

GNU LibreDWG

for version 0.13.3, 16 February 2024

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This manual is for GNU LibreDWG (version 0.13.3, 16 February 2024).

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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	24
4.3	OBJECTS	96
5	Sections	264
5.1	HEADER Section	264
5.2	OBJECTS Section	264
5.3	CLASSES Section	264
5.4	HANDLES Section	265
5.5	R2004_Header	265
5.6	UNKNOWN Section	265
5.7	SummaryInfo	265
5.8	Preview	266
5.9	VBAPProject	266
5.10	AppInfo	266
5.11	AppInfoHistory	266
5.12	FileDepList	266
5.13	AcDS	266
5.14	RevHistory	266
5.15	Security	266
5.16	ObjFreeSpace	266
5.17	Template	266
5.18	AuxHeader	266
5.19	Signature	266
5.20	INFO	267
5.21	SYSTEM_MAP	267
5.22	Tables	267
5.23	EXTRAS entities section	267
6	Structures	269
6.1	EED	269
6.2	XDATA	270

7	Functions	271
7.1	Decoding.....	271
7.2	Encoding.....	272
7.3	add api	273
7.4	dynapi.....	274
7.5	strings	276
7.6	Other Formats	276
7.6.1	DXF	276
7.6.2	DXFB.....	277
7.6.3	JSON	277
7.6.4	GeoJSON	277
8	Errors	278
9	Programs	279
10	Bindings	282
11	Reference API	283
12	Reporting bugs	284
Appendix A GNU Free Documentation License ..		285
13	Index	293
13.1	General Index.....	293
13.2	Object and Field Index.....	297

1 Overview

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

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 0.13.3 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 0.13.3, coverage is approximately 99%.

It can read all DWG formats from r1.2 to r2018 for 99%. The internally supported DWG revisions are identified as r1.1, r1.2, r1.3, r1.4, r2.0b, r2.0, r2.10, r2.21, r2.22, r2.4, r2.5, r2.6, r9, r9c1, r10, r11b1, r11b2, r11, r13b1, r13b2, r13, r13c3, r14, r2000b, r2000, r2000i, r2002, r2004a, r2004b, r2004c, r2004, r2007a, r2007b, r2007, r2010b, r2010, r2013b, r2013, r2018b and r2018.

Here is a list of features that are still missing:

Writing 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 or older formats 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 `TODD` file for a detailed coverage report.

Reading binary DXF should be complete but is undertested.

Reading and writing pre-R13 DXF

Reading and writing pre-R13 DXF's is work in progress. There is no support planned for the very old pre-R2.0 DXF format.

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
 ASSOCFILLETSSURFACEACTIONBODY ASSOCEXTRUDEDSURFACEACTIONBODY
 ASSOCLOFTEDSURFACEACTIONBODY ASSOCNETWORKDEPENDENCY
 ASSOCDEPENDENCY ASSOCVALUEDEPENDENCY ASSOCNETWORKSURFACEACTIONBODY
 ASSOCOFFSETSURFACEACTIONBODY 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 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
 ASSOCEXTRUDEDSURFACEACTIONBODY ASSOCGEOMDEPENDENCY
 ASSOCLOFTEDSURFACEACTIONBODY ASSOCNETWORKASSOCOSNAPPOINTREFACTIONPARAM
 ASSOCOSNAPPOINTREFACTIONPARAM ASSOCPERSSUBENTMANAGER ASSOCREVOLVEDSURFACEACTIONBODY
 ASSOCVERTEXACTIONPARAM ATEXT BLKREFOBJECTCONTEXTDATA
 CONTEXTDATAMANAGER CSACDOCUMENTOPTIONS CURVEPATH DATALINK DATATABLE
 DIMASSOC DYNAMICBLOCKPROXYNODE EXTRUDEDSURFACEFCFOBJECTCONTEXTDATA
 GEOMAPIMAGE GEOPOSITION-MARKER LAYOUTPRINTCONFIG LEADEROBJECTCONTEXTDATA
 LOFTEDSURFACE MLEADEROBJECTCONTEXTDATA MOTIONPATH MTEXTATTRIBUTEOBJECTCONTEXTDATA
 MTEXTOBJECTCONTEXTDATA NAVISWORKSMODEL NAVISWORKSMODELDEF NURBSURFACE
 PERSUBENTMGR PLANESURFACE POINTPATH RENDERENTRY RENDERGLOBAL REVOLVEDSURFACE
 RTEXT SUNSTUDY SWEPTSURFACE TABLE (works only pre-2010) TABLECONTENT
 TEXTOBJECTCONTEXTDATA TVDEVICEPROPERTIES

ASSOCDIMDEPENDENCYBODY BLOCKPARAMDEPENDENCYBODY
 ALIGNMENTPARAMETERENTITY BASEPOINTPARAMETERENTITY
 FLIPPARAMETERENTITY LINEARPARAMETERENTITY POINTPARAMETERENTITY
 ROTATIONPARAMETERENTITY VISIBILITYPARAMETERENTITY
 VISIBILITYGRIPENTITY XYPARAMETERENTITY BLOCKALIGNEDCONSTRAINTPARAMETER
 BLOCKANGULARCONSTRAINTPARAMETER BLOCKARRAYACTION
 BLOCKDIAMETRICCONSTRAINTPARAMETER BLOCKHORIZONTAL-

CONSTRAINTPARAMETER BLOCKLINEARCONSTRAINTPARAMETER
 BLOCKLOOKUPACTION BLOCKLOOKUPPARAMETER BLOCK-
 POINTPARAMETER BLOCKPOLARGRIP BLOCKPOLARPARAMETER
 BLOCKPOLARSTRETCHACTION BLOCKPROPERTIESTABLE BLOCK-
 PROPERTIESTABLEGRIP BLOCKRADIALCONSTRAINTPARAMETER
 BLOCKREPRESENTATION BLOCKSTRETCHACTION BLOCKUSER-
 PARAMETER BLOCKVERTICALCONSTRAINTPARAMETER
 BLOCKXYGRIP POINTCLOUD POINTCLOUDEX POINTCLOUDDEF
 POINTCLOUDDEFEX POINTCLOUDDEF_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 ASSOCBERSUBENTMANAGER
 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, LibreCAD, FreeCAD, 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.

`ACadSharp`

Read and write the basic objects in most DWG and DXF formats. Written in C#, under the MIT 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 DWG versions and details. Which is especially important for attached links and data from third party applications: BIM, MAP, GIS, AEC, MECH, ..., 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 271), 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 271).

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 <code>programs/geom.c</code> .	
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 <i>Dwg_Color</i>	[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
AXISMODE	BS, DXF 70
AXISUNIT	2RD, DXF 20
BACKZ	BD
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
CELTSCALE	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
DIMARROW BD
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
DIMMZF	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
FASTZOOM B, DXF 70
FILLETRAD
 BD, DXF 40
FILLMODE B, DXF 70
FINGERPRINTGUID
 TV, DXF 2
FLAGS BL
FLATLAND B, DXF 70
FRONTZ BD
GRIDMODE RS, DXF 70
GRIDUNIT 2RD, DXF 20
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

MENUEXT RC

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
PUCSORGLEFT
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, DXF 50

SNAPBASE 2RD, DXF 20

SNAPISOPAIR
RS, DXF 70

SNAPMODE RS, DXF 70

SNAPSTYLE
RS, DXF 70

SNAPUNIT 2RD, DXF 20

SOLIDHIST
RC, DXF 280

SORTENTS RC, DXF 280

SPLFRAME B, DXF 70

SPLINESEGS
BS, DXF 70

SPLINETYPE
BS, DXF 70

STEPWISE 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

TARGET 3BD

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
BSd, DXF 70
TSTACKALIGN
BS
TSTACKSIZE
BS
UCSBASE H, DXF 2
UCSICON RC
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 BSd, DXF 70

USERI2 BSd, DXF 70
USERI3 BSd, DXF 70
USERI4 BSd, DXF 70
USERI5 BSd, 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 3RD, DXF 20
VIEWDIR 3BD, DXF 30
VIEWMODE B
VIEWSIZE RD, DXF 40
VIEWTWIST
BD
VIEW_CONTROL_OBJECT
H
VISRETAIN
B, DXF 70
VPOINTX 3RD
VPOINTXALT
3RD
VPOINTY 3RD
VPOINTYALT
3RD
VPOINTZ 3RD
VPOINTZALT
3RD
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
aspect_ratio
    RD
bitsize  RL
bitsize_hi
    RL
circle_zoom_percent
    RS
codepage  RS
dwg_size  RL
flag_3d   RS
layer_colors
    RS
numentities
    RS
oldCECOLOR_hi
    RL
oldCECOLOR_lo
    RL
size      RL
unit1_name
    TV
unit1_ratio
    BD
unit2_name
    TV
unit2_ratio
    BD
```

```
unit3_name
    TV
unit3_ratio
    BD
unit4_name
    TV
unit4_ratio
    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_20
    H
unknown_21
    BL
unknown_22
    BL
unknown_23
    BD
unknown_4f2
    RL
unknown_5
    RS
```

unknown_51e
RS

unknown_520
RS

unknown_52c
RSd

unknown_52e
RS

unknown_530
RC

unknown_54
BS

unknown_55
BS

unknown_56
BS

unknown_57
BS

unknown_59
RS

unknown_6
RS

unknown_6a
RS

unknown_6b
RS

unknown_6c
RS

unknown_8
BL

unknown_9
BL

unknown_day
RS

unknown_hour
RS

unknown_min
RS

```

unknown_mon
    RS

unknown_ms
    RS

unknown_sec
    RS

unknown_string
    T

unknown_year
    RS

```

4.2 ENTITIES

All graphical objects with its fields. See [Common Entity fields], page 260,

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

```

3DLINE

```

parent    struct _dwg_object_entity*

start     3RD, DXF 10
end       3RD, DXF 11

extrusion
    3RD, DXF 210

thickness
    RD, DXF 39

```

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
    RC, DXF 2
```

```

revision_major
    BL

revision_minor1
    BS

revision_minor2
    BS

revision_bytes
    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, DXF 2

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, DXF 70

lock_position_flag
B

style H, DXF 7

mtext_style
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, DXF 70

lock_position_flag
 B

style H, DXF 7

mtext_style
 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 TV, DXF 2

xref_pname
TV, DXF 1

base_pt 2RD, DXF 10

BODY

See [3DSOLID], page 24,

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, DXF 2

xline1_pt
3BD, DXF 13

xline2_pt
3BD, DXF 14

oblique_angle
BD, DXF 50

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, DXF 2

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, DXF 2

xline1_pt
 3BD, DXF 13

xline2_pt 3BD, DXF 14
center_pt 3BD, DXF 15
xline2end_pt 3RD

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, DXF 2

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, DXF 2

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, DXF 2

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, DXF 2

first_arc_pt
3BD, DXF 15

leader_len
BD, DXF 40

DWFUNDERLAY

See [UNDERLAY], page 32,

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*

ENDREP

parent struct _dwg_object_entity*
numcols RS, DXF 70
numrows RS, DXF 71
colspacing
 RD, DXF 40
rowspacing
 RD, DXF 41

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
            RC, DXF 2
revision_major
            BL
revision_minor1
            BS
revision_minor2
            BS
revision_bytes
            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

```

FLIPGRIPENTITY

```
parent    struct _dwg_object_entity*
```

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
splineflags
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

num_cols RS, DXF 70
num_rows RS, DXF 71
col_spacing
RD, DXF 44
row_spacing
RD, DXF 45
block_name
TV, DXF 2

JUMP

parent struct _dwg_object_entity*
jump_address_raw
RL
jump_address
RL
jump_entity_section
Dwg_Entity_Sections

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, DXF 2

`first_arc_pt`
 3BD, DXF 15

`leader_len`
 BD, DXF 40

`ovr_center`
 3BD, DXF 12

`jog_point`
 3BD, DXF 13

LAYOUTPRINTCONFIG

`parent` struct `_dwg_object_entity*`

`class_version`
 BS

`flag` BS, DXF 93

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, DXF 213

dimgap BD

box_height
 BD, DXF 40

box_width
 BD, DXF 41

hookline_dir
 B, DXF 74

hookline_on
 B, DXF 75

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

unknown_bit_4
 B

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

light_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

unknown_r11
2RD

LINEARGRIPENTITY

parent struct _dwg_object_entity*

LINEARPARAMETERENTITY

parent struct _dwg_object_entity*

LOAD

parent struct _dwg_object_entity*

file_name
TV, DXF 1

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
    RC, DXF 2
```

revision_major
BL

revision_minor1
BS

revision_minor2
BS

revision_bytes
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
unknown_b1 B
unknown_b2 B

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*

hatch_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

line_color
 CMC, DXF 91

line_ltype
 H, DXF 341

line_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
    RC, DXF 2

revision_major
    BL

revision_minor1
    BS

revision_minor2
    BS

revision_bytes
    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 32,

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
    RC, DXF 2

revision_major
    BL

revision_minor1
    BS

revision_minor2
    BS

revision_bytes
    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
extra_r11_size BL
extra_r11_text TV
num_m_verts    BS, DXF 71
num_n_verts    BS, DXF 72
```

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
start_width  BD, DXF 40
end_width    BD, DXF 41
flag         RC, DXF 70
extrusion    BE, DXF 210
```

