spacing..... 86
 - break_unknown1..... 86
 - break_unknown2..... 86
 - breaks..... 235, 236
 - brightness..... 46, 90, 91, 165, 202, 210
 - bs1..... 25, 108, 115, 116, 119
 - bs2..... 25, 108
 - bulge..... 88, 234
 - bulges..... 55, 244
 - bulges_present..... 233
 - bumpmap..... 173
 - byblock..... 172
 - byblock_color..... 49
 - bylayer..... 172
 - byte..... 6
- C**
- c_prop29..... 208
 - c_prop29_int..... 208
 - c_prop2c..... 208
 - c_prop2c_int..... 208
 - c_prop33..... 209
 - c_prop33_int..... 209
 - camera_path..... 180
 - CAMERA..... 30
 - CAMERADISPLAY..... 8
 - CAMERAHEIGHT..... 8
 - canonical_media_name..... 183
 - cast_shadows..... 50
 - CECOLOR..... 8
 - cell_alignment..... 227, 250
 - cell_contents..... 253
 - cell_flag_override..... 250
 - cell_parent..... 225, 251
 - cells..... 81, 152, 198, 254
 - cellstyle..... 199, 231, 248, 254
 - cellstyle.bg_color..... 247
 - cellstyle.borders..... 248
 - cellstyle.bottom_margin..... 248
 - cellstyle.content_format..... 247
 - cellstyle.content_layout..... 247
 - cellstyle.data_flags..... 247
 - cellstyle.horiz_margin..... 248
 - cellstyle.margin_horiz_spacing..... 248
 - cellstyle.margin_override_flags..... 248
 - cellstyle.margin_vert_spacing..... 248
 - cellstyle.merge_flags..... 247
 - cellstyle.num_borders..... 248
 - cellstyle.property_override_flags..... 247
 - cellstyle.right_margin..... 248
 - cellstyle.tabledatacolumn_parent..... 248
 - cellstyle.tablerow_parent..... 248
 - cellstyle.type..... 247
 - cellstyle.vert_margin..... 248
 - cellstyle_id..... 254
 - CELLSTYLEMAP..... 152
 - CELTSCALE..... 8
 - CELTYPE..... 8
 - CELWEIGHT..... 8
 - center..... 24, 25, 30, 39, 89, 233
 - center_pt..... 26, 34, 126
 - CEPSNTYPE..... 8
 - chain_actions..... 123, 125, 126, 127, 128, 130, 132, 133, 134, 136, 138, 139, 141, 143, 146, 148, 149
 - CHAMFERA..... 8
 - CHAMFERB..... 8
 - CHAMFERC..... 9
 - CHAMFERD..... 9
 - channel_flags..... 173
 - char..... 6
 - char*..... 7
 - char_spacing..... 24
 - check_intersections..... 97, 100
 - checksum..... 245

- child_id..... 109, 116, 117, 120
- child_param..... 109, 116, 117, 120
- child_status..... 109, 116, 117, 120
- childs..... 162
- childval..... 162
- circle_zoom..... 89, 211
- CIRCLE..... 30
- class_id..... 71, 186
- class_version..... 25, 28, 29, 31, 32, 33, 34, 35, 37, 38, 41, 42, 45, 47, 49, 59, 60, 66, 68, 74, 79, 91, 92, 101, 102, 103, 104, 105, 106, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 119, 120, 121, 122, 123, 137, 152, 154, 160, 161, 162, 164, 165, 166, 167, 170, 171, 174, 177, 180, 181, 182, 184, 185, 186, 187, 188, 189, 190, 192, 194, 196, 197, 199, 216, 228, 242, 254
- classification_colorramps..... 185
- classification_colorscheme..... 68
- classname..... 112, 213, 227
- CLAYER..... 9
- clip_boundary..... 90
- clip_boundary_type..... 46, 91
- clip_inverts..... 30
- clip_mode..... 46, 91
- clip_verts..... 30, 46, 91, 195
- clipping..... 46, 91, 164
- clippings..... 67
- clone_ins_pt.. 26, 31, 33, 34, 35, 36, 38, 39, 48, 229
- cloning..... 155, 156, 213
- cloning_r14..... 156
- close_to_axis..... 74
- closed..... 233
- closed_b..... 45, 76
- closed_surfaces..... 54
- CMATERIAL..... 9
- CMLJUST..... 9
- CMLSCALE..... 9
- CMLSTYLE..... 9
- code..... 161, 223, 224, 230
- codes..... 140, 145
- col_gutter..... 240
- col_sizes..... 240
- col_spacing..... 56
- col_type..... 240
- col_width..... 240
- col_widths..... 81
- color.. 25, 49, 58, 60, 154, 168, 194, 196, 215, 232, 235, 239, 240, 241, 245, 248, 255
- color_bleed_scale..... 173
- color_bottom..... 166
- color_far..... 166
- color_middle..... 166
- color_near..... 166
- color_r11..... 255
- color_rs..... 168
- color_sky_horizon..... 166
- color_sky_zenith..... 166
- color_top..... 166
- color_underground_azimuth..... 166
- color_underground_horizon..... 166
- color1..... 237
- color2..... 238
- colorramps..... 185
- colors..... 43, 57
- colorscheme..... 226
- cols..... 153, 237
- column_heights..... 60, 181
- column_offset..... 127
- column_type..... 59, 181
- column_width..... 59, 181
- combined_state..... 130
- COMMENTS..... 258, 260
- comp_data_size..... 245
- complex_shapecode..... 236
- compression_type..... 245
- conn_pts.... 127, 129, 137, 140, 142, 144, 145, 223
- connection_line_color..... 155
- connection_linewt..... 155
- connection_ltype..... 155
- connection_string..... 153
- connections..... 224, 225
- const_width..... 55, 243
- constraint_type..... 45
- content..... 239
- content_base..... 238
- content_color..... 227, 250
- content_format..... 226, 253
- content_height..... 225
- content_layout..... 226
- content_type..... 177
- content_width..... 225
- context..... 180
- CONTEXTDATAMANAGER..... 152
- contrast..... 30, 46, 90, 91, 165, 202, 210
- control_points..... 234
- controlled_objdep..... 255
- coord_proj_radius..... 163
- coord_system_datum..... 163
- coord_system_def..... 163
- coord_system_wkt..... 163
- coord_type..... 163
- COORDS..... 9
- corner_decel..... 180
- corner1..... 22, 76, 88
- corner2..... 22, 76, 88
- corner3..... 22, 76, 88
- corner4..... 22, 76, 88
- CPSNID..... 9
- crc32..... 245
- crease..... 56
- crop_plane..... 242
- crop_x_dir..... 242
- crop_y_dir..... 242
- croppings..... 69
- cross_sections..... 54
- crosssects..... 98
- CSACDOCUMENTOPTIONS..... 152

- CSHADOW 9
 ctrl_pts 45, 77
 ctrl_tol 45, 77
 ctx 60
 cur_colorscheme 68
 curr_type 194
 curve_type 70, 71, 233
 CURVEPATH 152
 custom_data 254
 customdata 153, 252
 customdata_items 252, 254
 cv_hull_display 64
- D**
- d_node 104, 105, 115, 121
 dashes 172, 233
 dashes_r11 172
 data 64, 72, 186, 201, 218
 data_3dpoint 252
 data_adapter 152
 data_algn_offset 223
 data_date 252
 data_double 252
 data_flags 225
 data_handle 252
 data_horiz_bottom_color 83
 data_horiz_bottom_linewt 84
 data_horiz_bottom_visibility 85
 data_horiz_ins_color 83
 data_horiz_ins_linewt 84
 data_horiz_ins_visibility 85
 data_horiz_top_color 83
 data_horiz_top_linewt 84
 data_horiz_top_visibility 85
 data_link 252
 data_long 252
 data_numbits 72, 186
 data_point 252
 data_row_alignment 82
 data_row_color 81
 data_row_fill_color 82
 data_row_fill_none 81
 data_row_height 82
 data_row_style_override 86
 data_size 64, 72, 186, 201, 219, 220, 251
 data_string 252
 data_text_style 82
 data_type 249, 251
 data_vert_ins_color 83
 data_vert_ins_linewt 84
 data_vert_ins_visibility 85
 data_vert_left_color 83
 data_vert_left_linewt 84
 data_vert_left_visibility 85
 data_vert_right_color 83
 data_vert_right_linewt 84
 data_vert_right_visibility 85
- dataflags 28, 29, 86
 DATALINK 152
 DATATABLE 153
 dates 197
 datidx 218
 datidx_segidx 218
 day 153
 DBCOLOR 153
 decomp_data_size 245
 def_base_angle_pt 144
 def_basept 123, 125, 126, 128, 130, 132, 133, 134, 139, 141, 143, 146, 149
 def_classification_colorscheme 185
 def_elevation_colorscheme 185
 def_endpt .. 123, 125, 126, 128, 130, 132, 133, 134, 139, 141, 143, 146, 149
 def_intensity_colorscheme 184
 def_label_pt 131, 138
 def_pt .. 25, 31, 32, 33, 34, 36, 37, 38, 47, 128, 136, 138, 146, 148, 160, 228, 241
 default_flag 59
 default_lighting_type 90
 default_lightning_type 202, 210
 default_text 239
 default_value 27
 defaultid 156
 definition 62
 definition_id 30
 deflines 44, 58
 degree 44, 76, 234
 DELOBJ 9
 dep 106, 110, 111, 114, 123, 216
 dep_body 109
 dep_on 109
 depbodyid 109
 dependency 124, 126, 129, 132, 133, 142, 147
 dependent 142, 145
 dependent_on_compound_object 112
 depid 216
 deps ... 103, 104, 113, 122, 127, 129, 135, 137, 140, 142, 144, 145, 217
 desc 122, 154, 191, 224
 description 151, 152, 171, 172, 174, 178, 179, 187, 191, 197, 203, 237
 design_pt 163
 dest_pt 232
 destblock 246
 destfile 246
 destination 190
 DETAILVIEWSTYLE 154
 DGNDEFINITION 213
 DGNFRAME 9
 DGNUNDERLAY 30
 di_unknown 220
 diagnostics_bsp_mode 176
 diagnostics_grid_float 176
 diagnostics_grid_mode 176
 diagnostics_mode 176