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
flag           BS, DXF 70
numverts      BS, DXF 71
numfaces      BS, DXF 72

```

PROXY_ENTITY

```

parent         struct _dwg_object_entity*

```

class_id BL, DXF 90
 version BL, DXF 95
 maint_version
 BL, DXF 97
 from_dxf B, DXF 70
 data_numbits
 BL
 data_size
 BL, DXF 160
 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 24,

REPEAT

parent struct _dwg_object_entity*

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
    RC, DXF 2

revision_major
    BL

revision_minor1
    BS

revision_minor2
    BS

revision_bytes
    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

```

ROTATIONGRIPENTITY

```
parent    struct _dwg_object_entity*
```

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*

```
begin_addr_r11
    RL
```

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, DXF 2
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
splineflags
    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
    RC, DXF 2

revision_major
    BL

revision_minor1
    BS

revision_minor2
    BS

revision_bytes
    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_b11
    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

dimgap 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 93,

VERTEX_PFACE

See [VERTEX_3D], page 93,

VERTEX_PFACE_FACE

parent struct _dwg_object_entity*
 flag RC, DXF 70
 vertind BS, DXF 71

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 76,

XYGRIPENTITY

```
parent    struct _dwg_object_entity*
```

XYPARAMETERENTITY

```
parent    struct _dwg_object_entity*
```

4.3 OBJECTS

All non-graphical objects with its fields. See [Common Object fields], page 262,

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
    RC, DXF 2

revision_major
    BL

revision_minor1
    BS

revision_minor2
    BS

revision_bytes
    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
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_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      RSd
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*
flags_r11
          RS

```

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      Dwg_VALUEPARAM*
version     BL, DXF 90
b1          B, DXF 70
workplane
            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      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
        RC
    revision_major
        BL
    revision_minor1
        BS
    revision_minor2
        BS
    revision_bytes
        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
aap_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    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

```

ASSOCROTATEDDDIMACTIONBODY

```

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

```

ASSOCWEPTSURFACEACTIONBODY

```

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         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      Dwg_BLOCKSTRETCHACTION_handles*
num_codes
          BL, DXF 75
codes     Dwg_BLOCKSTRETCHACTION_codes*
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_cyclling
B, DXF 280
bg_insert_cyclling_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*

```

flags_r11
RS

model_space
H

paper_space
H

BLOCK_HEADER

BLOCK_HEADER is a table object.

parent struct _dwg_object_object*

flag RC

name TV

used RSd

is_xref_ref
B

is_xref_resolved
BS

is_xref_dep
B

xref H

__iterator
BL

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

flag2      RS

unknown_r11
    RC

block_offset_r11
    RL

```

BREAKDATA

```

parent     struct _dwg_object_object*

num_pointrefs
    BL, DXF 90

pointrefs
    H*, DXF 330

dimref     H, DXF 331

```

BREAKPOINTREF

```

parent     struct _dwg_object_object*

```


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

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
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       RSd
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
DIMALTZ	BS, DXF 285
DIMALTTZ	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
 DIMATFIT BS, DXF 289
 DIMFXLON B, DXF 290
 DIMTXTDIRECTION
 B, DXF 294
 DIMALTMZF
 BD
 DIMALTMZS
 T
 DIMMZFB 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*
 flags_r11 RS
 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
 2RD, 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      RSd
is_xref_ref
          B
is_xref_resolved
          BS
is_xref_dep
          B
xref      H
flag0     BS
frozen    B
on        B
frozen_in_new
          B
locked    B
plotflag  B, DXF 290
linewt    RC, DXF 370
color     CMC, DXF 62
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*

flags_r11
    RS

```

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*

```

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      RSd
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
numdashes
          RC, DXF 73
dashes    Dwg_LTYPE_dash*
dashes_r11
          RD, DXF 49
has_strings_area
          B
strings_area
          TF
unknown_r11
          RC

```

LTYPE_CONTROL

LTYPE_CONTROL is a table_control object.

```

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

```

flags_r11
RS

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 Dwg_Object_SCALE

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 90
version   BL, DXF 71
maint_version
          BL, DXF 97
from_dxf  B, DXF 70
data_numbits
          BL
data_size
          BL, DXF 161
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_r
RC, DXF 280

fog_color_g
RC, DXF 280

fog_color_b
RC, 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      RSd

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*

flags_r11
RS

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

numviewports
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       RSd
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*
flags_r11
    RS

```

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      RSd
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

flag_3d
    RS

unknown_r2
    RC

unknown_r11
    RC

```

VIEW_CONTROL

VIEW_CONTROL is a table_control object.

```

parent
    struct _dwg_object_object*

num_entries
    BS, DXF 70

entries
    H*

flags_r11
    RS

```

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_obscured_color
CMC, DXF 65

edge_obscured_color_int
BS, DXF 176

edge_obscured_ltype
BL, DXF 75

edge_obscured_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	RSd
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*
flags_r11       RS

```

VX_CONTROL

VX_CONTROL is a table_control object.

```

parent          struct _dwg_object_object*
num_entries     BS, DXF 70
entries         H*
flags_r11       RS

```

VX_TABLE_RECORD

VX_TABLE_RECORD is a table object.

```

parent          struct _dwg_object_object*
flag            RC
name           TV
used           RSd
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

vport_entity_address
RS

r11_viewport_index
RSd

r11_prev_entry_index
RSd

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 218,

DWFDEFINITION

See [UNDERLAYDEFINITION], page 218,

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 218,

ASSOCARRAYPOLARPARAMETERS

See [ASSOCARRAYPARAMETERS], page 218,

ASSOCARRAYRECTANGULARPARAMETERS

See [ASSOCARRAYPARAMETERS], page 218,

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
b193      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*
itemloc    BL

```

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    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     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
schdat	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 RLLd*
 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 RS
 name 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 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_BLOCKSTRETCHACTION_codes

```

parent    struct _dwg_object_BLOCKSTRETCHACTION*
b195     BL, DXF 95
bs76     BS, DXF 76
b194     BL, DXF 94

```

Dwg_BLOCKSTRETCHACTION_handles

```

parent    struct _dwg_object_BLOCKSTRETCHACTION*
hdl       H, DXF 331
shrt     BS, DXF 74
long1    BL, DXF 94
long2    BL, DXF 94

```

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_bl
 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, DXF 2

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 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 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
style	H
direction	3BD
color	CMC
width	BD
height	BD
line_spacing_factor	BD
default_text	T
line_spacing_style	BS
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_MLINESTYLE_line

parent struct _dwg_object_MLINESTYLE*

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
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

secondheader_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
    RLd

gap_array_size
    RL

crc32      RLx

padding    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*
```

<code>num_geoms</code>	BL, DXF 90
<code>hexindex</code>	BL, DXF 91
<code>flags</code>	BL, DXF 92
<code>color</code>	CMC, DXF 62
<code>layer</code>	T, DXF 8
<code>ltype</code>	T, DXF 6
<code>ltype_scale</code>	BD, DXF 40
<code>plotstyle</code>	T, DXF 1
<code>linewt</code>	BLd, DXF 370
<code>face_transparency</code>	BS, DXF 70
<code>edge_transparency</code>	BS, DXF 71
<code>hatch_type</code>	BS, DXF 72
<code>hatch_pattern</code>	T, DXF 2
<code>hatch_angle</code>	BD, DXF 41
<code>hatch_spacing</code>	BD, DXF 42
<code>hatch_scale</code>	BD, DXF 43
Dwg_SECTION_typesettings	
<code>parent</code>	struct <code>_dwg_object_SECTION_SETTINGS*</code>
<code>type</code>	BS, DXF 90
<code>generation</code>	BS, DXF 91
<code>num_sources</code>	BL, DXF 92
<code>sources</code>	H*, DXF 330
<code>destblock</code>	H, DXF 331
<code>destfile</code>	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       T16
value    T16

```

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
 unit_type
 BL
 format_string
 TU

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
RCd, DXF 62

dwg struct _dwg_struct*

edge_visualstyle
H, DXF 348

eed Dwg_Eed*

elevation_r11
RD, DXF 38

entmode BB, DXF 67
extra_r11 RS
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
layer H, DXF 8
linewt RC, DXF 370
ltype H, DXF 6
ltype_flags BB
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
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, DXF 39
viewport    H
xdicobjhandle
           H, DXF 360

```

Common Object fields

```

dwg        struct _dwg_struct*
eed        Dwg_Eed*
handleref
           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
```

5 Sections

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

HEADER CLASSES HANDLES OBJFREESPACE + 2NDHEADER MEASUREMENT/TEMPLATE 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

The old pre-R13 formats (from r1.1 to r11) have those sections, with the tables interleaved into the HEADER.

HEADER ENTITIES BLOCKS entities EXTRAS entities

With (from r1.1 to r10) those 5 Section 5.22 [Tables], page 267:

BLOCKS LAYER STYLE LTYPE VIEW

With r11 came the additional tables:

UCS VPORT APPID DIMSTYLE VX

But we convert them internally to r2004 table record and table control objects. See Section 5.22 [Tables], page 267.

5.1 HEADER Section

See Chapter 4 [Objects], page 8.

5.2 OBJECTS Section

The OBJECTS Section is usually split up into multiple pages (separate sections of type AcDbObjects) and contains all entities and objects. It is indexed by Section 5.4 [HANDLES], page 265.

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. Its 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 **undhandled** classes are always ignored. There are no fields known, only its type.

5.4 HANDLES Section

The Handles section contains a sorted list of all object handles and its 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 252,

5.8 Preview

The optional Preview section contains the thumbnail stream of BMP, WMF or PNG data of the drawing. Note that blocks or proxy objects can also contain its own preview fields. The program **dwgbmp** can extract the preview image 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.

5.22 Tables

The old pre-R13 formats (from r1.1 to r11) have no objects and no sections, just tables, which we store in the sections indexed by the enum **Dwg_Section_Type_r11**.

BLOCKS LAYER STYLE LTYPE VIEW

With r11 came the additional tables:

UCS VPORT APPID DIMSTYLE VX

Since r13 all those tables are stored as table control objects and tablerecord objects.

From pre-r13 DWG's these tables are imported as old r11 sections and as new CONTROL objects, so that all entities are accessible via the single BLOCK_CONTROL.model_space -> BLOCK_HEADER.entities iterator, all layers via the LAYER_CONTROL.entries -> LAYER objects, and so on. All blocks are accessed via all other model_space BLOCK_HEADER's, `get_first_owned_block (BLOCK_HEADER)`. Each CONTROL object holds a list of all table records, i.e. entries. Each table record entry has a name and other common table fields.

5.23 EXTRAS entities section

Before R13 we had no objects, just the 5-10 tables, and the entities divided into 3 sections. The entities, the blocks and the extras. Blocks just contains the entities from each BLOCK to the ENDBLK entity.

Extras contain entities which had no room in the original section, e.g. when closing a polyline, which needs one additional byte. Thus the original entity is replaced by an undocumented JUMP entity, which gives the offset into the EXTRAS section, until a JUMP in the EXTRAS jumps back to the next original entity.

See e.g. `r10/entities.dwg`

The JUMP [31] replaces the POLYLINE_2D entity which got later closed. An open POLYLINE_2D needs size 8, but closed 9 bytes. Hence they added the new closed replacement to the extras section at offset 0, index [66], and added another JUMP [67] back to the next original entity. Here it jumps back to the VERTEX_2D [32] at offset 0x84f.

```

type: 18 [RCd]
Add entity JUMP [31] Decode entity JUMP
=====
Entity number: 31, Type: 18, Addr: 847
flag_r11: 0x0 [RC 0]
size: 8 [RS]
jump_address_raw: 0x80000000 [RLx 0]
jump_entity_section: DWG_EXTRA_SECTION

```

```

jump_address: 0x0

type: 20 [RCd]
Add entity VERTEX_2D [32] Decode entity VERTEX_2D
=====
Entity number: 32, Type: 20, Addr: 84f
flag_r11: 0x0 [RC 0]
size: 24 [RS]
layer: 0 [H(RSd) 8]
opts_r11: 0x0 [RSx 0]
point: (5.500000, 7.500000) [2RD 10]

....

extras entities: (0x10c0-0x10d1 (0), size 17)
=====
type: 19 [RCd]
Add entity POLYLINE_2D [66] Decode entity POLYLINE_2D
=====
Entity number: 66, Type: 19, Addr: 10c0
flag_r11: 0x80 [RC 0]
      HAS_ATTRIBS(0x80)
size: 9 [RS]
layer: 0 [H(RSd) 8]
opts_r11: 0x1 [RSx 0]
      HAS_FLAG(0x1)
flag: 0x1 [RC 70]
      CLOSED(0x1)

type: 18 [RCd]
Add entity JUMP [67] Decode entity JUMP
=====
Entity number: 67, Type: 18, Addr: 10c9
flag_r11: 0x0 [RC 0]
size: 8 [RS]
jump_address_raw: 0x84f [RLx 0]
jump_entity_section: DWG_ENTITY_SECTION
jump_address: 0x84f
=====
extras entities: end

```

The entity iterator knows about these jumps. The DXF structure resolves those jumps, and inserts the replaced entities.