- diagnostics_photon_mode..... 176
- diagnostics_samples_mode..... 177
- DICTIONARY..... 155
- DICTIONARY_ACAD_GROUP..... 9
- DICTIONARY_ACAD_MLINESSTYLE..... 9
- DICTIONARY_COLOR..... 9
- DICTIONARY_LAYOUT..... 9
- DICTIONARY_LIGHTLIST..... 9
- DICTIONARY_MATERIAL..... 9
- DICTIONARY_NAMED_OBJECT..... 9
- DICTIONARY_PLOTSETTINGS..... 9
- DICTIONARY_PLOTSTYLENAME..... 9
- DICTIONARY_VISUALSTYLE..... 9
- DICTIONARYVAR..... 156
- DICTIONARYWDFLT..... 156
- diffuse_color..... 172
- diffusemap..... 172
- dim_rotation..... 37
- DIMADEC..... 9, 159
- DIMALT..... 9, 157
- DIMALTD..... 9, 157
- DIMALTF..... 10, 158
- DIMALTMZF..... 10, 159
- DIMALTMZS..... 10, 159
- DIMALTRND..... 10, 159
- DIMALTTD..... 10, 158
- DIMALTTZ..... 10, 159
- DIMALTU..... 10, 158
- DIMALTZ..... 10, 159
- DIMAPOST..... 10, 158
- DIMAPOST_T..... 10
- DIMARCSYM..... 10, 158
- DIMASO..... 10
- DIMASSOC..... 10, 156
- dimasz..... 49
- DIMASZ..... 10, 158
- dimatfit..... 241
- DIMATFIT..... 10, 159
- DIMAUNIT..... 10, 158
- DIMAZIN..... 10, 158
- dimbase_version..... 110, 137
- DIMBLK..... 10, 160
- DIMBLK_T..... 10, 158
- DIMBLK1..... 10, 160
- DIMBLK1_T..... 10, 159
- DIMBLK2..... 10, 160
- DIMBLK2_T..... 10, 159
- DIMCEN..... 10, 158
- DIMCLRD..... 10, 159
- DIMCLRD_C..... 10
- DIMCLRD_N..... 159
- DIMCLRE..... 10, 159
- DIMCLRE_C..... 11
- DIMCLRE_N..... 159
- DIMCLRT..... 11, 159
- DIMCLRT_C..... 11
- DIMCLRT_N..... 159
- DIMDEC..... 11, 158
- DIMDLE..... 11, 158
- DIMDLI..... 11, 158
- DIMDSEP..... 11, 159
- dimension..... 102, 160, 182, 187
- dimension_x..... 189
- dimension_y..... 189
- DIMENSION_ALIGNED..... 31
- DIMENSION_ANG2LN..... 32
- DIMENSION_ANG3PT..... 33
- DIMENSION_DIAMETER..... 34
- DIMENSION_LINEAR..... 35
- DIMENSION_ORDINATE..... 37
- DIMENSION_RADIUS..... 38
- dimensionobj..... 156
- DIMEXE..... 11, 158
- DIMEXO..... 11, 158
- DIMFIT..... 11, 157
- DIMFRAC..... 11, 159
- DIMFXL..... 11, 158
- DIMFXLON..... 11, 159
- dingap..... 49, 87
- DIMGAP..... 11, 158
- DIMJOGANG..... 11, 158
- DIMJUST..... 11, 157
- DIMLDRBLK..... 11, 160
- DIMLFAC..... 11, 158
- DIMLIM..... 11, 157
- dimline_pt..... 102
- DIMLTEX1..... 11, 160
- DIMLTEX2..... 11, 160
- DIMLTYPE..... 11, 160
- DIMLUNIT..... 11, 159
- DIMLWD..... 11, 159
- DIMLWE..... 11, 159
- DIMMALTZ..... 11, 157
- DIMMALTZ..... 11, 157
- DIMMZS..... 11, 159
- DIMMZF..... 11, 159
- DIMMZS..... 11, 159
- dimosxd..... 241
- DIMPOST..... 12, 158
- DIMPOST_T..... 12
- DIMRND..... 12, 158
- DIMSAH..... 12, 157
- DIMSAV..... 12
- DIMSCALE..... 12, 158
- DIMSD1..... 12, 157
- DIMSD2..... 12, 157
- DIMSE1..... 12, 157
- DIMSE2..... 12, 157
- DIMSHO..... 12
- DIMSOXD..... 12, 157
- dimstyle.. 26, 32, 33, 34, 35, 36, 38, 39, 48, 49, 87, 229
- DIMSTYLE..... 12, 156
- DIMSTYLE_CONTROL..... 160
- DIMSTYLE_CONTROL_OBJECT..... 12
- DIMTAD..... 12, 157
- DIMTDEC..... 12, 158

- DIMTFAC..... 12, 158
- DIMTFILL..... 12, 158
- DIMTFILLCLR..... 12, 158
- DIMTIH..... 12, 157
- dimtix..... 241
- DIMTIX..... 12, 157
- dimtmove..... 241
- DIMTM..... 12, 158
- DIMTMOVE..... 12, 159
- dimtofl..... 241
- DIMTOFL..... 12, 157
- DIMTOH..... 12, 157
- DIMTOL..... 12, 157
- DIMTOLJ..... 12, 157
- DIMTP..... 12, 158
- DIMTSZ..... 12, 158
- DIMTVP..... 12, 158
- DIMTXSTY..... 12, 160
- DIMTXT..... 13, 158
- DIMTXTDIRECTION..... 13, 159
- DIMTZIN..... 13, 157
- DIMUNIT..... 13, 157
- DIMUPT..... 13, 157
- DIMZIN..... 13, 157
- direction..... 96, 99, 100, 239
- displacement..... 216
- display_boundary_on..... 195
- display_brightness..... 206
- display_brightness_bl..... 206
- display_brightness_int..... 206
- display_frame..... 213
- display_image..... 167
- display_index..... 174, 187, 189, 191
- display_location.... 127, 129, 135, 137, 140, 142, 144, 145
- display_name..... 154, 191
- display_props..... 46, 91, 164
- display_settings..... 206
- display_settings_int..... 206
- display_shadow_type..... 207
- display_shadow_type_int..... 207
- DISPSILH..... 13
- dist_center..... 225
- dist_top_left..... 225
- distance..... 121, 129, 135, 142
- distance_desc..... 135, 139
- distance_name..... 135, 139
- distance_value_set..... 140
- dlevel..... 55
- DMDIMOBJECTCONTEXTDATA..... 160
- do_sea_level_corr..... 163
- dogleg_length..... 236
- dogleg_vector..... 236
- double..... 6, 7
- double[3]..... 7
- double_flag..... 44, 58
- double_line_spacing..... 232
- draft_angle..... 41, 74, 79, 96, 99, 100
- draft_end_distance..... 41, 74, 79
- draft_start_distance..... 41, 74, 79
- DRAGMODE..... 13
- DRAGVS..... 13
- drawing_units..... 184, 191
- ds_version..... 218, 223
- DUMMY..... 160
- DWFDEFINITION..... 213
- DWFFRAME..... 13
- DWFUNDERLAY..... 39
- dwg..... 255, 257
- Dwg_3DSOLID_material..... 214
- Dwg_3DSOLID_silhouette..... 214
- Dwg_3DSOLID_wire..... 214
- Dwg_AcDs..... 218
- Dwg_AcDs_Data..... 219
- Dwg_AcDs_Data_Record..... 220
- Dwg_AcDs_Data_RecordHdr..... 220
- Dwg_AcDs_DataBlob..... 219
- Dwg_AcDs_DataBlob01..... 219
- Dwg_AcDs_DataBlobRef..... 219
- Dwg_AcDs_DataBlobRef_Page..... 220
- Dwg_AcDs_DataIndex..... 220
- Dwg_AcDs_DataIndex_Entry..... 220
- Dwg_AcDs_Schema..... 220
- Dwg_AcDs_Schema_Prop..... 222
- Dwg_AcDs_SchemaData..... 221
- Dwg_AcDs_SchemaData_UProp..... 221
- Dwg_AcDs_SchemaIndex..... 221
- Dwg_AcDs_SchemaIndex_Prop..... 221
- Dwg_AcDs_Search..... 222
- Dwg_AcDs_Search_Data..... 222
- Dwg_AcDs_Search_IdIdx..... 222
- Dwg_AcDs_Search_IdIdxs..... 222
- Dwg_AcDs_Segment..... 223
- Dwg_AcDs_SegmentIndex..... 223
- Dwg_ACSH_HistoryNode..... 215
- Dwg_ACSH_SubentColor..... 215
- Dwg_ACSH_SubentMaterial..... 216
- Dwg_ACTIONBODY..... 216
- Dwg_ARRAYITEMLOCATOR..... 216
- Dwg_ASSOCACTION_Deps..... 216
- Dwg_ASSOCACTIONBODY_action..... 216
- Dwg_ASSOCARRAYITEM..... 216
- Dwg_ASSOCPARAMBASEDACTIONBODY..... 217
- Dwg_ASSOCSURFACEACTIONBODY..... 217
- Dwg_BLOCKACTION_connectionpts..... 223
- Dwg_BLOCKLOOKUPACTION_lut..... 223
- Dwg_BLOCKPARAMETER_connection..... 224
- Dwg_BLOCKPARAMETER_PropInfo..... 223
- Dwg_BLOCKPARAMVALUESET..... 224
- Dwg_BLOCKVISIBILITYPARAMETER_state..... 224
- Dwg_CellContentGeometry..... 225
- Dwg_CellStyle..... 225
- Dwg_ColorRamp..... 226
- Dwg_COMPOUNDOBJECTID..... 224
- Dwg_CONSTRAINTGROUPNODE..... 224
- Dwg_ContentFormat..... 226