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 274, 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 274, 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.
```

Note: Pre-R13 DWG's do contain all deleted entities, which e.g. were moved into a BLOCK. Those entities do have a type > 127. You need to filter them out by yourself, when processing the DWG.

7.2 Encoding

Encoding DWG files, i.e. DWG write support, can be disabled via `./configure --disable-write`. The default formats and only useful ones are currently `r1.1 - r2000`. Experimentally work is ongoing for the `r2004` format, which is also used for `r2010`, `r2013`, and `r2018`. The `r2007` format version is not covered yet. The pre-r13 formats are much simpler and can be written, but need some hand-holding and manual conversions when converting from newer formats still.

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 273, 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 274, 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 274.

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 276. 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 281.

```
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_1_2 - R_2000 are supported yet. For DXF you can try all versions R_13 - R_2018.

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 276.

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-malloc'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, and converted from and to their proper codepage to UTF-8 or `\U+XXXX`.

To encode unicode characters special `\U+XXXX` sequences are used, and pre-r2007 DXF MIF `\M+nXXXX` sequences, where `n` is one of the asian wide-character codepages 932 (Japanese), 950 (trad. Chinese), 949 (Korean Wansung), 1361 (Johab), and 936 (simplified Chinese).

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 273, (`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. Unicode is encoded as `\U+XXXX`. 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 quotes 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.

Support for the different `r1.x` DXF format is not planned.

Reading DXF works for most objects. Converting a minimal DXF to DWG may fail, and needs some fixes.

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 279. 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.

Note that for the versions before R13 we convert all tables to table control and record objects internally, so that we can use our iterators needed for DXF support. This does not reflect the internal DWG structure. See Section 5.22 [Tables], page 267.

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`, polyline bulges would need segmentation into line segments. `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, Minimal 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, minJSON, GeoJSON.

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

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

`-help` display this help and exit

`-version` output version information and exit

minJSON is minimized JSON, without whitespace.

dwgwrite

Create a DWG from a given input file (see Section 7.6.1 [DXF], page 276, see Section 7.6.2 [DXFB], page 277, see Section 7.6.3 [JSON], page 277), optionally via `--as=rNNNN` as another version. For now can only create r1.2-r2000 DWG files.

dxfwrite

Create a DXF from a given input file (DWG, see Section 7.6.1 [DXF], page 276, see Section 7.6.2 [DXFB], page 277, see Section 7.6.3 [JSON], page 277), optionally via `--as=rNNNN` as another version. 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.

dxl2dwg

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 r1.2-r2000 DWG. 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. For now can only create r1.2-r2000 DWG.

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`, `-dxf`, `-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 and set its properties. 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 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.) Issues and pull requests at the github mirror (<https://github.com/LibreDWG/libredwg>) are also accepted.

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. For patches longer than 15 lines we need your copyright assignment to the FSF clerk. See `CONTRIBUTING` in the source distribution.

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13 Index

13.1 General Index

- (
 (Dwg_Data..... 274
- *
- *layer..... 274
 *line..... 274
- B**
 bug reporting..... 284
- C**
 checklist for bug reports..... 284
 code, error..... 7
 code, return..... 7
 Common Entity fields..... 260
 Common Object fields..... 262
 compilation..... 5
 coverage..... 1
- D**
 data types..... 6
 dwg file format..... 1
 dwg_add_Document..... 272, 273
 dwg_add_object..... 273
 dwg_add_TEXT..... 274
 dwg_decode_OBJECT..... 272
 dwg_dynapi_common_set_value..... 276
 dwg_dynapi_common_utf8text..... 275
 dwg_dynapi_common_value..... 275
 dwg_dynapi_entity_set_value..... 275
 dwg_dynapi_entity_utf8text..... 275
 dwg_dynapi_entity_value..... 275
 dwg_dynapi_header_set_value..... 276
 dwg_dynapi_header_utf8text..... 275
 dwg_dynapi_header_value..... 275
 dwg_dynapi_subclass_utf8text..... 275
 dwg_dynapi_subclass_value..... 275
 dwg_encode_OBJECT..... 273
 dwg_getall_ENTITY..... 272
 dwg_getall_OBJECT..... 272
 dwg_read_file..... 271
 dwg_setup_OBJECT..... 273
 dwg_write_file..... 272
 dwg2dxf..... 279
 dwg2ps..... 280
 dwg2svg2..... 281
 dwg2SVG..... 280
- dwgadd..... 281
 dwgfilter..... 280
 dwgfuzz..... 281
 dwggrep..... 280
 dwglayers..... 280
 dwgplot..... 281
 dwgread..... 279
 dwgrewrite..... 280
 dwgwrite..... 279
 dxf2dwg..... 279
 DXF, ASCII DXF..... 276
 DXFB, Binary DXF..... 277
 dxfwrite..... 279
- E**
 EED..... 269
 ENTITIES..... 24
 entity, 3DFACE..... 24
 entity, 3DLINE..... 24
 entity, 3DSOLID..... 24
 entity, ALIGNMENTPARAMETERENTITY... 26
 entity, ARC..... 26
 entity, ARC_DIMENSION..... 28
 entity, ARCALIGNEDTEXT..... 26
 entity, ATTDEF..... 29
 entity, ATTRIB..... 30
 entity, BASEPOINTPARAMETERENTITY... 32
 entity, BLOCK..... 32
 entity, BODY..... 32
 entity, CAMERA..... 32
 entity, CIRCLE..... 32
 entity, DGNUNDERLAY..... 32
 entity, DIMENSION_ALIGNED..... 33
 entity, DIMENSION_ANG2LN..... 34
 entity, DIMENSION_ANG3PT..... 35
 entity, DIMENSION_DIAMETER..... 37
 entity, DIMENSION_LINEAR..... 38
 entity, DIMENSION_ORDINATE..... 39
 entity, DIMENSION_RADIUS..... 40
 entity, DWFUNDERLAY..... 42
 entity, ELLIPSE..... 42
 entity, ENDBLK..... 42
 entity, ENDREP..... 42
 entity, EXTRUDEDSURFACE..... 42
 entity, FLIPGRIPENTITY..... 45
 entity, FLIPPARAMETERENTITY..... 45
 entity, GEOPOSITIONMARKER..... 45
 entity, HATCH..... 46
 entity, HELIX..... 47
 entity, IMAGE..... 48
 entity, INSERT..... 49

- entity, JUMP 50
 - entity, LARGE_RADIAL_DIMENSION 50
 - entity, LAYOUTPRINTCONFIG 51
 - entity, LEADER 51
 - entity, LIGHT 53
 - entity, LINE 55
 - entity, LINEARGRIPENTITY 55
 - entity, LINEARPARAMETERENTITY 55
 - entity, LOAD 55
 - entity, LOFTEDSURFACE 55
 - entity, LWPOLYLINE 58
 - entity, MESH 59
 - entity, MINSERT 59
 - entity, MLINE 60
 - entity, MPOLYGON 61
 - entity, MTEXT 62
 - entity, MULTILEADER 63
 - entity, NAVISWORKSMODEL 65
 - entity, NURBSURFACE 66
 - entity, OLE2FRAME 67
 - entity, OLEFRAME 68
 - entity, PDFUNDERLAY 68
 - entity, PLANESURFACE 68
 - entity, POINT 70
 - entity, POINTCLOUD 70
 - entity, POINTCLOUDEX 71
 - entity, POINTPARAMETERENTITY 73
 - entity, POLARGRIPENTITY 73
 - entity, POLYLINE_2D 73
 - entity, POLYLINE_3D 74
 - entity, POLYLINE_MESH 74
 - entity, POLYLINE_PFACE 75
 - entity, PROXY_ENTITY 75
 - entity, RAY 76
 - entity, REGION 76
 - entity, REPEAT 76
 - entity, REVOLVEDSURFACE 76
 - entity, ROTATIONGRIPENTITY 78
 - entity, ROTATIONPARAMETERENTITY 78
 - entity, RTEXT 79
 - entity, SECTIONOBJECT 79
 - entity, SEQEND 79
 - entity, SHAPE 80
 - entity, SOLID 80
 - entity, SPLINE 80
 - entity, SWEPTSURFACE 81
 - entity, TABLE 84
 - entity, TEXT 91
 - entity, TOLERANCE 91
 - entity, TRACE 92
 - entity, UNKNOWN_ENT 92
 - entity, VERTEX_2D 92
 - entity, VERTEX_3D 93
 - entity, VERTEX_MESH 93
 - entity, VERTEX_PFACE 93
 - entity, VERTEX_PFACE_FACE 93
 - entity, VIEWPORT 93
 - entity, VISIBILITYGRIPENTITY 95
 - entity, VISIBILITYPARAMETERENTITY 95
 - entity, WIPEOUT 95
 - entity, XLINE 96
 - entity, XYGRIPENTITY 96
 - entity, XYPARAMETERENTITY 96
 - enums 6
 - error 278
 - error code 7
- ## F
- features, still missing 1
 - functions 271
 - functions, create 273
 - functions, decoding 271
 - functions, dynamic field access 274
 - functions, encoding 272
 - functions, other formats 276
 - functions, read path 271
 - functions, write path 272
- ## G
- gambas 282
 - GeoJSON 277
- ## H
- header 5
 - HEADER 8
- ## J
- JSON 277
- ## L
- license 1
 - linking 5
 - load_dwg 281
- ## O
- object, ACMECOMMANDHISTORY 96
 - object, ACMESCOPE 96
 - object, ACMESTATEMGR 96
 - object, ACSH_BOOLEAN_CLASS 96
 - object, ACSH_BOX_CLASS 97
 - object, ACSH_BREP_CLASS 97
 - object, ACSH_CHAMFER_CLASS 99
 - object, ACSH_CONE_CLASS 99
 - object, ACSH_CYLINDER_CLASS 99
 - object, ACSH_EXTRUSION_CLASS 100
 - object, ACSH_FILLET_CLASS 101
 - object, ACSH_HISTORY_CLASS 102
 - object, ACSH_LOFT_CLASS 102
 - object, ACSH_PYRAMID_CLASS 102
 - object, ACSH_REVOLVE_CLASS 103

- object, ACSH_SPHERE_CLASS 104
- object, ACSH_SWEEP_CLASS 104
- object, ACSH_TORUS_CLASS 105
- object, ACSH_WEDGE_CLASS 105
- object, ALDIMOBJECTCONTEXTDATA 106
- object, ANGDIMOBJECTCONTEXTDATA .. 106
- object,
 - ANNOTSCALEOBJECTCONTEXTDATA .. 106
- object, APPID 107
- object, APPID_CONTROL 107
- object, ASSOC2DCONSTRAINTGROUP 107
- object,
 - ASSOC3POINTANGULARDIMACTIONBODY .. 108
- object, ASSOCACTION 109
- object, ASSOCACTIONPARAM 109
- object,
 - ASSOCALIGNEDDIMACTIONBODY 109
- object, ASSOCARRAYACTIONBODY 110
- object,
 - ASSOCARRAYMODIFYACTIONBODY ... 110
- object,
 - ASSOCARRAYMODIFYPARAMETERS ... 218
- object,
 - ASSOCARRAYPATHPARAMETERS 219
- object,
 - ASSOCARRAYPOLARPARAMETERS 219
- object,
 - ASSOCARRAYRECTANGULARPARAMETERS .. 219
- object, ASSOCASMBODYACTIONPARAM .. 110
- object,
 - ASSOCBLENDSURFACEACTIONBODY .. 112
- object,
 - ASSOCCOMPOUNDACTIONPARAM 113
- object, ASSOCDEPENDENCY 113
- object, ASSOCDIMDEPENDENCYBODY 114
- object, ASSOCEDGEACTIONPARAM 114
- object,
 - ASSOCEDGECHAMFERACTIONBODY .. 115
- object,
 - ASSOCEDGEFILLETACTIONBODY 115
- object,
 - ASSOCEXTENDSURFACEACTIONBODY .. 115
- object,
 - ASSOCEXTRUDESURFACEACTIONBODY .. 115
- object, ASSOCFACEACTIONPARAM 116
- object,
 - ASSOCFILLETSURFACEACTIONBODY .. 116
- object, ASSOCGEOMDEPENDENCY 116
- object,
 - ASSOCLOFTEDSURFACEACTIONBODY .. 117
- object, ASSOCMLEADERACTIONBODY 117
- object, ASSOCNETWORK 117
- object,
 - ASSOCNETWORKSURFACEACTIONBODY .. 118
- object, ASSOCOBJECTACTIONPARAM 119
- object,
 - ASSOCOFFSETSURFACEACTIONBODY .. 119
- object,
 - ASSOCORDINATEDIMACTIONBODY 119
- object,
 - ASSOCOSNAPPOINTREFACTIONPARAM .. 120
- object,
 - ASSOCPATCHSURFACEACTIONBODY .. 120
- object, ASSOCPATHACTIONPARAM 121
- object, ASSOCPESSUBENTMANAGER 121
- object,
 - ASSOCPLANESURFACEACTIONBODY .. 123
- object, ASSOCPOINTREFACTIONPARAM .. 124
- object,
 - ASSOCRESTOREENTITYSTATEACTIONBODY .. 124
- object,
 - ASSOCREVOLVEDSURFACEACTIONBODY .. 125
- object,
 - ASSOCROTATEDDIMACTIONBODY 125
- object,
 - ASSOCSCWEPSTURFACEACTIONBODY .. 125
- object,
 - ASSOCTRIMSURFACEACTIONBODY 125
- object, ASSOCVALUEDEPENDENCY 126
- object, ASSOCVARIABLE 126
- object, ASSOCVERTEXACTIONPARAM 127
- object, BLKREFOBJECTCONTEXTDATA .. 127
- object, BLOCK_CONTROL 154
- object, BLOCK_HEADER 155
- object,
 - BLOCKALIGNEDCONSTRAINTPARAMETER .. 128
- object, BLOCKALIGNMENTGRIP 129
- object,
 - BLOCKALIGNMENTPARAMETER 129
- object,
 - BLOCKANGULARCONSTRAINTPARAMETER .. 130
- object, BLOCKARRAYACTION 131
- object, BLOCKBASEPOINTPARAMETER .. 132
- object,
 - BLOCKDIAMETRICCONSTRAINTPARAMETER .. 132
- object, BLOCKFLIPACTION 133
- object, BLOCKFLIPGRIP 134
- object, BLOCKFLIPPARAMETER 135
- object,
 - BLOCKGRIPLOCATIONCOMPONENT ... 136
- object,
 - BLOCKHORIZONTALCONSTRAINTPARAMETER .. 136
- object,
 - BLOCKLINEARCONSTRAINTPARAMETER .. 137
- object, BLOCKLINEARGRIP 138
- object, BLOCKLINEARPARAMETER 138
- object, BLOCKLOOKUPACTION 139
- object, BLOCKLOOKUPGRIP 140
- object, BLOCKLOOKUPPARAMETER 140
- object, BLOCKMOVEACTION 141
- object,
 - BLOCKPARAMDEPENDENCYBODY 142
- object, BLOCKPOINTPARAMETER 142
- object, BLOCKPOLARGRIP 143
- object, BLOCKPOLARPARAMETER 143

- object, BLOCKPOLARSTRETCHACTION... 144
- object, BLOCKPROPERTIESTABLE 145
- object, BLOCKPROPERTIESTABLEGRIP ... 145
- object,
 - BLOCKRADIALCONSTRAINTPARAMETER... 145
- object, BLOCKREPRESENTATION..... 146
- object, BLOCKROTATEACTION 146
- object, BLOCKROTATIONGRIP 147
- object, BLOCKROTATIONPARAMETER.... 147
- object, BLOCKSCALEACTION 148
- object, BLOCKSTRETCHACTION..... 149
- object, BLOCKUSERPARAMETER..... 150
- object,
 - BLOCKVERTICALCONSTRAINTPARAMETER... 151
- object, BLOCKVISIBILITYGRIP 152
- object, BLOCKVISIBILITYPARAMETER ... 152
- object, BLOCKXYGRIP..... 153
- object, BLOCKXYPARAMETER..... 153
- object, BREAKDATA 156
- object, BREAKPOINTREF..... 156
- object, CELLSTYLEMAP 157
- object, CONTEXTDATAMANAGER 157
- object, CSACDOCUMENTOPTIONS..... 157
- object, CURVEPATH 157
- object, DATALINK 157
- object, DATATABLE 158
- object, DBCOLOR 158
- object, DETAILVIEWSTYLE..... 158
- object, DGNDEFINITION..... 218
- object, DICTIONARY 160
- object, DICTIONARYVAR 160
- object, DICTIONARYWDFLT..... 160
- object, DIMASSOC..... 161
- object, DIMSTYLE..... 161
- object, DIMSTYLE_CONTROL 164
- object, DMDIMOBJECTCONTEXTDATA ... 165
- object, DUMMY..... 165
- object, DWFDEFINITION 218
- object, DYNAMICBLOCKPROXYNODE.... 165
- object,
 - DYNAMICBLOCKPURGEPREVENTER.. 165
- object, EVALUATION_GRAPH 165
- object, FCFOBJECTCONTEXTDATA 166
- object, FIELD..... 166
- object, FIELDLIST..... 167
- object, GEODATA..... 167
- object, GEOMAPIIMAGE..... 169
- object, GRADIENT_BACKGROUND 170
- object, GROUND_PLANE_BACKGROUND .. 170
- object, GROUP..... 171
- object, IBL_BACKGROUND..... 171
- object, IDBUFFER..... 171
- object, IMAGE_BACKGROUND 172
- object, IMAGEDEF 172
- object, IMAGEDEF_REACTOR..... 172
- object, INDEX 172
- object, LAYER 173
- object, LAYER_CONTROL..... 173
- object, LAYER_INDEX..... 174
- object, LAYERFILTER..... 173
- object, LAYOUT 174
- object, LEADEROBJECTCONTEXTDATA .. 175
- object, LIGHTLIST 175
- object, LONG_TRANSACTION 175
- object, LTYPE 176
- object, LTYPE_CONTROL..... 176
- object, MATERIAL..... 177
- object, MENTALRAYRENDERSETTINGS... 179
- object,
 - MLEADEROBJECTCONTEXTDATA 181
- object, MLEADERSTYLE..... 182
- object, MLINestyle..... 184
- object, MOTIONPATH 184
- object,
 - MTEXTATTRIBUTEOBJECTCONTEXTDATA .. 185
- object, MTEXTOBJECTCONTEXTDATA ... 185
- object, NAVISWORKSMODELDEF 186
- object, OBJECT_PTR..... 186
- object, ORDDIMOBJECTCONTEXTDATA .. 186
- object, PARTIAL_VIEWING_INDEX..... 187
- object, PDFDEFINITION 218
- object, PERSUBENTMGR..... 187
- object, PLACEHOLDER 187
- object, PLOTSETTINGS 187
- object, POINTCLOUDCOLORMAP 189
- object, POINTCLOUDDEF..... 189
- object, POINTCLOUDDEF_REACTOR..... 190
- object, POINTCLOUDDEF_REACTOR_EX.. 190
- object, POINTCLOUDDEFEX 190
- object, POINTPATH 190
- object, PROXY_OBJECT 190
- object,
 - RADIMLGOBJECTCONTEXTDATA 191
- object, RADIMOBJECTCONTEXTDATA 191
- object, RAPIDRTRENDERSETTINGS 192
- object, RASTERVARIABLES 193
- object, RENDERENTRY 193
- object, RENDERENVIRONMENT 194
- object, RENDERGLOBAL..... 194
- object, RENDERSETTINGS..... 195
- object, SCALE 196
- object, SECTION_MANAGER..... 198
- object, SECTION_SETTINGS 198
- object, SECTIONVIEWSTYLE..... 196
- object, SKYLIGHT_BACKGROUND..... 198
- object, SOLID_BACKGROUND 199
- object, SORTENTSTABLE 199
- object, SPATIAL_FILTER 199
- object, SPATIAL_INDEX..... 200
- object, STYLE 200
- object, STYLE_CONTROL..... 201
- object, SUN 201
- object, SUNSTUDY 201
- object, TABLECONTENT 203
- object, TABLEGEOMETRY 203
- object, TABLESTYLE..... 203

object, TEXTOBJECTCONTEXTDATA 204
 object, TVDEVICEPROPERTIES 204
 object, UCS 205
 object, UCS_CONTROL 206
 object, UNKNOWN_OBJ 206
 object, VBA_PROJECT 206
 object, VIEW 206
 object, VIEW_CONTROL 208
 object, VISUALSTYLE 208
 object, VPORT 214
 object, VPORT_CONTROL 217
 object, VX_CONTROL 217
 object, VX_TABLE_RECORD 217
 object, WIPEOUTVARIABLES 218
 object, XRECORD 218
 OBJECTS 96
 OCS 7
 overview 1

P

patches, contributing 284
 perl 282
 problems 284
 programs 279
 projects, related 3
 python 282

R

Reference API 283
 reporting bugs 284
 return code 7

S

Sections 264
 strings 276
 structs 6
 structures 269
 SummaryInfo 265

13.2 Object and Field Index

—

__iterator 155, 260
 _3DDWFPREC 21
 _dxf_sab_converted 25, 43, 56, 66, 69, 77, 82,
 98, 111

3

3DFACE 24
 3DLINE 24
 3DSOLID 24

T

table, APPID 107
 table, BLOCK_HEADER 155
 table, DIMSTYLE 161
 table, LAYER 173
 table, LTYPE 176
 table, STYLE 200
 table, UCS 205
 table, VIEW 206
 table, VPORT 214
 table, VX_TABLE_RECORD 217
 table_control, APPID_CONTROL 107
 table_control, BLOCK_CONTROL 154
 table_control, DIMSTYLE_CONTROL 164
 table_control, LAYER_CONTROL 173
 table_control, LTYPE_CONTROL 176
 table_control, STYLE_CONTROL 201
 table_control, UCS_CONTROL 206
 table_control, VIEW_CONTROL 208
 table_control, VPORT_CONTROL 217
 table_control, VX_CONTROL 217
 Tables 267

U

unknown 281

V

version, API/ABI 1

X

XDATA 270

A

aaab_version 108, 109, 110, 117, 119, 125
 aab_version 108, 109, 110, 112, 115, 116, 117,
 118, 119, 120, 123, 124, 125, 126
 aap_version 109, 111, 113, 114, 116, 119, 120,
 121, 124, 127, 218
 ACADMAINTVER 8
 acis_data 25, 43, 56, 66, 69, 76, 82, 97, 111
 acis_empty 24, 42, 55, 66, 68, 76, 81, 97, 111
 acis_empty_bit 26, 44, 57, 67, 70, 78, 83, 98, 112
 acis_empty2 25, 43, 56, 66, 69, 77, 82, 98, 112
 acis_index 220

- ACMECOMMANDHISTORY 96
 ACMESCOPE 96
 ACMESTATEMGR 96
 ACSH_BOOLEAN_CLASS 96
 ACSH_BOX_CLASS 97
 ACSH_BREP_CLASS 97
 ACSH_CHAMFER_CLASS 99
 ACSH_CONE_CLASS 99
 ACSH_CYLINDER_CLASS 99
 ACSH_EXTRUSION_CLASS 100
 ACSH_FILLET_CLASS 101
 ACSH_HISTORY_CLASS 102
 ACSH_LOFT_CLASS 102
 ACSH_PYRAMID_CLASS 102
 ACSH_REVOLVE_CLASS 103
 ACSH_SPHERE_CLASS 104
 ACSH_SWEEP_CLASS 104
 ACSH_TORUS_CLASS 105
 ACSH_WEDGE_CLASS 105
 act_measurement 28, 34, 35, 36, 37, 39, 40, 41,
 51, 234
 action_index 107, 109, 118, 126
 action_offset_x 134, 142, 150
 action_offset_y 134, 142, 150
 action_type 115
 actionbody 107, 108, 109, 110, 117, 118, 119,
 125, 126
 actions 108, 117, 118, 131, 134, 140, 141, 144,
 147, 149
 active_cycles 235
 active_viewport 175
 adb_version 114, 142
 additional_data_flag 255
 affects_graphics 236
 ALDIMOBJECTCONTEXTDATA 106
 align_angle 44, 83, 101, 105
 align_direction 57
 align_option 101, 105
 align_perpendicular 130
 align_space 183
 align_start 45, 84
 alignment 27, 176, 245
 alignment_pt 29, 31, 91, 185, 204
 ALIGNMENTPARAMETERENTITY 26
 alt_hlt 205
 alt_hltcolor 205
 ambient_color 94, 177, 207, 215
 ANGBASE 8
 ANGDIMOBJECTCONTEXTDATA 106
 ANGDIR 8
 angle 33, 47, 61, 131, 148, 237
 angle_desc 144, 148
 angle_name 144, 148
 angle_offset 134, 142, 150
 angle_value_set 144, 148
 annot_type 52
 annotative_app 30, 32
 annotative_data_bytes 30, 32
 annotative_data_size 30, 32
 annotative_short 30, 32
 ANNOTSCALEOBJECTCONTEXTDATA 106
 anonymous 155
 antialiasing_level 205
 appid 63
 APPID 107
 APPID_CONTROL 107
 APPID_CONTROL_OBJECT 8
 arc_end_param 29
 arc_handle 28
 arc_length_parameterization 57
 arc_pt 106
 arc_start_param 29
 ARC 26
 ARC_DIMENSION 28
 ARCALIGNEDTEXT 26
 areafillparms 246
 array_index 219
 arrow_end_symbol 196
 arrow_handle 64, 240
 arrow_head 182
 arrow_head_size 182
 arrow_position 197
 arrow_size 64, 240, 243
 arrow_start_symbol 196
 arrow_symbol 159
 arrow_symbol_color 159, 196
 arrow_symbol_extension_length 197
 arrow_symbol_size 159, 196
 arrowhead 239
 arrowhead_on 52
 arrowhead_type 52
 arrowheads 65
 asdap_class_version 111, 114, 116, 119, 127
 aspect_ratio 21, 207, 215
 assoc_dep 108, 109, 117, 119, 125
 ASSOC2DCONSTRAINTGROUP 107
 ASSOC3POINTANGULARDIMACTIONBODY 108
 ASSOCACTION 109
 ASSOCACTIONPARAM 109
 ASSOCALIGNEDDIMACTIONBODY 109
 ASSOCARRAYACTIONBODY 110
 ASSOCARRAYMODIFYACTIONBODY 110
 ASSOCARRAYMODIFYPARAMETERS 218
 ASSOCARRAYPARAMETERS 218
 ASSOCARRAYPATHPARAMETERS 219
 ASSOCARRAYPOLARPARAMETERS 219
 ASSOCARRAYRECTANGULARPARAMETERS 219
 ASSOCASMBODYACTIONPARAM 110
 ASSOCBLENDSSURFACEACTIONBODY 112
 ASSOCCOMPOUNDACTIONPARAM 113
 assocdep 108, 116, 126, 222
 ASSOCDEPENDENCY 113
 ASSOCDIMDEPENDENCYBODY 114
 ASSOCEDGEACTIONPARAM 114
 ASSOCEDGECHAMFERACTIONBODY 115
 ASSOCEDGEFILLETACTIONBODY 115