Dwg_CONTEXTDATA_dict	225	Dwg_SUNSTUDY_Dates	246
Dwg_CONTEXTDATA_submgr	225	Dwg_TABLE_AttrDef	249
Dwg_DATALINK_customdata	227	Dwg_TABLE_BreakHeight	249
Dwg_DATATABLE_column	227	Dwg_TABLE_BreakRow	249
Dwg_DATATABLE_row	227	Dwg_TABLE_Cell	249
Dwg_DIMASSOC_Ref	227	Dwg_TABLE_CustomDataItem	251
Dwg_DIMENSION_common	228	Dwg_TABLE_value	251
Dwg_EVAL_Edge	229	Dwg_TableCell	252
Dwg_EVAL_Node	230	Dwg_TableCellContent	253
Dwg_EvalExpr	230	Dwg_TableCellContent_Attr	253
Dwg_EvalVariant	230	Dwg_TableDataColumn	254
Dwg_FIELD_ChildValue	231	Dwg_TABLEGEOMETRY_Cell	247
Dwg_FileDepList_Files	231	Dwg_TableRow	254
Dwg_FormattedTableData	231	Dwg_TABLESTYLE_border	248
Dwg_FormattedTableMerged	231	Dwg_TABLESTYLE_CellStyle	247
Dwg_GEODATA_meshface	232	Dwg_TABLESTYLE_rowstyles	248
Dwg_GEODATA_mesht	232	Dwg_UCS_orthopts	254
Dwg_GridFormat	232	Dwg_VALUEPARAM	254
Dwg_HATCH_Color	232	Dwg_VALUEPARAM_vars	255
Dwg_HATCH_ControlPoint	232	DWG_ERR_CLASSESNOTFOUND	271
Dwg_HATCH_DefLine	232	DWG_ERR_INTERNALERROR	271
Dwg_HATCH_Path	233	DWG_ERR_INVALIDDDWG	271
Dwg_HATCH_PathSeg	233	DWG_ERR_INVALIDDEED	271
Dwg_HATCH_PolylinePath	234	DWG_ERR_INVALIDHANDLE	271
Dwg_LAYER_entry	234	DWG_ERR_INVALIDIDTYPE	271
Dwg_LEADER_ArrowHead	234	DWG_ERR_IOERROR	271
Dwg_LEADER_BlockLabel	235	DWG_ERR_NOTYETSUPPORTED	271
Dwg_LEADER_Break	235	DWG_ERR_OUTOFMEM	271
Dwg_LEADER_Line	235	DWG_ERR_PAGENOTFOUND	271
Dwg_LEADER_Node	235	DWG_ERR_SECTIONNOTFOUND	271
Dwg_LIGHTLIST_light	236	DWG_ERR_UNHANDLEDCLASS	271
Dwg_LinkedData	237	DWG_ERR_VALUEOUTOFBOUNDS	271
Dwg_LinkedTableData	237	DWG_ERR_WRONGCRC	271
Dwg_LTYPE_dash	236	DWGCODEPAGE	13
Dwg_LWPOLYLINE_width	237	DYNAMICBLOCKPROXYNODE	160
Dwg_MATERIAL_color	237	DYNAMICBLOCKPURGEPREVENTER	161
Dwg_MATERIAL_gentexture	237		
Dwg_MATERIAL_mapper	237		
Dwg_MESH_edge	238	E	
Dwg_MLEADER_AnnotContext	238	e1	229
Dwg_MLEADER_Content	255	e2	229
Dwg_MLEADER_Content_Block	239	e3	229
Dwg_MLEADER_Content_MText	239	edge_color	205
Dwg_MLINE_line	241	edge_color_int	205
Dwg_MLINE_vertex	241	edge_crease_angle	205
Dwg_MLINESTYLE_line	240	edge_crease_angle_int	205
Dwg_OCD_Dimension	241	edge_do_hide_precision	206
Dwg_PARTIAL_VIEWING_INDEX_Entry	242	edge_do_hide_precision_int	206
Dwg_POINTCLOUD_Clippings	243	edge_flags	230
Dwg_POINTCLOUD_IntensityStyle	243	edge_halo_gap	206
Dwg_POINTCLOUDCOLORMAP_Ramp	242	edge_halo_gap_int	206
Dwg_POINTCLOUDINDEX_Croppings	242	edge_intersection_color	204
Dwg_PROXY_LWPOLYLINE	243	edge_intersection_color_int	205
Dwg_R2004_Header	244	edge_intersection_ltype	205
Dwg_SECTION_geometrysettings	245	edge_intersection_ltype_int	205
Dwg_SECTION_typesettings	246	edge_isolines	206
Dwg_SPLINE_control_point	246	edge_isolines_int	206
Dwg_SummaryInfo_Property	247	edge_jitter	206

- edge_jitter_int 206
- edge_model 204
- edge_model_int 204
- edge_modifier 205
- edge_modifier_int 205
- edge_obscured_color 205
- edge_obscured_color_int 205
- edge_obscured_ltype 205
- edge_obscured_ltype_int 205
- edge_opacity 205
- edge_opacity_int 205
- edge_overhang 205
- edge_overhang_int 205
- edge_silhouette_color 206
- edge_silhouette_color_int 206
- edge_silhouette_width 206
- edge_silhouette_width_int 206
- edge_style 204
- edge_style_apply 206
- edge_style_apply_int 206
- edge_style_int 204
- edge_transparency 246
- edge_visualstyle 255
- edge_width 205
- edge_width_int 205
- edge_wiggle 209
- edge_wiggle_int 209
- edges 56, 95, 97, 161
- eed 255, 257
- eed1071 123, 124, 125, 126, 127, 128, 129, 130, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149
- elevation 26, 27, 28, 31, 32, 33, 34, 36, 37, 38, 43, 47, 55, 57, 70, 76, 86, 88, 228, 243
- elevation_apply_to_fixed_range 69
- elevation_as_gradient 69
- elevation_max 68
- elevation_min 68
- elevation_out_of_range_behavior 69
- elevation_r11 255
- ELEVATION 13
- ELLIPSE 39
- enable 167
- enable_context 180
- enable_frame_text 43
- enabled 112
- encr_sat_data .. 22, 40, 52, 62, 65, 72, 77, 93, 106
- end 52, 235, 237, 249
- end_angle 24, 25, 39, 180, 233
- end_draft_angle 54
- end_draft_dist 96, 100
- end_draft_magnitude 54
- end_line_length 193
- end_line_overshoot 193
- end_marker 23, 41, 53, 63, 66, 73, 78, 94, 108
- end_pt 126
- end_tan_vec 44, 76
- end_tangent 234
- end_time 197
- end_width 70, 88
- endblk_entity 152
- ENDBLK 39
- ENDCAPS 13
- endpoint 234
- endpt .. 124, 125, 126, 129, 131, 132, 133, 135, 139, 142, 144, 147, 150
- endptproj 48, 171
- endsetbacks 97
- energy_multiplier 177
- entities 152
- entity 120, 152
- entmode 255
- entries 103, 150, 160, 169, 172, 182, 196, 201, 203, 212, 220, 225
- entry_size 220
- ents 194
- environ_image_enabled 174, 187, 190, 191
- environ_image_filename 174, 187, 190, 191
- evalexpr 92, 94, 95, 97, 98, 99, 101, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 161, 230
- evaluation_error_code 162
- evaluation_error_msg 162
- evaluation_option 162
- evaluation_status 162
- EVALUATION_GRAPH 161
- evaluator 122
- evaluatorid 216
- explodable 151
- export_mi_enabled 176
- expr 146
- expr_description 124, 126, 129, 132, 133, 142, 147
- expr_name 124, 126, 129, 132, 133, 142, 147
- expression 216
- exprs 135
- ext_lighting_model 203
- extents_height 59, 181
- extents_max 67, 68, 185, 186, 242
- extents_min 67, 68, 185, 242
- extents_width 59, 181
- extlight_length 51
- extlight_radius 51
- extlight_shape 51
- extlight_width 51
- EXTMAX 13, 170
- EXTMIN 13, 170
- EXTNAMES 13
- extra_acis_data .. 23, 40, 53, 63, 65, 73, 78, 93, 107
- extra_r11 255
- EXTRUDESURFACE 39
- extrusion 24, 25, 27, 28, 30, 31, 32, 33, 34, 36, 37, 38, 39, 43, 46, 47, 48, 52, 55, 56, 57, 58, 66, 70, 74, 76, 80, 87, 88, 195, 228, 243

F

- face_color_mode 204
- face_color_mode_int 204
- face_lighting_model 204
- face_lighting_model_int 204
- face_lighting_quality 204
- face_lighting_quality_int 204
- face_modifier 204
- face_modifier_int 204
- face_mono_color 204
- face_mono_color_int 204
- face_opacity 204
- face_opacity_int 204
- face_specular 204
- face_specular_int 204
- face_transparency 246
- face_visualstyle 255
- face1 232
- face2 232
- face3 232
- faces 55
- FACETRES 13
- factor 237
- fade 30, 46, 91, 165
- falloff_angle 50
- FASTZOOM 211
- FCFOBJECTCONTEXTDATA 161
- fdata 80, 198
- feature_index 231
- feature_location_pt 38, 182
- fg_ray_count 176
- fg_sample_radius_state1 176
- fg_sample_radius_state2 176
- fg_sample_radius_state3 176
- fg_sample_radius1 176
- fg_sample_radius2 176
- field_length 28, 29
- field_refs 237
- field_state 162
- fields 162
- FIELD 161
- FIELDLIST 162
- file_header_size 218
- file_ID_string[12] 244
- file_path 167
- file_signature 218
- file_size 218
- filename 30, 168, 213, 231, 237
- filepath 231
- filesize 231
- filing_option 162
- fill_color 179, 249
- FILLETRAD 13
- FILLMODE 13
- filter_height 188
- filter_type 188
- filter_width 188
- final_gathering_enabled 176
- fingerprint 231
- FINGERPRINTGUID 13
- first_arc_pt 35, 39, 48, 160, 187
- first_attrib 47, 56, 85
- first_endpoint 233
- first_entity 151
- first_nodeid 161
- first_nodeid_copy 161
- first_seg_angle 177
- first_vertex 69, 70, 71
- fit_pts 45, 77
- fit_to_screen 168
- fit_tol 44, 76
- fitpts 234
- flag 26, 30, 31, 32, 33, 35, 36, 37, 38, 44, 47, 54, 64, 70, 71, 76, 88, 102, 142, 146, 150, 156, 161, 168, 170, 171, 179, 191, 195, 200, 201, 210, 212, 228, 233, 237, 249, 252
- flag_for_table_value 81
- flag_r11 255
- flag0 159
- flag1 26, 31, 32, 33, 35, 36, 37, 38, 47, 228
- flag2 38, 151
- flag3 151
- flags .. 28, 29, 57, 60, 62, 74, 75, 153, 154, 181, 192, 199, 200, 217, 221, 222, 224, 235, 243, 245, 249, 251
- FLAGS 13
- flip_arrow1 26, 31, 33, 34, 35, 36, 38, 39, 48, 229, 242
- flip_arrow2 26, 31, 33, 34, 35, 36, 38, 39, 48, 229, 242
- flip_label 131
- flip_label_desc 131
- FLIPPARAMETERENTITY 42
- flipped_state_label 131
- flow 240
- flow_dir 58
- flow_direction 81, 199
- flow_reversed 60, 181
- fog_background_enabled 174, 187, 189, 191
- fog_color 189
- fog_density_far 190
- fog_density_near 190
- fog_distance_far 190
- fog_distance_near 190
- fog_enabled 174, 187, 189, 191
- font 25
- font_19 25
- font_file 196
- format 162
- format_flags 251
- format_string 249, 252
- frame_rate 180
- frames 180
- from_dxf 71, 186
- front_clip_on 195
- front_clip_z 89, 195, 202, 210
- frozen 168

frozen_in_new 168
 frozen_layers 90
 full_visualstyle 255

G

gap_array_size 245
 generation 27, 29, 87, 196, 246
 genprocname 173, 237
 genproctableend 174
 genproctype 173
 genprocvalbool 174
 genprocvalcolor 174
 genprocvalint 174
 genprocvalreal 174
 genprocvaltext 174
 gentextures 174
 geo_rss_tag 163
 GEODATA 162
 geoiimage_brightness 165
 geoiimage_contrast 165
 geoiimage_fade 165
 geoiimage_height 165
 geoiimage_position 165
 geoiimage_width 165
 geom 246
 geom_data_flag 247, 253
 geom_parent 225
 geom_shader_usage 200
 GEOMAPIMAGE 164
 geomesh_faces 164
 geomesh_pts 164
 geometry 247, 253
 geometry_status 103, 104, 113, 122
 GEOPOSITIONMARKER 42
 gi_photons_per_light 176
 gi_sample_count 175
 gi_sample_radius 175
 gi_sample_radius_enabled 175
 global_illumination_enabled 175
 glyph_display_type 51
 gradient_angle 43, 57
 gradient_name 43, 57
 gradient_shift 43, 57
 gradient_tint 43, 57
 GRADIENT_BACKGROUND 165
 grid_flags 211
 grid_major 89, 211
 GRIDMODE 13, 211
 GRIDUNIT 13, 89, 211
 grip_expr 131
 grip_status 217
 grip_type 131
 GROUND_PLANE_BACKGROUND 166
 groups 166
 GROUP 166
 guide_curves 54
 guides 98