- ASSOCEXTENDSURFACEACTIONBODY 115
 ASSOCXTRUDESURFACEACTIONBODY 115
 ASSOCFACEACTIONPARAM 116
 ASSOCFILLETSSURFACEACTIONBODY 116
 ASSOCGEOMDEPENDENCY 116
 associated_annotation 53
 associated_ucs 207
 associativity 161
 ASSOCLOFTEDSURFACEACTIONBODY 117
 ASSOCMLADERACTIONBODY 117
 ASSOCNETWORK 117
 ASSOCNETWORKSURFACEACTIONBODY 118
 ASSOCOBJECTACTIONPARAM 119
 ASSOCOFFSETSURFACEACTIONBODY 119
 ASSOCORDINATEDIMACTIONBODY 119
 ASSOCOSNAPPOINTREFACTIONPARAM 120
 ASSOCPATCHSURFACEACTIONBODY 120
 ASSOCPATHACTIONPARAM 121
 ASSOCPESSUBENTMANAGER 121
 ASSOCPLANESURFACEACTIONBODY 123
 ASSOCPOINTREFACTIONPARAM 124
 ASSOCRESTOREENTITYSTATEACTIONBODY 124
 ASSOCREVOLVEDSURFACEACTIONBODY 125
 ASSOCROTATEDDIMACTIONBODY 125
 ASSOCWEPTSSURFACEACTIONBODY 125
 ASSOCTRIMSURFACEACTIONBODY 125
 ASSOCVALUEDEPENDENCY 126
 assocvariable 150
 ASSOCVARIABLE 126
 ASSOCVERTEXACTIONPARAM 127
 attach_bottom 65, 184
 attach_dir 65, 184, 241, 243
 attach_left 183
 attach_right 183
 attach_top 65, 184
 attachment... 28, 34, 35, 36, 37, 38, 40, 41, 51, 62,
 185, 234
 attdef 240, 254, 258
 attdef_class_version 30
 ATTDEF 29
 ATTDIA 8
 attenuation_end_limit 53
 attenuation_start_limit 53
 attenuation_type 53
 ATTMODE 8
 attr_defs 256
 ATTREQ 8
 attribs 49, 60, 90
 ATTRIB 30
 attrs 258
 AUNITS 8
 AUPREC 8
 AUTHOR 264
 auto_height 63, 186
 autotransform 243
 av_class_version 126
 axis_base_pt 48
 axis_point 78
 axis_pt 103
 axis_ratio 42
 axis_vector 48, 78
 axis_x 220
 axis_y 220
 axis_z 220
 AXISMODE 8
 AXISUNIT 8
- ## B
- b_prop1c 212
 b_prop1c_int 212
 b_prop1d 212
 b_prop1d_int 212
 b_prop1e 212
 b_prop1e_int 212
 b_prop1f 212
 b_prop1f_int 212
 b_prop20 212
 b_prop20_int 212
 b_prop21 212
 b_prop21_int 212
 b_prop22 212
 b_prop22_int 212
 b_prop23 212
 b_prop23_int 212
 b_prop24 212
 b_prop24_int 212
 b_prop2d 213
 b_prop2d_int 213
 b_prop31 214
 b_prop31_int 214
 b_prop37 214
 b_prop37_int 214
 b1 108, 112, 119, 126
 b2 112, 126
 b280 140
 b281 228
 b282 228
 b290 103, 127, 175
 b293 246
 b3 113
 b4 113
 b5 113
 back_clip_on 199
 back_clip_z 93, 199, 207, 215
 backfaces_enabled 179, 192, 195
 background 95, 208, 216
 BACKZ 8
 bank 45, 84, 101, 105
 base 244
 base_dir 244
 base_dist 99
 base_point 60
 base_point_set 45, 84
 base_pt 32, 132, 147, 149, 155
 base_state_label 135

- base_ucs 95, 175, 205, 208, 217
- base_vert 244
- BASEPOINTPARAMETERENTITY 32
- basept 128, 130, 131, 133, 135, 137, 138, 139,
144, 146, 148, 151, 154
- bd_prop26 213
- bd_prop26_int 213
- bd_prop27 213
- bd_prop27_int 213
- bd_prop34 214
- bd_prop34_int 214
- bd_prop38 214
- bd_prop38_int 214
- bd_prop39 214
- bd_prop39_int 214
- bd2 205
- bd2007_45 212
- bd44 103
- bd45 103
- be_major ... 128, 129, 130, 131, 132, 133, 134, 135,
136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 147,
148, 149, 150, 151, 152, 153
- be_minor ... 128, 129, 130, 131, 132, 133, 134, 135,
136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 147,
148, 149, 150, 151, 152, 153
- beg_tan_vec 47, 81
- begin_addr_r11 80
- bend_line_color 197
- bend_line_length 197
- bend_linewt 197
- bend_ltype 197
- bg_b191 .. 129, 134, 138, 140, 143, 145, 147, 152, 153
- bg_b192 .. 129, 134, 138, 140, 143, 145, 147, 152, 153
- bg_color 231, 245, 255
- bg_fill_color 63
- bg_fill_flag 63
- bg_fill_none 255
- bg_fill_scale 63
- bg_fill_trans 63
- bg_insert_cycling .. 129, 134, 138, 140, 143, 145,
147, 152, 153
- bg_insert_cycling_weight 129, 134, 138, 140,
143, 145, 147, 152, 153
- bg_location 129, 134, 138, 140, 143, 145, 147,
152, 153
- bg_scale 245
- bg_transparency 245
- bigfont_file 201
- bindata 44, 200
- bindata_size 44, 200
- bitsize 21
- bitsize_hi 21
- bl_prop25 212
- bl_prop25_int 212
- bl_prop28 213
- bl_prop28_int 213
- bl_prop2a 213
- bl_prop2a_int 213
- bl_prop2b 213
- bl_prop2b_int 213
- bl_prop2e 213
- bl_prop2e_int 213
- bl_prop2f 213
- bl_prop2f_int 213
- bl_prop30 213
- bl_prop30_int 214
- bl_prop32 214
- bl_prop32_int 214
- b12 113, 120, 121, 124
- b192 99, 100, 101, 104, 157
- b193 158, 221
- b195 99
- b196 136
- blend_options 113
- blendfactor 242
- blending_mode 205
- BLIPMODE 8
- blk 260
- blkisxref 155
- BLKREFOBJECTCONTEXTDATA 127
- blob 225
- blob01 223
- block... 29, 34, 35, 36, 38, 39, 40, 41, 51, 146, 165,
183, 234, 246
- block_color 65, 183
- block_connection 183
- block_entity 156
- block_handle 255
- block_header 49, 60, 90, 174
- block_name 50
- block_offset_r11 156
- block_owner 199
- block_rotation 65, 183
- block_scale 65, 183, 232, 255
- block_scaling 156
- block_size 25, 42, 56, 66, 68, 76, 81, 97, 111
- block_style 64
- block_table 244
- BLOCK 32
- BLOCK_CONTROL 154
- BLOCK_CONTROL_OBJECT 8
- BLOCK_HEADER 155
- BLOCK_RECORD_MSPACE 8
- BLOCK_RECORD_PSPACE 8
- BLOCKALIGNEDCONSTRAINTPARAMETER 128
- BLOCKALIGNMENTGRIP 129
- BLOCKALIGNMENTPARAMETER 129
- BLOCKANGULARCONSTRAINTPARAMETER 130
- BLOCKARRAYACTION 131
- BLOCKBASEPOINTPARAMETER 132
- BLOCKDIAMETRICCONSTRAINTPARAMETER 132
- BLOCKFLIPACTION 133
- BLOCKFLIPGRIP 134
- BLOCKFLIPPARAMETER 135
- BLOCKGRIPLOCATIONCOMPONENT 136
- BLOCKHORIZONTALCONSTRAINTPARAMETER 136

- blocklabels 65
 - BLOCKLINEARCONSTRAINTPARAMETER 137
 - BLOCKLINEARGRIP 138
 - BLOCKLINEARPARAMETER 138
 - BLOCKLOOKUPACTION 139
 - BLOCKLOOKUPGRIP 140
 - BLOCKLOOKUPPARAMETER 140
 - BLOCKMOVEACTION 141
 - BLOCKPARAMDEPENDENCYBODY 142
 - BLOCKPOINTPARAMETER 142
 - BLOCKPOLARGRIP 143
 - BLOCKPOLARPARAMETER 143
 - BLOCKPOLARSTRETCHACTION 144
 - BLOCKPROPERTIESTABLE 145
 - BLOCKPROPERTIESTABLEGRIP 145
 - BLOCKRADIALCONSTRAINTPARAMETER 145
 - BLOCKREPRESENTATION 146
 - BLOCKROTATEACTION 146
 - BLOCKROTATIONGRIP 147
 - BLOCKROTATIONPARAMETER 147
 - blocks 153, 229
 - BLOCKSCALEACTION 148
 - BLOCKSTRETCHACTION 149
 - BLOCKUSERPARAMETER 150
 - BLOCKVERTICALCONSTRAINTPARAMETER 150
 - blockvisi_desc 153
 - blockvisi_name 153
 - BLOCKVISIBILITYGRIP 152
 - BLOCKVISIBILITYPARAMETER 152
 - BLOCKXYGRIP 153
 - BLOCKXYPARAMETER 153
 - blverts 79
 - BODY 32
 - border_color_overrides_flag 87
 - border_lineweight_overrides_flag 88
 - border_overrides 237
 - border_type 237
 - border_visibility_overrides_flag 89
 - borderline_color 160
 - borderline_linewt 160
 - borderline_ltype 160
 - borders 231, 253
 - bottom_grid_color 255
 - bottom_grid_linewt 255
 - bottom_height 79
 - bottom_margin 188, 231
 - bottom_row 236
 - bottom_visibility 256
 - boundary_handles 238
 - boundary_line_color 159
 - boundary_linewt 159
 - boundary_ltype 159
 - box_height 52
 - box_width 52
 - branch_index 241
 - break_flag 90
 - break_flow_direction 90
 - break_heights 90
 - break_rows 91
 - break_size 184
 - break_spacing 90
 - break_unknown1 90
 - break_unknown2 90
 - BREAKDATA 156
 - BREAKPOINTREF 156
 - breaks 240, 241
 - brightness 49, 94, 95, 169, 207, 215
 - bs1 27, 113, 120, 121, 124
 - bs2 27, 113
 - bulge 92, 239
 - bulges 58, 248
 - bulges_present 238
 - bumpmap 177
 - byblock 177
 - byblock_color 52
 - bylayer 177
 - byte 6
- ## C
- c_prop29 213
 - c_prop29_int 213
 - c_prop2c 213
 - c_prop2c_int 213
 - c_prop33 214
 - c_prop33_int 214
 - camera_path 184
 - CAMERA 32
 - CAMERADISPLAY 8
 - CAMERAHEIGHT 8
 - canonical_media_name 188
 - cast_shadows 53
 - CECOLOR 8
 - cell_alignment 232, 255
 - cell_contents 257
 - cell_flag_override 255
 - cell_parent 230, 256
 - cells 85, 157, 203, 259
 - cellstyle 204, 236, 253, 259
 - cellstyle.bg_color 252
 - cellstyle.borders 253
 - cellstyle.bottom_margin 252
 - cellstyle.content_format 252
 - cellstyle.content_layout 252
 - cellstyle.data_flags 252
 - cellstyle.horiz_margin 252
 - cellstyle.margin_horiz_spacing 253
 - cellstyle.margin_override_flags 252
 - cellstyle.margin_vert_spacing 253
 - cellstyle.merge_flags 252
 - cellstyle.num_borders 253
 - cellstyle.property_override_flags 252
 - cellstyle.right_margin 253
 - cellstyle.tabledatacolumn_parent 253
 - cellstyle.tablerow_parent 253
 - cellstyle.type 252

- cellstyle.vert_margin 252
- cellstyle_id 259
- CELLSTYLEMAP 157
- CELTSCALE 8
- CELTYPE 8
- CELWEIGHT 8
- center 26, 27, 32, 42, 93, 238
- center_pt 29, 37, 131
- CEPSNTYPE 9
- chain_actions .. 128, 129, 130, 132, 135, 136, 137, 139, 141, 142, 143, 146, 148, 150, 151, 152, 153
- CHAMFERA 9
- CHAMFERB 9
- CHAMFERC 9
- CHAMFERD 9
- channel_flags 178
- char 6
- char* 7
- char_spacing 26
- check_intersections 101, 105
- checksum 250
- child_id 113, 120, 121, 124
- child_param 113, 120, 121, 124
- child_status 113, 120, 121, 124
- childs 166
- childval 167
- circle_zoom 94, 216
- circle_zoom_percent 21
- CIRCLE 32
- class_id 76, 191
- class_version ... 28, 30, 31, 33, 34, 35, 37, 38, 39, 40, 44, 45, 48, 50, 51, 53, 63, 70, 71, 78, 83, 95, 96, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 124, 125, 126, 127, 142, 157, 159, 165, 166, 167, 169, 170, 171, 172, 175, 179, 181, 182, 184, 185, 186, 187, 189, 190, 191, 192, 193, 194, 195, 196, 199, 201, 202, 203, 204, 221, 233, 247, 259
- classification_colorramps 189
- classification_colorscheme 72
- classname 117, 219, 232
- CLAYER 9
- clip_boundary 95
- clip_boundary_type 49, 95
- clip_inverts 33
- clip_mode 49, 95
- clip_verts 33, 49, 96, 199
- clipping 49, 95, 169
- clippings 71
- clone_ins_pt .. 29, 34, 35, 36, 38, 39, 40, 41, 51, 234
- cloning 160, 161, 218
- close_to_axis 78
- closed 238
- closed_b 47, 81
- closed_surfaces 58
- CMATERIAL 9
- CMLJUST 9
- CMLSCALE 9
- CMLSTYLE 9
- code 166, 228, 229, 235
- codepage 21
- codes 145, 150
- col_gutter 245
- col_sizes 245
- col_spacing 50, 60
- col_type 245
- col_width 245
- col_widths 85
- color ... 27, 158, 173, 199, 201, 220, 237, 240, 244, 245, 250, 253, 260
- color_bleed_scale 177
- color_bottom 170
- color_far 171
- color_middle 170
- color_near 171
- color_r11 260
- color_sky_horizon 171
- color_sky_zenith 171
- color_top 170
- color_underground_azimuth 171
- color_underground_horizon 171
- color1 242
- color2 242
- colorramps 189
- colors 46, 61
- colorscheme 231
- cols 158, 242
- colspacing 42
- column_heights 63, 186
- column_offset 132
- column_type 63, 186
- column_width 63, 186
- combined_state 134
- COMMENTS 264
- comp_data_size 250
- complex_shapecode 241
- compression_type 250
- conn_pts 132, 134, 141, 145, 147, 149, 228
- connection_line_color 160
- connection_linewt 160
- connection_ltype 160
- connection_string 157
- connections 229, 230
- const_width 58, 248
- constraint_type 48
- content 243
- content_base 243
- content_color 232, 255
- content_format 231, 258
- content_height 230
- content_layout 231
- content_type 182
- content_width 230
- context 185
- CONTEXTDATAMANAGER 157
- contrast 33, 49, 94, 95, 169, 207, 215
- control_points 239

- controlled_objdep 259
- coord_proj_radius 168
- coord_system_datum 168
- coord_system_def 168
- coord_system_wkt 168
- coord_type 167
- COORDS 9
- corner_decel 185
- corner1 24, 80, 92
- corner2 24, 80, 92
- corner3 24, 80, 92
- corner4 24, 80, 92
- CPSNID 9
- crc32 250
- crease 59
- crop_plane 247
- crop_x_dir 247
- crop_y_dir 247
- croppings 73
- cross_sections 58
- crosssects 102
- CSACDOCUMENTOPTIONS 157
- CSHADOW 9
- ctrl_pts 48, 81
- ctrl_tol 47, 81
- ctx 63
- cur_colorscheme 72
- curr_type 198
- curve_type 73, 74, 75, 238
- CURVEPATH 157
- custom_data 258, 259
- customdata 158, 257
- customdata_items 257, 259
- cv_hull_display 67

- D**
- d_node 108, 110, 120, 125
- dashes 176, 238
- dashes_r11 176
- data 68, 76, 191, 206, 223
- data_3dpoint 257
- data_adapter 157
- data_algn_offset 228
- data_date 256
- data_double 256
- data_flags 230
- data_handle 257
- data_horiz_bottom_color 87
- data_horiz_bottom_linewt 88
- data_horiz_bottom_visibility 89
- data_horiz_ins_color 87
- data_horiz_ins_linewt 88
- data_horiz_ins_visibility 89
- data_horiz_top_color 87
- data_horiz_top_linewt 88
- data_horiz_top_visibility 89
- data_link 257
- data_long 256
- data_numbits 76, 191
- data_point 257
- data_row_alignment 86
- data_row_color 86
- data_row_fill_color 86
- data_row_fill_none 86
- data_row_height 86
- data_row_style_override 90
- data_size 68, 76, 191, 206, 224, 225, 256
- data_string 256
- data_text_style 86
- data_type 254, 256
- data_vert_ins_color 87
- data_vert_ins_linewt 89
- data_vert_ins_visibility 90
- data_vert_left_color 87
- data_vert_left_linewt 88
- data_vert_left_visibility 90
- data_vert_right_color 88
- data_vert_right_linewt 89
- data_vert_right_visibility 90
- dataflags 30, 31, 91
- DATALINK 157
- DATATABLE 158
- dates 202
- datidx 223
- datidx_segidx 223
- day 158
- DBCOLOR 158
- decomp_data_size 250
- def_base_angle_pt 148
- def_basept 128, 129, 130, 133, 135, 136, 137, 139, 143, 146, 148, 151, 154
- def_classification_colorscheme 189
- def_elevation_colorscheme 189
- def_endpt .. 128, 129, 130, 133, 135, 136, 137, 139, 143, 146, 148, 151, 154
- def_intensity_colorscheme 189
- def_label_pt 136, 142
- def_pt .. 28, 33, 34, 36, 37, 38, 39, 40, 50, 132, 141, 142, 150, 152, 165, 233, 246
- default_flag 63
- default_lighting_type 94
- default_lightning_type 207, 215
- default_text 244
- default_value 30
- defaultid 161
- definition 65
- definition_id 33
- defines 47, 62
- degree 47, 80, 239
- DELOBJ 9
- dep 111, 114, 116, 119, 127, 221
- dep_body 114
- dep_on 114
- depbodyid 114
- dependency 128, 131, 133, 137, 138, 146, 151

- dependent 147, 149
- dependent_on_compound_object 117
- depid 221
- deps ... 108, 109, 118, 126, 131, 134, 140, 141, 145,
147, 149, 222
- desc 127, 158, 196, 229
- description.... 156, 157, 176, 177, 179, 182, 184,
192, 195, 202, 208, 242
- design_pt 167
- dest_pt 237
- destblock 251
- destfile 251
- destination 195
- DETAILVIEWSTYLE 158
- DGNDEFINITION 218
- DGNFRAME 9
- DGNUNDERLAY 32
- di_unknown 225
- diagnostics_bsp_mode 181
- diagnostics_grid_float 181
- diagnostics_grid_mode 181
- diagnostics_mode 181
- diagnostics_photon_mode 181
- diagnostics_samples_mode 181
- DICTIONARY 160
- DICTIONARY_ACAD_GROUP 9
- DICTIONARY_ACAD_MLINESYLE 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 160
- DICTIONARYWDFLT 160
- diffuse_color 177
- diffusemap 177
- dim_rotation 39
- DIMADEC 10, 164
- DIMALT 10, 162
- DIMALTD 10, 162
- DIMALTF 10, 163
- DIMALTMZF 10, 164
- DIMALTMZS 10, 164
- DIMALTRND 10, 163
- DIMALTTD 10, 162
- DIMALTTZ 10, 162
- DIMALTU 10, 162
- DIMALTZ 10, 162
- DIMAPOST 10, 163
- DIMAPOST_T 10
- DIMARCSYM 10, 163
- DIMARROW 10
- DIMASO 10
- DIMASSOC 10, 161
- dimasz 52
- DIMASZ 10, 162
- dimatfit 246
- DIMATFIT 10, 164
- DIMAUNIT 10, 162
- DIMAZIN 10, 163
- dimbase_version 114, 142
- DIMBLK 10, 164
- DIMBLK_T 10, 163
- DIMBLK1 10, 164
- DIMBLK1_T 10, 163
- DIMBLK2 10, 164
- DIMBLK2_T 10, 163
- DIMCEN 10, 163
- DIMCLRD 11, 163
- DIMCLRD_C 11
- DIMCLRD_N 163
- DIMCLRE 11, 164
- DIMCLRE_C 11
- DIMCLRE_N 163
- DIMCLRT 11, 164
- DIMCLRT_C 11
- DIMCLRT_N 163
- DIMDEC 11, 162
- DIMBLE 11, 162
- DIMDLI 11, 162
- DIMDSEP 11, 164
- dimension 106, 165, 187, 191
- dimension_x 193
- dimension_y 193
- DIMENSION_ALIGNED 33
- DIMENSION_ANG2LN 34
- DIMENSION_ANG3PT 35
- DIMENSION_DIAMETER 37
- DIMENSION_LINEAR 38
- DIMENSION_ORDINATE 39
- DIMENSION_RADIUS 40
- dimensionobj 161
- DIMEXE 11, 162
- DIMEXO 11, 162
- DIMFIT 11, 162
- DIMFRAC 11, 164
- DIMFXL 11, 163
- DIMFXLON 11, 164
- dingap 52, 92
- DIMGAP 11, 163
- DIMJOGANG 11, 163
- DIMJUST 11, 162
- DIMLDRBLK 11, 164
- DIMLFAC 11, 163
- DIMLIM 11, 161
- dimline_pt 106
- DIMLTEX1 11, 164
- DIMLTEX2 11, 164
- DIMLTYPE 11, 164
- DIMLUNIT 11, 164
- DIMLWD 11, 164
- DIMLWE 11, 164
- DIMMZ 11, 164

- DIMZS 12, 164
- dimosxd 246
- DIMPOST 12, 163
- DIMPOST_T 12
- dimref 156
- DIMRND 12, 162
- DIMSAH 12, 162
- DIMSAV 12
- DIMSCALE 12, 162
- DIMSD1 12, 162
- DIMSD2 12, 162
- DIMSE1 12, 162
- DIMSE2 12, 162
- DIMSH0 12
- DIMSOXD 12, 162
- dimstyle.. 29, 34, 35, 36, 38, 39, 40, 41, 51, 53, 92, 234
- DIMSTYLE 12, 161
- DIMSTYLE_CONTROL 164
- DIMSTYLE_CONTROL_OBJECT 12
- DIMTAD 12, 162
- DIMTDEC 12, 162
- DIMTFAC 12, 163
- DIMTFILL 12, 163
- DIMTFILLCLR 12, 163
- DIMTIH 12, 161
- dimtix 246
- DIMTIX 12, 162
- dimtmove 246
- DIMTM 12, 163
- DIMTMOVE 12, 164
- dimtofl 246
- DIMTOFL 12, 162
- DIMTOH 12, 162
- DIMTOL 12, 161
- DIMTOLJ 12, 162
- DIMTP 12, 163
- DIMTSZ 12, 163
- DIMTVP 12, 163
- DIMTXSTY 13, 164
- DIMTXT 13, 163
- DIMTXTDIRECTION 13, 164
- DIMTZIN 13, 162
- DIMUNIT 13, 162
- DIMUPT 13, 162
- DIMZIN 13, 162
- direction 100, 103, 104, 244
- displacement 221
- display_boundary_on 199
- display_brightness 211
- display_brightness_bl 211
- display_brightness_int 211
- display_frame 218
- display_image 171
- display_index 179, 192, 194, 195
- display_location.... 131, 134, 140, 141, 144, 147, 149
- display_name 159, 196
- display_props 48, 95, 169
- display_settings 211
- display_settings_int 211
- display_shadow_type 211
- display_shadow_type_int 212
- DISPSILH 13
- dist_center 230
- dist_top_left 230
- distance 126, 133, 139, 146
- distance_desc 139, 144
- distance_name 139, 144
- distance_value_set 144
- dlevel 59
- DMDIMOBJECTCONTEXTDATA 165
- do_sea_level_corr 168
- dogleg_length 241
- dogleg_vector 241
- double 6, 7
- double[3] 7
- double_flag 47, 62
- double_line_spacing 237
- draft_angle 44, 78, 83, 100, 103, 104
- draft_end_distance 44, 78, 83
- draft_start_distance 44, 78, 83
- DRAGMODE 13
- DRAGVS 13
- drawing_units 188, 196
- ds_version 223, 228
- DUMMY 165
- DWFDEFINITION 218
- DWFFRAME 13
- DWFUNDERLAY 42
- dwg 260, 262
- Dwg_3DSOLID_material 219
- Dwg_3DSOLID_silhouette 219
- Dwg_3DSOLID_wire 220
- Dwg_AcDs 223
- Dwg_AcDs_Data 224
- Dwg_AcDs_Data_Record 225
- Dwg_AcDs_Data_RecordHdr 225
- Dwg_AcDs_DataBlob 224
- Dwg_AcDs_DataBlob01 224
- Dwg_AcDs_DataBlobRef 224
- Dwg_AcDs_DataBlobRef_Page 225
- Dwg_AcDs_DataIndex 225
- Dwg_AcDs_DataIndex_Entry 225
- Dwg_AcDs_Schema 225
- Dwg_AcDs_Schema_Prop 227
- Dwg_AcDs_SchemaData 226
- Dwg_AcDs_SchemaData_UProp 226
- Dwg_AcDs_SchemaIndex 226
- Dwg_AcDs_SchemaIndex_Prop 226
- Dwg_AcDs_Search 227
- Dwg_AcDs_Search_Data 227
- Dwg_AcDs_Search_IdIdx 227
- Dwg_AcDs_Search_IdIdxs 227
- Dwg_AcDs_Segment 228
- Dwg_AcDs_SegmentIndex 228