gutter 59, 181

H

h_nodeid 98
 h1 103, 217
 h2 217
 h330_2 109, 116, 117, 120
 h330_3 109, 116, 117, 120
 HALOGAP 13
 handedness 45
 handle 220, 222, 225, 234, 236, 253, 255
 handlerref 257
 HANDLING 13
 HANDSEED 13
 hardowner 153
 has_action 110
 has_align_start 96, 100
 has_arrow2 242
 has_attribs 46, 56, 80
 has_bgcolor 249
 has_border_color_overrides 82
 has_border_linewidth_overrides 83
 has_border_visibility_overrides 84
 has_break_data 86
 has_child_param 109, 115, 116, 120
 has_civil_data 164
 has_content_blk 239
 has_content_format_overrides 253
 has_content_txt 239
 has_derived 44
 has_dogleg 60, 178, 236
 has_ds_data 255, 257
 has_edge_visualstyle 255
 has_entries 182
 has_face_visualstyle 256
 has_full_visualstyle 256
 has_geom_data 253
 has_graph 161
 has_h1 217
 has_landing 60, 178
 has_lastleaderlinepoint 236
 has_lastpt_ref 228
 has_leader 27
 has_linked_data 252
 has_name 109
 has_no_flags 22
 has_object 224
 has_photometric_data 50
 has_predefined 174, 188, 191
 has_reflection 215
 has_revision_guid 24, 41, 53, 63, 66, 73, 78, 94,
 108
 has_rotation 215
 has_shadow 197
 has_shear 215
 has_strings_area 172
 has_t78 122

- has_table_overrides..... 81
 - has_target_grip..... 51
 - has_text_frame..... 61, 178
 - has_vertex..... 69, 70, 71
 - has_webfile..... 50
 - has_wires..... 214
 - hasattrs..... 151
 - hatch_angle..... 246
 - hatch_angles..... 193
 - hatch_bg_color..... 193
 - hatch_color..... 193
 - hatch_pattern..... 193, 246
 - hatch_scale..... 193, 246
 - hatch_spacing..... 246
 - hatch_transparency..... 193
 - hatch_type..... 246
 - HATCH..... 43
 - hdls..... 140, 145, 195
 - header_address..... 244
 - header_horiz_bottom_color..... 83
 - header_horiz_bottom_linewt..... 84
 - header_horiz_bottom_visibility..... 85
 - header_horiz_ins_color..... 83
 - header_horiz_ins_linewt..... 84
 - header_horiz_ins_visibility..... 85
 - header_horiz_top_color..... 83
 - header_horiz_top_linewt..... 84
 - header_horiz_top_visibility..... 85
 - header_row_alignment..... 82
 - header_row_color..... 81
 - header_row_fill_color..... 82
 - header_row_fill_none..... 81
 - header_row_height..... 82
 - header_row_style_override..... 86
 - header_size..... 244
 - header_suppressed..... 81
 - header_text_style..... 82
 - header_vert_ins_color..... 83
 - header_vert_ins_linewt..... 84
 - header_vert_ins_visibility..... 85
 - header_vert_left_color..... 83
 - header_vert_left_linewt..... 84
 - header_vert_left_visibility..... 85
 - header_vert_right_color..... 83
 - header_vert_right_linewt..... 84
 - header_vert_right_visibility..... 85
 - height..... 27, 29, 74, 87, 89, 92, 95, 98, 101, 165,
166, 225, 240, 249, 254
 - height_w_gap..... 247, 253
 - HELIX..... 44
 - hexindex..... 245
 - HIDETEXT..... 13
 - highlevel_info..... 190
 - history_id..... 23, 41, 53, 63, 66, 73, 78, 94, 108
 - history_node..... 92, 94, 95, 97, 98, 99, 101
 - hookline_dir..... 49
 - hookline_on..... 49
 - hor_dir..... 86
 - horiz_alignment..... 27, 29, 87
 - horiz_cell_margin..... 81, 199
 - horiz_dir... 26, 31, 32, 33, 35, 36, 37, 38, 47, 161,
229
 - horiz_direction..... 81
 - horiz_margin..... 226
 - horizon..... 166
 - horizontal_mode..... 180, 200
 - host_block..... 163
 - host_drawing_visibility..... 182
 - hotspot_angle..... 50
 - hour..... 153
 - hours..... 198
 - HYPERLINKBASE..... 13, 258, 260
- ## I
- IBL_BACKGROUND..... 166
 - id..... 74, 88, 89, 161, 229, 230, 247
 - IDBUFFER..... 167
 - identifier_color..... 154, 192
 - identifier_exclude_characters..... 154, 192
 - identifier_height..... 154, 192
 - identifier_offset..... 154, 192
 - identifier_placement..... 154
 - identifier_position..... 192
 - identifier_style..... 154, 192
 - ididx..... 222, 223
 - ididxs..... 222
 - idxfrom..... 238
 - idxto..... 238
 - ignore_attachment..... 59
 - illuminance_dist..... 50
 - illumination_model..... 173
 - image_file..... 165
 - image_file_name..... 188
 - image_frame..... 188
 - image_height..... 165, 190
 - image_quality..... 188
 - image_size..... 167
 - image_visibility..... 165
 - image_width..... 165, 190
 - IMAGE_BACKGROUND..... 167
 - imagedef..... 46, 91
 - imagedefreactor..... 46, 91
 - IMAGE..... 45
 - IMAGEDEF..... 167
 - IMAGEDEF_REACTOR..... 167
 - increment..... 224
 - index..... 112, 137, 221, 249, 254
 - index_mask..... 232
 - INDEX..... 168
 - INDEXCTL..... 13
 - indicator_alpha..... 75
 - indicator_color..... 75
 - indirect_bump_scale..... 173
 - ins_pt... 27, 28, 30, 46, 56, 58, 75, 80, 86, 87, 123,
180, 181, 200

- ins_rotation.. 26, 31, 32, 34, 35, 36, 37, 38, 47, 229
 - ins_scale... 26, 31, 32, 34, 35, 36, 37, 38, 47, 229
 - INSBASE..... 14, 169
 - insert_units 151
 - inserts 152
 - INSERT..... 46
 - inspt_offset..... 48, 171
 - INSUNITS..... 14
 - intensity..... 50, 196
 - intensity_as_gradient 69
 - intensity_colorscheme 68
 - intensity_high_treshold..... 243
 - intensity_low_treshold..... 243
 - intensity_max 69
 - intensity_min 68
 - intensity_out_of_range_behavior..... 69
 - intensity_scheme 67
 - intensity_style 67
 - INTERFERECOLOR 14
 - INTERFEREOBJVS 14
 - INTERFEREVPVS 14
 - internal_only 203
 - INTERSECTIONCOLOR..... 14
 - INTERSECTIONDISPLAY..... 14
 - interval 198
 - intsectobj..... 228
 - inverse_transform..... 195
 - invis_flags..... 22
 - invisible..... 256
 - ipe_alignment 61
 - is_annotative..... 61, 179
 - is_associative..... 43, 58
 - is_attached_to_object 109
 - is_autofit_flag..... 250
 - is_bg_fill..... 240
 - is_bg_mask_fill..... 240
 - is_blob01..... 223
 - is_camera_plottable 203
 - is_ccw..... 233
 - is_changed..... 179
 - is_close_to_axis 99
 - is_col_flow_reversed..... 240
 - is_def_textloc 241
 - is_default..... 101, 102, 123, 160, 161, 170, 177,
180, 181, 182, 186, 187, 200, 234
 - is_default_transmatrix..... 217
 - is_delegating_to_owning_action..... 109
 - is_dst 197
 - is_face_variable 216
 - is_gradient_fill 43, 57
 - is_hardowner..... 155, 156
 - is_header_suppressed 199
 - is_height_auto 240
 - is_initialized..... 148
 - is_inside..... 242
 - is_inverted..... 242, 243
 - is_live 194
 - is_loaded..... 167, 185
 - is_locked..... 68
 - is_merged_value..... 249
 - is_modified_for_recompute..... 154, 191
 - is_neg_textdir 61
 - is_normal_reversed..... 239
 - is_not_annotative..... 59
 - is_on..... 196, 212
 - is_owned..... 216
 - is_partial..... 27
 - is_periodic..... 234
 - is_photometric 50
 - is_pspace..... 202
 - is_r2013... 105, 106, 108, 110, 111, 114, 115, 116,
119, 123
 - is_rational..... 234
 - is_read_dep..... 109
 - is_reverse..... 25
 - is_semi_assoc 217
 - is_semi_ovr..... 217
 - is_shape..... 196
 - is_shx..... 25
 - is_solid..... 42, 79
 - is_solid_fill..... 43, 57
 - is_text_extended..... 62
 - is_title_suppressed 199
 - is_underlined 25
 - is_unit_scale 191
 - is_vertical..... 196
 - is_watertight 55
 - is_write_dep..... 109
 - is_xdic_missing 256, 257
 - is_xref_dep..... 102, 151, 157, 168, 171, 196, 201,
202, 210, 212
 - is_xref_ref..... 102, 150, 157, 168, 171, 195, 200,
202, 210, 212
 - is_xref_resolved... 102, 150, 157, 168, 171, 196,
200, 202, 210, 212
 - isbylayerlt..... 256
 - isoline_present.. 23, 40, 52, 62, 65, 72, 77, 93, 107
 - isolines 23, 40, 52, 62, 65, 72, 77, 93, 107
 - ISOLINES..... 14
 - itemhandle..... 225
 - itemhandles..... 156
 - itemloc[3] 216
 - itemloc1..... 216
 - itemloc2..... 216
 - itemloc3..... 216
 - items..... 106, 213
- ## J
- jog_point 48, 187
 - JOINSTYLE 14
 - julian_day..... 197, 246
 - justification..... 56, 61

K

key..... 231
 KEYWORDS 258, 260
 kind_r11..... 256
 knot_tol..... 45, 77
 knotparam..... 44, 76
 knots..... 45, 77, 234