Dwg_ACSH_HistoryNode	220	Dwg_MATERIAL_gentexture	242
Dwg_ACSH_SubentColor	220	Dwg_MATERIAL_mapper	242
Dwg_ACSH_SubentMaterial	221	Dwg_MESH_edge	243
Dwg_ACTIONBODY	221	Dwg_MLEADER_AnnotContext	243
Dwg_ARRAYITEMLOCATOR	221	Dwg_MLEADER_Content	260
Dwg_ASSOCACTION_Deps	221	Dwg_MLEADER_Content_Block	244
Dwg_ASSOCACTIONBODY_action	221	Dwg_MLEADER_Content_MText	244
Dwg_ASSOCARRAYITEM	221	Dwg_MLINE_line	245
Dwg_ASSOCPARAMBASEDACTIONBODY	222	Dwg_MLINE_vertex	246
Dwg ASSOCSURFACEACTIONBODY	222	Dwg_MLINESTYLE_line	245
Dwg_BLOCKACTION_connectionpts	228	Dwg_OCD_Dimension	246
Dwg_BLOCKLOOKUPACTION_lut	228	Dwg_PARTIAL_VIEWING_INDEX_Entry	247
Dwg_BLOCKPARAMETER_connection	229	Dwg_POINTCLOUD_Clippings	247
Dwg_BLOCKPARAMETER_PropInfo	228	Dwg_POINTCLOUD_IntensityStyle	248
Dwg_BLOCKPARAMVALUESET	229	Dwg_POINTCLOUDCOLORMAP_Ramp	247
Dwg_BLOCKVISIBILITYPARAMETER_state	229	Dwg_POINTCLOUDEX_Croppings	247
Dwg_CellContentGeometry	230	Dwg_PROXY_LWPOLYLINE	248
Dwg_CellStyle	230	Dwg_R2004_Header	249
Dwg_ColorRamp	231	Dwg_SECTION_geometrysettings	250
Dwg_COMPOUNDOBJECTID	229	Dwg_SECTION_typesettings	251
Dwg_CONSTRAINTGROUPNODE	229	dwg_size	21
Dwg_ContentFormat	231	Dwg_SPLINE_control_point	251
Dwg_CONTEXTDATA_dict	230	Dwg_SummaryInfo_Property	251
Dwg_CONTEXTDATA_submgr	230	Dwg_SUNSTUDY_Dates	251
Dwg_DATALINK_customdata	232	Dwg_TABLE_AttrDef	254
Dwg_DATATABLE_column	232	Dwg_TABLE_BreakHeight	254
Dwg_DATATABLE_row	232	Dwg_TABLE_BreakRow	254
Dwg_DIMASSOC_Ref	232	Dwg_TABLE_Cell	254
Dwg_DIMENSION_common	233	Dwg_TABLE_CustomDataItem	256
Dwg_EVAL_Edge	234	Dwg_TABLE_value	256
Dwg_EVAL_Node	234	Dwg_TableCell	257
Dwg_EvalExpr	235	Dwg_TableCellContent	258
Dwg_EvalVariant	235	Dwg_TableCellContent_Attr	258
Dwg_FIELD_ChildValue	236	Dwg_TableDataColumn	258
Dwg_FileDepList_Files	236	Dwg_TABLEGEOMETRY_Cell	251
Dwg_FormattedTableData	236	Dwg_TableRow	259
Dwg_FormattedTableMerged	236	Dwg_TABLESTYLE_border	253
Dwg_GEODATA_meshface	237	Dwg_TABLESTYLE_CellStyle	252
Dwg_GEODATA_meshtpt	237	Dwg_TABLESTYLE_rowstyles	253
Dwg_GridFormat	237	Dwg_UCS_orthopts	259
Dwg_HATCH_Color	237	Dwg_VALUEPARAM	259
Dwg_HATCH_ControlPoint	237	Dwg_VALUEPARAM_vars	260
Dwg_HATCH_DefLine	237	DWG_ERR_CLASSESNOTFOUND	277
Dwg_HATCH_Path	238	DWG_ERR_INTERNALERROR	277
Dwg_HATCH_PathSeg	238	DWG_ERR_INVALIDDDWG	277
Dwg_HATCH_PolylinePath	239	DWG_ERR_INVALIDDEED	277
Dwg_LAYER_entry	239	DWG_ERR_INVALIDHANDLE	277
Dwg_LEADER_ArrowHead	239	DWG_ERR_INVALIDIDTYPE	277
Dwg_LEADER_BlockLabel	239	DWG_ERR_IOERROR	277
Dwg_LEADER_Break	240	DWG_ERR_NOTYETSUPPORTED	277
Dwg_LEADER_Line	240	DWG_ERR_OUTOFMEM	277
Dwg_LEADER_Node	240	DWG_ERR_PAGENOTFOUND	277
Dwg_LIGHTLIST_light	241	DWG_ERR_SECTIONNOTFOUND	277
Dwg_LinkedData	241	DWG_ERR_UNHANDLEDCLASS	277
Dwg_LinkedTableData	242	DWG_ERR_VALUEOUTOFBOUNDS	277
Dwg_LTYPE_dash	241	DWG_ERR_WRONGCRC	277
Dwg_LWPOLYLINE_width	241	DWGCODEPAGE	13
Dwg_MATERIAL_color	242	DYNAMICBLOCKPROXYNODE	165

- DYNAMICBLOCKPURGEPREVENTER 165
- E**
- e1 234
- e2 234
- e3 234
- edge_color 210
- edge_color_int 210
- edge_crease_angle 210
- edge_crease_angle_int 210
- edge_do_hide_precision 211
- edge_do_hide_precision_int 211
- edge_flags 235
- edge_halo_gap 211
- edge_halo_gap_int 211
- edge_intersection_color 209
- edge_intersection_color_int 209
- edge_intersection_ltype 210
- edge_intersection_ltype_int 210
- edge_isolines 211
- edge_isolines_int 211
- edge_jitter 210
- edge_jitter_int 211
- edge_model 209
- edge_model_int 209
- edge_modifier 210
- edge_modifier_int 210
- edge_obscured_color 210
- edge_obscured_color_int 210
- edge_obscured_ltype 210
- edge_obscured_ltype_int 210
- edge_opacity 210
- edge_opacity_int 210
- edge_overhang 210
- edge_overhang_int 210
- edge_silhouette_color 211
- edge_silhouette_color_int 211
- edge_silhouette_width 211
- edge_silhouette_width_int 211
- edge_style 209
- edge_style_apply 211
- edge_style_apply_int 211
- edge_style_int 209
- edge_transparency 250
- edge_visualstyle 260
- edge_width 210
- edge_width_int 210
- edge_wiggle 214
- edge_wiggle_int 214
- edges 59, 99, 101, 166
- eed 260, 262
- eed1071 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 147, 148, 149, 150, 151, 152, 153
- elevation 28, 29, 31, 33, 34, 36, 37, 38, 39, 41, 46, 50, 58, 61, 74, 80, 91, 92, 233, 248
- elevation_apply_to_fixed_range 72
- elevation_as_gradient 73
- elevation_max 72
- elevation_min 72
- elevation_out_of_range_behavior 72
- elevation_r11 260
- ELEVATION 13
- ELLIPSE 42
- enable 171
- enable_context 185
- enable_frame_text 46
- enabled 117
- encr_sat_data .. 25, 42, 56, 66, 68, 76, 81, 97, 111
- end 24, 55, 240, 241, 254
- end_angle 26, 27, 42, 184, 238
- end_draft_angle 57
- end_draft_dist 100, 104
- end_draft_magnitude 57
- end_line_length 197
- end_line_overshoot 197
- end_marker 26, 44, 57, 67, 69, 77, 82, 98, 112
- end_pt 131
- end_tan_vec 47, 81
- end_tangent 239
- end_time 202
- end_width 73, 74, 92
- endblk_entity 156
- ENDBLK 42
- ENDCAPS 13
- endpoint 238
- endpt .. 128, 130, 131, 133, 135, 137, 138, 139, 144, 146, 148, 151, 154
- endptproj 52, 175
- ENDREP 42
- endsetbacks 102
- energy_multiplier 181
- entities 156
- entity 124, 157
- entmode 260
- entries 107, 154, 165, 174, 176, 187, 201, 206, 208, 217, 225, 230
- entry_size 225
- ents 199
- environ_image_enabled 179, 192, 194, 195
- environ_image_filename 179, 192, 194, 195
- evalexpr ... 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 147, 149, 150, 151, 152, 153, 165, 235
- evaluation_error_code 167
- evaluation_error_msg 167
- evaluation_option 166
- evaluation_status 166
- EVALUATION_GRAPH 165
- evaluator 127
- evaluatorid 221
- explodable 156
- export_mi_enabled 181
- expr 150

- expr_description... 128, 131, 133, 137, 138, 146, 151
 expr_name 128, 131, 133, 137, 138, 146, 151
 expression..... 221
 exprs..... 140
 ext_lighting_model..... 208
 extents_height..... 62, 186
 extents_max 71, 190, 247
 extents_min 70, 71, 190, 247
 extents_width..... 62, 186
 extlight_length..... 54
 extlight_radius..... 54
 extlight_shape 54
 extlight_width..... 54
 EXTMAX 13, 174
 EXTMIN 13, 174
 EXTNAMES 13
 extra_acis_data.. 25, 43, 56, 67, 69, 77, 82, 98, 112
 extra_r11..... 260
 extra_r11_size 74
 extra_r11_text 74
 EXTRUDESURFACE..... 42
 extrusion... 24, 26, 27, 28, 29, 31, 32, 33, 34, 36, 37, 38, 39, 40, 42, 46, 49, 50, 52, 55, 58, 60, 61, 62, 70, 74, 79, 80, 85, 91, 92, 199, 233, 248
- F**
- face_color_mode..... 209
 face_color_mode_int..... 209
 face_lighting_model..... 208
 face_lighting_model_int..... 209
 face_lighting_quality..... 209
 face_lighting_quality_int..... 209
 face_modifier..... 209
 face_modifier_int..... 209
 face_mono_color..... 209
 face_mono_color_int..... 209
 face_opacity..... 209
 face_opacity_int..... 209
 face_specular..... 209
 face_specular_int..... 209
 face_transparency..... 250
 face_visualstyle..... 260
 face1..... 237
 face2..... 237
 face3..... 237
 faces..... 59
 FACETRES 13
 factor 242
 fade..... 33, 49, 95, 169
 falloff_angle 53
 FASTZOOM 13, 216
 FCFOBJECTCONTEXTDATA 166
 fdata..... 84, 203
 feature_index 236
 feature_location_pt..... 40, 187
 fg_ray_count 180
 fg_sample_radius_state1..... 180
 fg_sample_radius_state2..... 180
 fg_sample_radius_state3..... 181
 fg_sample_radius1..... 181
 fg_sample_radius2..... 181
 field_length..... 30, 31
 field_refs..... 242
 field_state..... 166
 FIELDLIST..... 167
 fields..... 167
 FIELD..... 166
 file_header_size..... 223
 file_ID_string..... 249
 file_name..... 55
 file_path..... 172
 file_signature..... 223
 file_size..... 223
 filename..... 172, 218, 236, 242
 filepath..... 236
 filesize..... 236
 filing_option..... 166
 fill_color..... 184, 253
 FILLETRAD..... 13
 FILLMODE..... 13
 filter_height..... 192
 filter_type..... 192
 filter_width..... 192
 final_gathering_enabled..... 180
 fingerprint..... 236
 FINGERPRINTGUID..... 13
 first_arc_pt..... 38, 41, 51, 165, 191
 first_attrib..... 49, 60, 90
 first_endpoint..... 238
 first_entity..... 156
 first_nodeid..... 165
 first_nodeid_copy..... 165
 first_seg_angle..... 182
 first_vertex..... 73, 74, 75
 fit_pts..... 48, 81
 fit_to_screen..... 172
 fit_tol..... 47, 81
 fitpts..... 239
 flag..... 28, 33, 34, 36, 37, 38, 39, 41, 50, 233
 flag1..... 28, 33, 34, 36, 37, 38, 39, 41, 50, 233
 flag2..... 40, 156
 flags... 30, 31, 60, 64, 65, 79, 158, 159, 186, 196, 203, 205, 222, 226, 227, 229, 240, 248, 250, 254, 256
 flags_r11.. 107, 155, 165, 174, 177, 201, 206, 208, 217
 FLAGS..... 13
 FLATLAND..... 13