L

12..... 217
 14..... 217
 15..... 217
 label_text..... 235
 label_viewports..... 198
 lamp_color_preset..... 51
 lamp_color_rgb..... 51
 lamp_color_temp..... 51
 lamp_color_type..... 50
 landing_dist..... 60, 178
 landing_gap..... 43, 178, 238
 LARGE_RADIAL_DIMENSION..... 47
 last_attrib..... 47, 56, 85
 last_entity..... 152
 last_height..... 196
 last_section_address..... 244
 last_section_id..... 244
 last_updated..... 168, 169, 195
 last_vertex..... 69, 70, 71
 lastleaderlinepoint..... 236
 lastpt_ref..... 228
 LASTSAVEDBY..... 258, 260
 LATITUDE..... 14
 layer..... 245, 256
 layer_r11..... 256
 LAYER..... 168
 LAYER_CONTROL..... 169
 LAYER_CONTROL_OBJECT..... 14
 LAYER_INDEX..... 169
 LAYERFILTER..... 169
 layout..... 152
 layout_flags..... 169
 layout_name..... 169
 LAYOUT..... 169
 LAYOUTPRINTCONFIG..... 170
 ldata..... 80, 198
 leader_endpt..... 38, 182
 leader_len..... 35, 39, 48
 leader_order..... 177
 leader1_pt..... 27
 leader2_pt..... 27
 leaders..... 238
 LEADER..... 48
 LEADEROBJECTCONTEXTDATA..... 170
 left_col..... 231
 left_grid_color..... 251
 left_grid_linewt..... 251
 left_margin..... 183

left_offset..... 24
 left_visibility..... 251
 length..... 92, 101, 236
 lens_length..... 89, 202, 210
 LENSLENGTH..... 14
 light_count..... 189
 light_luminance_scale..... 176
 LIGHTGLYPHDISPLAY..... 14
 lighting_model..... 188
 LIGHTLIST..... 171
 lights..... 171
 LIGHT..... 49
 LIMCHECK..... 14
 LIMMAX..... 14, 170
 LIMMIN..... 14, 170
 line_color..... 177
 line_index..... 235
 line_spacing_factor..... 240
 line_spacing_style..... 240
 line_type..... 177
 LINEARPARAMETERENTITY..... 52
 lines..... 180, 236, 241
 linespace_factor..... 59
 linespace_style..... 59
 linewt..... 60, 168, 178, 232, 235, 245, 248, 256
 LINE..... 51
 livesection..... 203
 loaded_bit..... 151
 location..... 161, 239
 lock_aspect..... 64
 lock_position_flag..... 28, 29
 lock_viewports..... 198
 locked..... 168
 loft_entity_transmatrix..... 53
 LOFTANG1..... 14
 LOFTANG2..... 14
 LOFTEDSURFACE..... 52
 LOFTMAG1..... 14
 LOFTMAG2..... 14
 LOFTNORMALS..... 14
 LOFTPARAM..... 14
 long..... 6
 LONG_TRANSACTION..... 171
 LONGITUDE..... 14
 lookup_desc..... 136
 lookup_name..... 136
 lower_left..... 211
 lowermost_left_tree_node_gap..... 244
 lowermost_right_tree_node_gap..... 244
 lspace_factor... 26, 31, 32, 34, 35, 36, 37, 39, 47,
 229
 lspace_style.. 26, 31, 32, 34, 35, 36, 37, 39, 47, 229
 lt_index..... 241
 lt_ltype..... 241
 LTSCALE..... 14
 ltype..... 60, 169, 232, 235, 245, 256
 ltype_flags..... 256
 ltype_r11..... 256

ltype_rs 169
 ltype_scale 245, 256
 LTYPE 171
 LTYPE_BYBLOCK 15
 LTYPE_BYLAYER 15
 LTYPE_CONTINUOUS 15
 LTYPE_CONTROL 172
 LTYPE_CONTROL_OBJECT 15
 luminance 173
 luminance_mode 173
 LUNITS 15
 LUPREC 15
 lut 135
 LWDISPLAY 15
 LWPOLYLINE 54

M

m_density 71
 main_gsmarker 228
 main_subent_type 228
 maint_version 45, 71, 186
 maintain_aspect_ratio 168
 major 92, 94, 95, 96, 97, 98, 99, 101, 161, 215,
 216, 230
 major_radius 95, 101
 major_version 45
 margin_horiz_spacing 226
 margin_override_flags 226
 margin_vert_spacing 226
 mat_absref 214
 material 169, 215, 237, 256
 material_count 189
 material_flags 256
 material_handle 214
 materials 23, 40, 53, 63, 65, 73, 78, 94, 107
 MATERIAL 172
 max_assoc_dep_index 103, 104, 113, 122
 max_extent 182
 max_intensity 243
 max_points 177
 max_regen_threads 200
 MAXACTVP 15
 maximum 224
 mdoc_class_version 154, 191
 MEASUREMENT 15
 memory_amount 189
 memory_limit 177
 MENTALRAYRENDERSETTINGS 174
 MENU 15
 merge_flags 226
 merged_cells 231
 merged_height_flag 250
 merged_width_flag 250
 MESH 55
 min_extent 182
 min_intensity 243
 minimum 224

minor 92, 94, 95, 96, 97, 98, 99, 101, 161, 215,
 216, 217, 230
 minor_major_ratio 234
 minor_radius 95, 101
 MINSERT 56
 minute 153
 MIRRTEXT 15
 miter_direction 241
 miter_option 96, 100
 mleader_order 177
 MLEADEROBJECTCONTEXTDATA 177
 mleaderstyle 60
 MLEADERSTYLE 177
 mlinestyle 57
 MLINE 56
 MLINestyle 179
 mode 64, 173
 model_edge 155
 model_space 150
 modeler_format_version 41, 53, 66, 73, 78
 month 153
 morehandles 160
 MOTIONPATH 180
 MPOLYGON 57
 mr_description 176
 mr_version 174
 msec 153
 msec 197, 247
 mtext 43
 mtext_handles 28, 29
 mtext_visible 43
 MTEXT 58
 MTEXTATTRIBUTEOBJECTCONTEXTDATA 180
 MTEXTOBJECTCONTEXTDATA 181
 MULTILEADER 60

N

n_density 71
 name 30, 43, 49, 57, 68, 75, 102, 105, 106, 108,
 109, 110, 111, 114, 115, 116, 119, 122, 123, 124, 125,
 126, 127, 128, 129, 130, 131, 133, 134, 135, 136, 137,
 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148,
 149, 150, 157, 165, 166, 167, 168, 171, 172, 174, 179,
 187, 190, 191, 195, 199, 200, 201, 210, 212, 213, 223,
 224, 234, 236, 237, 247, 251, 254
 name[7] 223
 named_ucs 90, 170, 201, 203, 212
 names 169
 namidx 222
 NAVISWORKSMODEL 62
 NAVISWORKSMODELDEF 181
 network_action_index 114
 network_version 114
 next_entity 256
 nextid 229, 230
 no_twist 54
 node 109

- node[4] 230
- nodeid 224, 230
- nodes 104, 161
- nolinks 256
- normal 239
- north_dir 163
- north_dir_angle_deg 164
- north_dir_angle_rad 164
- NORTHDIRECTION 15
- notes 43
- num_actions 103, 113, 114, 127, 129, 135, 137,
140, 142, 144, 145
- num_areafillparms 241
- num_arrowheads 61
- num_attr_defs 251
- num_attrs 253
- num_blocklabels 61
- num_blocks 22, 40, 52, 62, 65, 72, 77, 93, 106,
148, 224
- num_blverts 75
- num_borders 226, 249
- num_boundary_handles 58, 233
- num_break_heights 86
- num_break_rows 86
- num_breaks 235, 236
- num_bulges 55, 243
- num_cell_contents 252
- num_cells 81, 152, 198, 254
- num_childs 162
- num_childval 162
- num_classification_colorramps 185
- num_clip_inverts 30
- num_clip_verts 30, 46, 91, 194
- num_clippings 67
- num_codes 140, 145
- num_col_sizes 240
- num_colorramps 185
- num_colors 43, 57
- num_cols 56, 81, 153, 237, 252
- num_column_heights 60, 181
- num_connections 223, 225
- num_control_points 234
- num_crease 56
- num_croppings 69
- num_cross_sections 54
- num_crosssects 98
- num_ctrl_pts 45, 77
- num_customdata 153
- num_customdata_items 252, 254
- num_dashes 172, 233
- num_dates 197
- num_deflines 44, 58
- num_deps ... 103, 104, 113, 122, 127, 129, 135, 137,
140, 142, 144, 145, 217
- num_edges 55, 95, 97, 161
- num_eed 256, 257
- num_endsetbacks 97
- num_entries 103, 150, 160, 169, 172, 182, 196,
201, 203, 212, 220, 225
- num_ents 194
- num_faces 55
- num_field_refs 237
- num_fields 162
- num_fit_pts 45, 77
- num_fitpts 234
- num_frozen_layers 89
- num_gentextures 174
- num_geom 246
- num_geomesh_faces 164
- num_geomesh_pts 164
- num_geometry 247, 253
- num_geoms 245
- num_groups 166
- num_guide_curves 54
- num_guides 98
- num_hatch_angles 193
- num_hdls 140, 145, 195
- num_hours 198
- num_ididx 222
- num_ididxs 222
- num_index 220
- num_inserts 151
- num_intsectobj 228
- num_items 106, 213
- num_knots 45, 77, 234
- num_leaders 238
- num_lights 171
- num_lines 57, 180, 236, 241
- num_m_verts 71
- num_materials .. 23, 40, 53, 63, 65, 73, 78, 93, 107
- num_merged_cells 231
- num_morehandles 160
- num_n_verts 71
- num_names 169
- num_nodes 104, 161
- num_obj_ids 167
- num_objects 162
- num_objid_handles 213
- num_objids 72, 186
- num_orthopts 201
- num_owned 46, 56, 69, 70, 71, 80, 151
- num_owned_actions 114
- num_owned_params 103, 104, 113, 122
- num_pages 219
- num_params 109, 115, 116, 120, 224
- num_paths 44, 58
- num_points 48, 55, 170, 215, 235, 243
- num_prop_entries 221
- num_propinfos 128, 136, 138, 146, 148
- num_propnames 221
- num_props 207, 221, 258, 260
- num_pts 140, 145, 242
- num_radiuses 97
- num_ramps 242
- num_reactors 256, 257

- num_rows 56, 81, 153, 237, 252
 - num_rowstyles 199
 - num_schemas 221
 - num_search 222
 - num_sections 194
 - num_seeds 44
 - num_segidx 218
 - num_segparms 241
 - num_segs_or_paths 233
 - num_silhouettes .. 23, 40, 52, 63, 65, 73, 78, 93, 107
 - num_sortedidx 222
 - num_source_files 67
 - num_sources 246
 - num_startsetbacks 97
 - num_states 148
 - num_steps 117, 183
 - num_subdiv_vertex 55
 - num_subents 117, 183
 - num_submgrs 152
 - num_types 194
 - num_uprops 221
 - num_valuelist 224
 - num_values 103, 105, 113, 122, 217, 222
 - num_vars 255
 - num_vertex 55
 - num_vertexids 55
 - num_vertices 243
 - num_verts 57, 75
 - num_viewports 170
 - num_widths 55, 244
 - num_wires .. 23, 40, 52, 63, 65, 73, 77, 93, 107, 214
 - num_xdata 213
 - num_xrefpaths 228
 - num_xrefs 228
 - num1 195
 - numassocsteps 183
 - numassocsubents 183
 - numcols 135, 198
 - numelems 135
 - numfaces 71
 - numfragments 59
 - numgaps 244
 - numitems 155, 156, 213
 - numlayers 234
 - numlevels 214
 - numoverrides 199
 - numpoints 67, 185
 - numrows 135, 198, 214
 - numsections 244
 - numverts 71
 - numvports 198
 - NURBSURFACE 62
- ## O
- obj_ids 167
 - objdata_algn_offset 223
 - object 224, 242
 - OBJECT_PTR 182
 - objectcontext 152
 - objects 162
 - objid 256, 257
 - objid_handles 213
 - objids 72, 186
 - oblique_angle 27, 28, 32, 37, 75, 87, 196
 - obs_pt 163
 - OBSCOLOR 15
 - observation_coverage_tag 164
 - observation_from_tag 164
 - observation_to_tag 164
 - OBSLTYPE 15
 - obsolete_false 164
 - offset .. 140, 142, 144, 168, 220, 221, 223, 233, 240
 - offset_from_arc 24
 - OLE2FRAME 64
 - oleclient 64
 - OLEFRAME 64
 - OLESTARTUP 15
 - oleversion 64
 - on 168
 - on_off 89
 - opacity_percent 173
 - opacitymap 173
 - operand1 92
 - operand2 92
 - operation 92
 - option 111, 153
 - opts_r11 256
 - ORDDIMOBJECTCONTEXTDATA 182
 - order 109
 - orientation 125, 130, 134
 - orientation_on_both_grips 127, 129
 - origin 48, 67, 195
 - ORTHOMODE 15
 - orthopts 201
 - OSMODE 15
 - osnap_dist 228
 - osnap_mode 116
 - osnap_pt 228
 - osnap_type 228
 - other_dist 94
 - out_edge[5] 229
 - output_type 197
 - override_code 242
 - ovr 199
 - ovr_center 48, 187
 - owned_actions 114
 - owned_params 103, 105, 113, 122
 - owner 97
 - ownerhandle 256, 257
 - owningnetwork 103, 104, 113, 122

P

- pab 104, 105, 106, 108, 110, 111, 112, 113, 114, 115, 116, 119, 120, 121
- padding[12] 245
- padding[9] 223
- page_count 219
- page_data 219
- page_data_size 219
- page_index 219
- page_setup_wizard 198
- page_size 219, 220
- page_start_offset 219
- pages 220
- paper_height 183
- paper_image_origin 184
- paper_r11 256
- paper_size 183
- paper_space 150
- paper_units 184, 191
- paper_width 183
- param 110, 116
- paramblock 105, 106
- parameter_base_location 124, 125, 126, 128, 131, 132, 133, 135, 139, 141, 144, 147, 149
- params 109, 115, 116, 120, 224
- parent .. 22, 24, 25, 27, 28, 29, 30, 31, 32, 33, 34, 35, 37, 38, 39, 42, 43, 44, 45, 46, 47, 48, 49, 51, 52, 54, 55, 56, 57, 58, 60, 62, 64, 66, 68, 69, 70, 71, 72, 74, 75, 76, 77, 80, 86, 87, 88, 89, 91, 92, 93, 94, 95, 97, 98, 99, 101, 102, 103, 104, 105, 106, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 119, 120, 121, 122, 123, 124, 125, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 152, 153, 154, 155, 156, 160, 161, 162, 164, 165, 166, 167, 168, 169, 170, 171, 172, 174, 177, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 194, 195, 196, 197, 198, 199, 200, 201, 203, 209, 212, 213, 214, 216, 217, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 240, 241, 242, 243, 245, 246, 247, 248, 249, 253, 254
- parentid 230
- PARTIAL_VIEWING_INDEX 182
- path 181
- path_curve 54
- path_entity 42, 80
- path_entity_id 79
- path_entity_transform_computed 42, 80
- path_entity_transmatrix 42, 79
- path_flags 42, 79
- path_option 153
- path_type 48
- pathdata 79
- pathdata_size 79
- pathentity_transform 96, 100
- paths 44, 58
- pattern_len 171
- pattern_type 44, 58
- pbsab_status ... 108, 110, 111, 112, 114, 115, 116, 119, 120, 121
- PDFDEFINITION 213
- PDFUNDERLAY 64
- PDMODE 15
- PDSIZE 15
- PELEVATION 15
- PELLIPSE 15
- periodic 45, 76
- PERSUBENTMGR 182
- PEXTMAX 15
- PEXTMIN 15
- photon_trace_depth1 176
- photon_trace_depth2 176
- photon_trace_depth3 176
- physical_intensity 50
- physical_intensity_method 50
- PICKSTYLE 15
- PINSBASE 15
- pixel_size 44, 167
- PLACEHOLDER 183
- plane_line_color 192
- plane_linewt 192
- plane_ltype 192
- plane_normal_lofting_type 54
- PLANESURFACE 64
- PLIMCHECK 16
- PLIMMAX 16
- PLIMMIN 16
- PLINEGEN 16
- PLINEWID 16
- plot_flags 183
- plot_glyph 49
- plot_origin 184
- plot_paper_unit 184
- plot_rotation_mode 184
- plot_type 184
- plot_window_ll 184
- plot_window_ur 184
- plotflag 168
- plotsettings 169
- PLOTSETTINGS 183
- plotstyle 169, 245, 257
- plotstyle_flags 257
- plotview 183
- plotview_name 183
- point... 23, 40, 52, 62, 65, 72, 77, 88, 93, 107, 186, 232, 234
- point_present .. 23, 40, 52, 62, 65, 72, 77, 93, 107
- pointclouddef 67
- pointclouddefex 68
- POINT 66
- POINTCLOUD 66
- POINTCLOUDCOLORMAP 184
- POINTCLOUDEF 185
- POINTCLOUDEF_REACTOR 186
- POINTCLOUDEF_REACTOR_EX 186
- POINTCLOUDDEFEX 185

- POINTCLOUDEX 68
 POINTPARAMETERENTITY 69
 POINTPATH 186
 points 48, 55, 171, 215, 235, 243
 POLARGRIPENTITY 69
 polyline_paths 233
 POLYLINE_2D 69
 POLYLINE_3D 70
 POLYLINE_MESH 70
 POLYLINE_PFACE 71
 position 42, 50, 249
 position_desc 138
 position_name 138
 predef_presets_first 190
 preset_name 188
 prev_entity 257
 prev_entry 213
 preview 151, 257
 preview_exists 257
 preview_is_proxy 257
 preview_size 151, 257
 printer_cfg_file 183
 procedure 190
 projection 238
 PROJECTNAME 16
 prompt 28
 prop_entries 221
 prop_states 124, 125, 126, 128, 131, 132, 133,
 134, 139, 141, 144, 147, 149
 prop1.. 124, 125, 126, 128, 130, 132, 133, 134, 136,
 138, 139, 141, 143, 146, 148, 149
 prop2.. 124, 125, 126, 128, 130, 132, 133, 134, 136,
 138, 139, 141, 143, 146, 147, 148, 149
 prop3.. 124, 125, 126, 128, 131, 132, 133, 134, 139,
 141, 143, 147, 149
 prop4.. 124, 125, 126, 128, 131, 132, 133, 134, 139,
 141, 143, 147, 149
 property_flags 227
 property_override_flags 225, 226
 propnames 221
 props 221, 258, 260
 PROXY_ENTITY 71
 PROXY_OBJECT 186
 PROXYGRAPHICS 16
 prvsav_segidx 218
 PSLTSCALE 16
 PSOLHEIGHT 16
 PSOLWIDTH 16
 PSTYLEMODE 16
 PSVPSCALE 16
 pt 74, 123, 128, 254
 pt0 45, 91, 164, 233
 pt1 64, 112
 pt2 64, 97, 101, 112
 pts 140, 145, 242
 PUCSBASE 16
 PUCSNAME 16
 PUCSORG 16
 PUCSORGBACK 16
 PUCSORGBOTTOM 16
 PUCSORGFRONT 16
 PUCSORGGLEFT 16
 PUCSORGRIGHT 16
 PUCSORGTOP 16
 PUCSORTHOREF 16
 PUCSORTHVIEW 17
 PUCSXDIR 17
 PUCSYDIR 17
- ## Q
- QTEXTMODE 17
- ## R
- r_node 104, 105, 115, 121
 RADIMLGOBJECTCONTEXTDATA 186
 RADIMOBJECTCONTEXTDATA 187
 radius 24, 25, 30, 43, 45, 98, 99, 233
 radiuses 97
 ramps 242
 rapidrt_version 188
 RAPIDRTRENDERSETTINGS 187
 RASTERVARIABLES 188
 rational 44, 76
 ray_trace_depth1 175
 ray_trace_depth2 175
 ray_trace_depth3 175
 ray_tracing_enabled 175
 RAY 72
 reactor 67, 68
 reactors 257
 readdep 109
 REALWORLDSCALE 17
 record_hdrs 219
 record_history 98
 record_size 219, 220
 records 219
 rect_height 58, 181
 rect_width 58, 181
 ref 156, 219
 ref_pt 163
 ref_pt2d 164
 refcount 231
 reference_vector_for_
 controlling_twist 42, 80
 reflectance 216
 reflectance_scale 173
 reflectionmap 172
 reflectivity 173
 refraction_index 173
 refractionmap 173
 REGENMODE 17
 REGION 72
 rel_transform 217
 render_level 188

- render_mode 89, 202, 210
 - render_target 188
 - render_time 188, 189
 - RENDERENTRY 188
 - RENDERENVIRONMENT 189
 - RENDERGLOBAL 190
 - RENDERSETTINGS 190
 - REQUIREDVERSIONS 17
 - reserved 43, 57
 - resunits 167
 - revision_bytes[9] .. 23, 41, 53, 63, 66, 73, 78, 94, 107
 - revision_guid[39] .. 23, 41, 53, 63, 65, 73, 78, 94, 107
 - revision_major .. 23, 41, 53, 63, 66, 73, 78, 94, 107
 - revision_minor1 .. 23, 41, 53, 63, 66, 73, 78, 94, 107
 - revision_minor2 .. 23, 41, 53, 63, 66, 73, 78, 94, 107
 - REVISIONNUMBER 258, 260
 - revolve_angle 74, 99
 - revolved_entity_transmatrix 74
 - REVOLVEDSURFACE 72
 - rgb 237
 - right_col 232
 - right_grid_color 250
 - right_grid_linewt 251
 - right_margin 183, 226
 - right_offset 24
 - right_visibility 251
 - root_tree_node_gap 244
 - rotated_type 156
 - rotation... 27, 29, 46, 56, 74, 75, 80, 87, 123, 165, 166, 167, 180, 200, 227, 236, 239, 250
 - ROTATIONPARAMETERENTITY 74
 - row_heights 81
 - row_offset 127
 - row_parent 251, 253
 - row_spacing 56
 - rows 227, 237
 - rowstyles 199
 - RTEXT 74
 - ruled_surface 54
- S**
- sab.. 108, 110, 111, 112, 114, 115, 116, 119, 120, 121
 - sab_size 22, 40, 52, 62, 65, 72, 77, 93, 107
 - sampling_contrast_color1 175
 - sampling_contrast_color2 175
 - sampling_contrast_color3 175
 - sampling_contrast_color4 175
 - sampling_filter1 175
 - sampling_filter2 175
 - sampling_mr_filter 175
 - sampling1 175
 - sampling2 175
 - save_enabled 190
 - save_filename 190
 - saved_filename 67
 - SAVEIMAGES 17
 - scale 30, 46, 56, 75, 80, 101, 102, 123, 160, 161, 168, 170, 177, 179, 180, 181, 182, 187, 200, 215, 236, 239
 - scale_est 163
 - scale_factor... 41, 61, 79, 96, 100, 123, 165, 238
 - scale_flag 46, 56, 80
 - scale_spacing 44, 58
 - scale_vec 163
 - SCALE 191
 - scenario 44, 76
 - schdat 218
 - schema 156
 - schema_namidx 222
 - schemas 221
 - schidx 218, 220
 - schidx_segidx 218
 - sea_level_elev 163
 - search 218, 222
 - search_segidx 218
 - second_endpoint 233
 - second_header_address 244
 - second_seg_angle 177
 - secondary_background 167
 - seconds 153
 - section_array_size 245
 - section_info_id 245
 - section_map_address 245
 - section_map_id 245
 - section_settings 75
 - section_type 245
 - SECTION_MANAGER 194
 - SECTION_SETTINGS 194
 - SECTIONOBJECT 75
 - sections 194
 - SECTIONVIEWSTYLE 191
 - seeds 44
 - segidx 218, 220, 221
 - segidx_offset 218
 - segidx_unknown 218
 - segment_idx 223
 - segments 219
 - segparms 241
 - segs 233
 - segsz 223
 - select_dates_from_calendar 197
 - select_range_of_dates 197
 - selectable 166
 - selection_marker 215
 - self_illumination 173
 - seqend 47, 56, 70, 71, 85
 - SEQEND 75
 - setup_name 197
 - shade_plot_type 198
 - SHADEDGE 17
 - SHADEDIF 17
 - shadeplot 90, 184
 - shadeplot_customdpi 184

- shadeplot_mode 90
- shadeplot_reslevel 184
- shadeplot_type 184
- shadow 257
- shadow_flags 257
- shadow_map_size 50
- shadow_map_softness 50
- shadow_maps_enabled 175
- shadow_mapsize 197
- shadow_mode 175
- shadow_softness 197
- shadow_type 50, 197
- SHADOWPLANELOCATION 17
- shape_flag 236
- SHAPE 75
- sheet_set_name 197
- sheet_subset_name 197
- shift_value 232
- short 6
- short170 64
- shorts 140, 145
- show_clipping 67
- show_cropping 69
- show_history 98
- show_intensity 67, 68
- show_properties 123, 125, 126, 127, 128, 130, 132, 133, 134, 136, 138, 139, 141, 143, 146, 148, 149
- show_rotation 165
- SHOWHIST 17
- shsw_b294 97, 101
- shsw_b295 97, 101
- shsw_b296 97, 101
- shsw_b193 96, 100
- shsw_text 96, 100
- shsw_text_size 96, 100
- shsw_text2 96, 100
- shsw_text2_size 96, 100
- si_tag 221
- si_unknown_1 221
- si_unknown_2 221
- sides 98
- signature 223
- silhouettes 23, 40, 53, 63, 65, 73, 78, 93, 107
- simple_surfaces 54
- single_color_gradient 43, 57
- size 20, 46, 91, 164, 220, 221, 223, 243
- SKETCHINC 17
- SKPOLY 17
- SKYLIGHT_BACKGROUND 194
- sm_axis 39
- SNAPANG 17, 89, 211
- SNAPBASE 17, 89, 211
- SNAPISOPAIR 17, 211
- SNAPMODE 17, 211
- SNAPSTYL 17
- SNAPSTYLE 211
- SNAPUNIT 17, 89, 211
- solid 54, 74
- SOLID 76
- SOLID_BACKGROUND 194
- SOLIDHIST 17
- sort_ents 194
- sortedidx 222
- SORTENTS 17
- SORTENTSTABLE 194
- source 238
- source_filename 185
- source_files 67
- source_pt 232
- sources 246
- spacing 198
- SPATIAL_FILTER 194
- SPATIAL_INDEX 195
- specular_color 172
- specular_gloss_factor 172
- specularmap 172
- SPLFRAME 17
- splineflags1 44, 76
- SPLINE 76
- SPLINESEGS 17
- SPLINETYPE 17
- start 52, 235, 237, 249
- start_angle 24, 25, 39, 74, 99, 179, 233
- start_day 189
- start_draft_angle 54
- start_draft_dist 96, 100
- start_draft_magnitude 54
- start_minute 189
- start_month 189
- start_msec 189
- start_pt 45
- start_second 189
- start_tangent 234
- start_time 197
- start_width 70, 88
- start_year 189
- startsetbacks 97
- state 75, 130
- states 148
- status 49, 106, 109, 112, 116, 182, 224
- status_flag 89
- std_scale_factor 184
- std_scale_type 184
- step_id 215
- steps 117, 183
- STEPSIZE 18
- STEPSPERSEC 18
- strings_area 172
- strokes 209
- strokes_int 209
- struct 7
- strvalue 156
- sty 199
- style 24, 28, 29, 44, 58, 59, 75, 76, 87, 236, 239
- style_attachment 61
- style_content 60

- style_id..... 76, 253, 254
 - style_parent..... 253
 - style_sheet..... 89
 - style_type..... 203
 - STYLE..... 195
 - STYLE_CONTROL..... 196
 - STYLE_CONTROL_OBJECT..... 18
 - stylesheet..... 184
 - STYLESHEET..... 18
 - stylization_type..... 68
 - subdiv_vertex..... 55
 - subent..... 110
 - subents..... 117, 183
 - SUBJECT..... 258, 260
 - submgrs..... 152
 - sun..... 90, 203, 212
 - sunid..... 194
 - SUN..... 196
 - SUNSTUDY..... 197
 - SURFTAB1..... 18
 - SURFTAB2..... 18
 - SURFTYPE..... 18
 - SURFU..... 18
 - SURFV..... 18
 - sweep_alignment_flags..... 42, 79
 - sweep_entity..... 42, 80, 99
 - sweep_entity_id..... 79
 - sweep_entity_transform_computed..... 42, 80
 - sweep_entity_transmatrix..... 42, 79
 - sweep_transmatrix..... 42
 - sweep_vector..... 42
 - sweepdata..... 79
 - sweepdata_size..... 79
 - sweepentity_transform..... 96, 100
 - SWEPTSURFACE..... 77
- T**
- t2..... 24
 - t3..... 24
 - t58..... 122
 - t78..... 122
 - tab_order..... 169
 - table_flag_override..... 81
 - table_name..... 153
 - TABLECONTENT..... 198
 - tabledatacolumn_parent..... 226
 - tablegeometry..... 247, 253
 - TABLEGEOMETRY..... 198
 - tablerow_parent..... 226
 - tablestyle..... 80, 198
 - TABLE..... 80
 - TABLESTYLE..... 199
 - tag..... 28, 29, 247
 - tangent_dir..... 88
 - target..... 50, 227
 - target_path..... 180
 - tdata..... 80, 198
 - TDCREATE..... 18, 258, 260
 - TDINDWG..... 18, 258, 260
 - TDUCREATE..... 18
 - TDUPDATE..... 18, 258, 260
 - TDUSRTIMER..... 18
 - TDUUPDATE..... 18
 - text..... 59, 225, 227, 237, 249
 - text_align_type..... 178
 - text_alignment..... 43, 61, 238, 248
 - text_always_left..... 178
 - text_angle_type..... 178
 - text_angletype..... 60, 238
 - text_bottom..... 239
 - text_color..... 61, 178, 248
 - text_default..... 178
 - text_direction..... 25
 - text_extended..... 179
 - text_height..... 58, 178, 227, 238, 248, 250
 - text_left..... 60, 238
 - text_midpt.. 25, 31, 32, 33, 34, 36, 37, 38, 47, 228
 - text_position..... 25
 - text_right..... 60, 238
 - text_rotation... 26, 31, 32, 33, 35, 36, 37, 38, 47, 229, 241
 - text_size..... 24, 196
 - text_style..... 60, 178, 198, 227, 248, 250
 - text_top..... 239
 - text_value..... 24, 29, 75, 87, 250
 - texts..... 155, 156
 - TEXT..... 86
 - TEXTOBJECTCONTEXTDATA..... 199
 - TEXTQLTY..... 18
 - TEXTSIZE..... 18
 - TEXTSTYLE..... 18
 - texturemode..... 238
 - thickness.. 24, 27, 28, 30, 52, 55, 66, 70, 76, 87, 243
 - thickness_r11..... 257
 - THICKNESS..... 18
 - tile_order..... 177
 - tile_size..... 177
 - TILEMODE..... 18
 - TILEMODELIGHTSYNCH..... 18
 - tiling..... 238
 - timestamp..... 231
 - TIMEZONE..... 18
 - title_horiz_bottom_color..... 82
 - title_horiz_bottom_linewt..... 83
 - title_horiz_bottom_visibility..... 84
 - title_horiz_ins_color..... 82
 - title_horiz_ins_linewt..... 83
 - title_horiz_ins_visibility..... 84
 - title_horiz_top_color..... 82
 - title_horiz_top_linewt..... 83
 - title_horiz_top_visibility..... 84
 - title_row_alignment..... 82
 - title_row_color..... 81
 - title_row_fill_color..... 82
 - title_row_fill_none..... 81

- title_row_height 82
 - title_row_style_override 86
 - title_suppressed 81
 - title_text_style 82
 - title_vert_ins_color 82
 - title_vert_ins_linewt 84
 - title_vert_ins_visibility 85
 - title_vert_left_color 82
 - title_vert_left_linewt 83
 - title_vert_left_visibility 85
 - title_vert_right_color 83
 - title_vert_right_linewt 84
 - title_vert_right_visibility 85
 - TITLE 258, 260
 - TOLERANCE 87
 - tooltip 131, 153, 252
 - top_grid_color 250
 - top_grid_linewt 250
 - top_height 75
 - top_margin 183
 - top_row 231
 - top_visibility 250
 - topradius 98
 - total_data_size 219
 - total_segments 218
 - TRACE 87
 - TRACEWID 18
 - trans 215
 - trans_space_flag 156
 - transform 195, 239
 - transform_present 215
 - translation 215
 - translucence 173
 - transmatrix 62, 105, 106, 217, 237
 - transmittance_scale 173
 - transparency 165, 215
 - TREEDEPTH 18
 - triangle_count 189
 - TSTACKALIGN 18
 - TSTACKSIZE 19
 - turn_height 45
 - turns 45
 - TVDEVICEPROPERTIES 200
 - twist_angle 41, 74, 79, 89, 96, 99, 100, 202
 - two_sided_material 173
 - txt 255
 - type 28, 29, 49, 60, 64, 146, 177, 214, 222, 223, 225, 227, 235, 239, 242, 243, 246, 247, 249, 253, 254
 - type_size 222
 - types 194
- ## U
- u.bd 230
 - u.bl 230
 - u.bs 230
 - u.handle 231
 - u.rc 231
 - u.text 231
 - u_isolines 41, 53, 63, 66, 73, 78
 - ucs_at_origin 90, 211
 - ucs_elevation 90, 170, 201, 203, 211
 - ucs_name 67
 - ucs_origin 67, 68
 - ucs_x_dir 67, 68
 - ucs_y_dir 67, 68
 - ucs_z_dir 67, 68
 - ucsorg 90, 201, 203, 211
 - UCS 200
 - UCS_CONTROL 201
 - UCS_CONTROL_OBJECT 19
 - UCSBASE 19
 - UCSFOLLOW 211
 - UCSICON 211
 - UCSNAME 19
 - UCSORG 19, 170
 - UCSORGBACK 19
 - UCSORGBOTTOM 19
 - UCSORGFRONT 19
 - UCSORGLEFT 19
 - UCSORGRIGHT 19
 - UCSORGTOP 19
 - UCSORTHOREF 19
 - UCSORTHOVIEW 19, 90, 170, 201, 203, 211
 - UCSVP 90, 211
 - ucsxdir 90, 201, 203, 211
 - UCSXDIR 19, 170
 - ucsydir 90, 201, 203, 211
 - UCSYDIR 19, 170
 - ui_index 235
 - uint64_t 6
 - UNDERLAY 30
 - UNDERLAYDEFINITION 213
 - unit_scale_horiz 163
 - unit_scale_vert 163
 - unit_type 249, 252, 255
 - unitfactor 62
 - UNITMODE 19
 - units 188
 - units_value_horiz 163
 - units_value_vert 163
 - unknown 22, 26, 31, 33, 34, 35, 36, 37, 39, 40, 48, 52, 62, 65, 72, 77, 93, 102, 106, 162, 167, 220, 222, 225, 229, 240, 251, 252
 - unknown_0 20, 117, 182
 - unknown_1 20, 218, 219, 220, 222, 244
 - unknown_10 20
 - unknown_11 20
 - unknown_12 20
 - unknown_13 21

- unknown_14 21
- unknown_14b 21
- unknown_15 21
- unknown_16 21
- unknown_17 21
- unknown_2 ... 21, 117, 182, 218, 219, 220, 222, 223, 244
- unknown_20 21
- unknown_21 21
- unknown_22 21
- unknown_23 21
- unknown_3 21, 117, 223, 244
- unknown_54 21
- unknown_55 21
- unknown_56 21
- unknown_57 21
- unknown_8 21
- unknown_9 21
- unknown_b 80, 164, 226
- unknown_b0 59
- unknown_b1 193
- unknown_b2 193
- unknown_b37 119
- unknown_bit_1 48
- unknown_bit_2 49
- unknown_bit_3 49
- unknown_bit_5 49
- unknown_bl 80, 226
- unknown_bl0 69
- unknown_bl1 69, 80, 199
- unknown_bl10 118
- unknown_bl11 118
- unknown_bl12 118
- unknown_bl13 118
- unknown_bl14 118
- unknown_bl15 118
- unknown_bl16 118
- unknown_bl17 118
- unknown_bl18 118
- unknown_bl19 118
- unknown_bl2 199
- unknown_bl20 118
- unknown_bl21 118
- unknown_bl22 118
- unknown_bl23 118
- unknown_bl24 118
- unknown_bl25 118
- unknown_bl26 118
- unknown_bl27 118
- unknown_bl28 118
- unknown_bl29 119
- unknown_bl3 199
- unknown_bl30 119
- unknown_bl31 119
- unknown_bl32 119
- unknown_bl33 119
- unknown_bl34 119
- unknown_bl35 119
- unknown_bl36 119
- unknown_bl6 117
- unknown_bl6a 117
- unknown_bl7 117
- unknown_bl7a 117
- unknown_bl8 117
- unknown_bl9 117
- unknown_bool 148
- unknown_bs 86
- unknown_h 80
- unknown_long 244
- unknown_rc 80, 199
- unknown_short 87
- unknown_short_1 49
- unknown_t 137
- unknown_text1 21
- unknown_text2 22
- unknown_text3 22
- unknown_text4 22
- unknown1 164, 258, 260
- unknown2 164, 258, 260
- UNKNOWN_ENT 88
- UNKNOWN_OBJ 201
- unnamed 166
- up_dir 163
- upd_basept 124, 125, 126, 128, 131, 132, 133, 135, 139, 141, 144, 147, 149
- upd_endpt .. 124, 125, 126, 128, 131, 132, 133, 135, 139, 142, 144, 147, 150
- upd_state 130
- update_option 153
- update_status 153
- upper_right 211
- uprops 221
- use_attenuation_limits 50
- use_block_rotation 179
- use_block_scale 179
- use_default_lights 90, 202, 210
- use_lut_palette 200
- use_subset 197
- use_tiling 168
- used ... 102, 150, 157, 168, 171, 195, 200, 201, 210, 212
- user_scale_factor 163
- user_text ... 26, 31, 32, 33, 35, 36, 37, 38, 47, 229
- USERI1 19
- USERI2 19
- USERI3 19
- USERI4 19
- USERI5 19
- USERR1 19
- USERR2 19
- USERR3 19
- USERR4 19
- USERR5 19
- USRTIMER 20
- uvec 46, 91
- uvec1 64

uvec2..... 64

V

v_isolines..... 41, 53, 63, 66, 74, 78
 value.. 122, 124, 132, 133, 146, 147, 162, 216, 227,
 231, 247, 251, 253, 255
 value.handle91..... 230
 value.long90..... 230
 value.num40..... 230
 value.pt2d..... 230
 value.pt3d..... 230
 value.short70..... 230
 value.text1..... 230
 value_code..... 230
 value_data_type..... 227
 value_format_string..... 227
 value_set... 124, 127, 129, 132, 133, 135, 142, 147
 value_string..... 162, 252
 value_string_length..... 162
 value_unit_type..... 227
 valuelist..... 224
 values..... 103, 105, 114, 122, 217, 222
 vars..... 255
 VBA_PROJECT..... 201
 vector..... 72
 version.... 22, 40, 52, 62, 65, 71, 72, 77, 93, 103,
 106, 117, 186, 217, 218, 231
 VERSIONGUID..... 20
 vert_alignment..... 27, 29, 87
 vert_cell_margin..... 81, 199
 vert_dir..... 75
 vert_margin..... 226
 vertex..... 55, 69, 70, 71, 241
 vertex_direction..... 241
 VERTEX_2D..... 88
 VERTEX_3D..... 88
 VERTEX_MESH..... 88
 VERTEX_PFACE..... 88
 VERTEX_PFACE_FACE..... 88
 vertexids..... 55
 vertices..... 243
 vertind[4]..... 88
 verts..... 57, 75
 view..... 30, 198
 view_name..... 188
 view_target..... 89, 202, 210
 view_twist..... 210
 view_width..... 202, 210
 VIEW_CONTROL..... 203
 VIEW_CONTROL_OBJECT..... 20
 VIEWCTR..... 20, 89, 202, 210
 VIEWDIR..... 89, 202, 210
 viewlabel_alignment..... 155, 193
 viewlabel_attachment..... 155, 193
 viewlabel_offset..... 155, 193
 viewlabel_pattern..... 155, 193
 viewlabel_text_color..... 155, 193

viewlabel_text_height..... 155, 193
 viewlabel_text_style..... 155, 193
 VIEWMODE..... 202, 210
 viewport..... 212
 viewports..... 170
 VIEWPORT..... 89
 VIEWSIZE..... 20, 89, 202, 210
 viewstyle_flags..... 154, 191
 viewtable..... 180
 VIEW..... 201
 virtual_edge_flag..... 250
 virtual_guide..... 54
 VISIBILITYGRIPENTITY..... 91
 VISIBILITYPARAMETERENTITY..... 91
 visible..... 232, 248
 VISRETAIN..... 20
 visualstyle..... 90, 169, 198, 203, 212
 VISUALSTYLE..... 203
 void*..... 7
 vp_dir_from_target..... 214
 vp_id..... 214
 vp_perspective..... 214
 vp_target..... 214
 vp_up_dir..... 214
 vport_entity_header..... 90
 VPORT..... 209
 VPORT_CONTROL..... 212
 VPORT_CONTROL_OBJECT..... 20
 vvec..... 46, 91
 vvec1..... 64
 vvec2..... 64
 VX_CONTROL..... 212
 VX_CONTROL_OBJECT..... 20
 VX_TABLE_RECORD..... 20, 212

W

w..... 246
 wchar*..... 7
 web_angle1..... 51
 web_angle2..... 51
 web_angle3..... 51
 web_angle4..... 51
 web_angle5..... 51
 web_flux..... 51
 web_rotation..... 51
 web_symmetry..... 51
 webfile..... 50
 webfile_type..... 51
 weight..... 232
 weighted..... 45, 77
 width..... 89, 92, 101, 165, 225, 235, 240, 254
 width_factor..... 27, 29, 75, 87, 196
 width_w_gap..... 247, 253
 widths..... 55, 244
 WIPEOUT..... 91
 WIPEOUTVARIABLES..... 213

wireframe_data_present ... 23, 40, 52, 62, 65, 72,
77, 93, 107
WIREFRAME..... 20
wires..... 23, 40, 52, 63, 65, 73, 78, 93, 107, 214
wizard_flag..... 25
word_break..... 240
workplane[3] 103
WORLDVIEW..... 20

X

x 66, 246
x_ang..... 66
x_axis_dir..... 58, 181
x_dir..... 58, 217
x_direction..... 48, 87, 171
x_label..... 150
x_label_desc..... 150
x_offset..... 236
x_radius..... 95
x_value..... 150
x_value_set..... 150
x04..... 244
x20..... 244
x40..... 245
x80..... 244
XCLIPFRAME..... 20
xdata..... 213
xdata_size..... 213
xdicobjhandle..... 257, 258
XEDIT..... 20
xline1_pt..... 26, 32, 34, 36
xline1end_pt..... 33

xline1start_pt..... 33
xline2_pt..... 26, 32, 34, 37
xline2end_pt..... 33
xline2start_pt..... 33
XLINE..... 91
XRECORD..... 213
xref ... 102, 151, 157, 168, 171, 196, 201, 202, 210,
212
xref_pname..... 151
xrefoverlaid..... 151
xrefpaths..... 228
xrefs..... 228
xscale..... 24
XYPARAMETERENTITY..... 91

Y

y 66, 246
y_label..... 150
y_label_desc..... 150
y_offset..... 236
y_value..... 150
y_value_set..... 150
year..... 153

Z

z 66, 246
z_is_zero..... 22, 51
z_max..... 243
z_min..... 243
zerol..... 164