- has_border_visibility_overrides..... 89
- has_break_data..... 90
- has_child_param..... 113, 120, 121, 124
- has_civil_data..... 169
- has_content_blk..... 243
- has_content_format_overrides..... 258
- has_content_txt..... 243
- has_derived..... 47
- has_dogleg..... 64, 182, 240
- has_ds_data..... 260, 262
- has_edge_visualstyle..... 260
- has_entries..... 187
- has_face_visualstyle..... 260
- has_full_visualstyle..... 260
- has_geom_data..... 257
- has_graph..... 166
- has_h1..... 222
- has_landing..... 64, 182
- has_lastleaderlinepoint..... 240
- has_lastpt_ref..... 233
- has_leader..... 29
- has_linked_data..... 257
- has_name..... 114
- has_no_flags..... 24
- has_object..... 229
- has_photometric_data..... 54
- has_predefined..... 179, 192, 195
- has_reflection..... 220
- has_revision_guid.. 26, 44, 57, 67, 70, 78, 83, 98, 112
- has_rotation..... 220
- has_shadow..... 201
- has_shear..... 220
- has_strings_area..... 176
- has_t78..... 127
- has_table_overrides..... 85
- has_target_grip..... 54
- has_text_frame..... 64, 183
- has_vertex..... 73, 74, 75
- has_webfile..... 54
- has_wires..... 219
- hasattrs..... 155
- hatch_angle..... 251
- hatch_angles..... 198
- hatch_bg_color..... 198
- hatch_color..... 62, 198
- hatch_pattern..... 198, 251
- hatch_scale..... 198, 251
- hatch_spacing..... 251
- hatch_transparency..... 198
- hatch_type..... 250
- HATCH..... 46
- hdls..... 145, 150, 200
- header_address..... 249
- header_horiz_bottom_color..... 87
- header_horiz_bottom_linewt..... 88
- header_horiz_bottom_visibility..... 89
- header_horiz_ins_color..... 87
- header_horiz_ins_linewt..... 88
- header_horiz_ins_visibility..... 89
- header_horiz_top_color..... 87
- header_horiz_top_linewt..... 88
- header_horiz_top_visibility..... 89
- header_row_alignment..... 86
- header_row_color..... 86
- header_row_fill_color..... 86
- header_row_fill_none..... 86
- header_row_height..... 86
- header_row_style_override..... 90
- header_size..... 249
- header_suppressed..... 85
- header_text_style..... 86
- header_vert_ins_color..... 87
- header_vert_ins_linewt..... 88
- header_vert_ins_visibility..... 89
- header_vert_left_color..... 87
- header_vert_left_linewt..... 88
- header_vert_left_visibility..... 89
- header_vert_right_color..... 87
- header_vert_right_linewt..... 88
- header_vert_right_visibility..... 89
- height.... 29, 31, 79, 91, 93, 97, 99, 100, 103, 106, 170, 230, 244, 254, 259
- height_w_gap..... 252, 258
- HELIX..... 47
- hexindex..... 250
- HIDETEXT..... 14
- highlevel_info..... 195
- history_id..... 26, 44, 57, 67, 70, 77, 83, 98, 112
- history_node.. 96, 97, 99, 100, 101, 102, 103, 104, 105, 106
- hookline_dir..... 52
- hookline_on..... 52
- hor_dir..... 90
- horiz_alignment..... 30, 31, 91
- horiz_cell_margin..... 85, 203
- horiz_dir... 28, 33, 35, 36, 37, 38, 40, 41, 50, 166, 234
- horiz_direction..... 85
- horiz_margin..... 231
- horizon..... 170
- horizontal_mode..... 185, 204
- host_block..... 167
- host_drawing_visibility..... 186
- hotspot_angle..... 53
- hour..... 158
- hours..... 202
- HYPERLINKBASE..... 14, 264

I

- IBL_BACKGROUND 171
- id 78, 92, 93, 166, 234, 235, 252
- IDBUFFER 171
- identifier_color 159, 196
- identifier_exclude_characters 159, 197
- identifier_height 159, 196
- identifier_offset 159, 197
- identifier_placement 159
- identifier_position 197
- identifier_style 159, 196
- ididx 227, 228
- ididxs 227
- idxfrom 243
- idxto 243
- ignore_attachment 63
- illuminance_dist 54
- illumination_model 178
- image_file 169
- image_file_name 193
- image_frame 193
- image_height 169, 195
- image_quality 193
- image_size 172
- image_visibility 169
- image_width 169, 195
- imagedef 49, 96
- imagedefreactor 49, 96
- IMAGE 48
- IMAGE_BACKGROUND 172
- IMAGEDEF 172
- IMAGEDEF_REACTOR 172
- increment 229
- index 116, 141, 226, 254, 258
- index_mask 237
- INDEX 172
- INDEXCTL 14
- indicator_alpha 79
- indicator_color 79
- indirect_bump_scale 177
- ins_pt ... 29, 31, 32, 49, 59, 62, 80, 85, 91, 92, 127, 185, 204
- ins_rotation .. 28, 33, 35, 36, 37, 38, 40, 41, 51, 234
- ins_scale ... 28, 33, 35, 36, 37, 38, 40, 41, 50, 234
- INSBASE 14, 174
- insert_units 156
- inserts 156
- INSERT 49
- inspt_offset 52, 175
- INSUNITS 14
- intensity 53, 201
- intensity_as_gradient 72
- intensity_colorscheme 72
- intensity_high_treshold 248
- intensity_low_treshold 248
- intensity_max 72
- intensity_min 72
- intensity_out_of_range_behavior 72
- intensity_scheme 71
- intensity_style 71
- INTERFERECOLOR 14
- INTERFEREOBJVS 14
- INTERFEREVPVS 14
- internal_only 208
- INTERSECTIONCOLOR 14
- INTERSECTIONDISPLAY 14
- interval 202
- intsectobj 233
- inverse_transform 199
- invis_flags 24
- invisible 260
- ipe_alignment 65
- is_annotative 65, 184
- is_associative 46, 61
- is_attached_to_object 114
- is_autofit_flag 254
- is_bg_fill 245
- is_bg_mask_fill 245
- is_blob01 228
- is_camera_plottable 208
- is_ccw 238
- is_changed 183
- is_close_to_axis 103
- is_col_flow_reversed 245
- is_def_textloc 246
- is_default 106, 127, 165, 166, 175, 181, 185, 186, 191, 204, 239
- is_default_transmatrix 222
- is_delegating_to_owning_action 114
- is_dst 201
- is_face_variable 221
- is_gradient_fill 46, 61
- is_hardwoner 160, 161
- is_header_suppressed 204
- is_height_auto 245
- is_initialized 152
- is_inside 247
- is_inverted 247
- is_live 198
- is_loaded 172, 190
- is_locked 72
- is_merged_value 254
- is_modified_for_recompute 159, 196
- is_neg_textdir 65
- is_normal_reversed 244
- is_not_annotative 63
- is_on 201, 217
- is_owned 221
- is_partial 29
- is_periodic 239
- is_photometric 54
- is_pspace 207
- is_r2013 ... 109, 110, 113, 114, 116, 119, 120, 121, 124, 127
- is_rational 239
- is_read_dep 113

is_reverse 27
 is_semi_assoc 222
 is_semi_ovr 222
 is_shape 200
 is_shx 27
 is_solid 44, 84
 is_solid_fill 46, 61
 is_text_extended 65
 is_title_suppressed 204
 is_underlined 27
 is_unit_scale 196
 is_vertical 200
 is_watertight 59
 is_write_dep 114
 is_xdic_missing 261, 262
 is_xref_dep 107, 155, 161, 173, 176, 200, 205,
 206, 215, 217
 is_xref_ref 107, 155, 161, 173, 176, 200, 205,
 206, 215, 217
 is_xref_resolved 107, 155, 161, 173, 176, 200,
 205, 206, 215, 217
 isbylayerlt 261
 isoline_present .. 25, 43, 56, 66, 69, 77, 82, 98, 111
 isolines 25, 43, 56, 66, 69, 77, 82, 97, 111
 ISOLINES 14
 itemhandle 230
 itemhandles 160, 161
 itemloc 221, 222
 items 110, 219

J

jog_point 51, 191
 JOINSTYLE 14
 julian_day 201, 251
 jump_address 50
 jump_address_raw 50
 jump_entity_section 50
 JUMP 50
 justification 60, 65

K

key 236
 KEYWORDS 264
 knot_tol 47, 81
 knotparam 47, 81
 knots 48, 81, 239

L

l2 222
 l4 222
 l5 222
 label_text 240
 label_viewports 203
 lamp_color_preset 54
 lamp_color_rgb 54
 lamp_color_temp 54
 lamp_color_type 54
 landing_dist 64, 182
 landing_gap 45, 182, 243
 LARGE_RADIAL_DIMENSION 50
 last_attrib 49, 60, 90
 last_entity 156
 last_height 201
 last_section_address 249
 last_section_id 249
 last_updated 172, 174, 200
 last_vertex 73, 74, 75
 lastleaderlinepoint 240
 lastpt_ref 233
 LASTSAVEDBY 264
 LATITUDE 14
 layer 250, 261
 layer_colors 21
 LAYER 173
 LAYER_CONTROL 173
 LAYER_CONTROL_OBJECT 14
 LAYER_INDEX 174
 LAYERFILTER 173
 layout 156
 layout_flags 174
 layout_name 174
 LAYOUT 174
 LAYOUTPRINTCONFIG 51
 ldata 84, 203
 leader_endpt 40, 187
 leader_len 38, 41, 51
 leader_order 182
 leader1_pt 29
 leader2_pt 29
 leaders 243
 LEADER 51
 LEADEROBJECTCONTEXTDATA 175
 left_col 236
 left_grid_color 256
 left_grid_linewt 256
 left_margin 188
 left_offset 27
 left_visibility 256
 length 97, 106, 241
 lens_length 93, 207, 215
 LENSLENGTH 14
 light_color 53
 light_count 194
 light_luminance_scale 181
 lighting_model 192

- lights 175
 - LIGHT 53
 - LIGHTGLYPHDISPLAY 14
 - LIGHTLIST 175
 - LIMCHECK 14
 - LIMMAX 14, 174
 - LIMMIN 14, 174
 - line_color 64, 182
 - line_index 240
 - line_linewt 64
 - line_ltype 64
 - line_spacing_factor 244
 - line_spacing_style 245
 - line_type 182
 - LINE 55
 - LINEARGRIPENTITY 55
 - LINEARPARAMETERENTITY 55
 - lines 184, 241, 246
 - linespace_factor 62
 - linespace_style 62
 - linewt 173, 182, 237, 240, 250, 253, 261
 - livesection 208
 - loaded_bit 155
 - LOAD 55
 - location 166, 244
 - lock_aspect 68
 - lock_position_flag 30, 31
 - lock_viewports 202
 - locked 173
 - loft_entity_transmatrix 57
 - LOFTANG1 14
 - LOFTANG2 14
 - LOFTEDSURFACE 55
 - LOFTMAG1 14
 - LOFTMAG2 14
 - LOFTNORMALS 14
 - LOFTPARAM 15
 - long 6
 - LONG_TRANSACTION 175
 - LONGITUDE 15
 - lookup_desc 141
 - lookup_name 141
 - lower_left 216
 - lowermost_left_tree_node_gap 249
 - lowermost_right_tree_node_gap 249
 - lspace_factor... 28, 34, 35, 36, 37, 39, 40, 41, 51, 234
 - lspace_style.. 28, 34, 35, 36, 37, 39, 40, 41, 51, 234
 - lt_index 245
 - lt_ltype 245
 - LTSCALE 15
 - ltype 173, 237, 240, 250, 261
 - ltype_flags 261
 - ltype_scale 250, 261
 - LTYPE 176
 - LTYPE_BYBLOCK 15
 - LTYPE_BYLAYER 15
 - LTYPE_CONTINUOUS 15
 - LTYPE_CONTROL 176
 - LTYPE_CONTROL_OBJECT 15
 - luminance 178
 - luminance_mode 178
 - LUNITS 15
 - LUPREC 15
 - lut 140
 - LWDISPLAY 15
 - LWPOLYLINE 58
- ## M
- m_density 75
 - main_gsmarker 233
 - main_subent_type 233
 - maint_version 48, 76, 191
 - maintain_aspect_ratio 172
 - major 96, 97, 99, 100, 101, 102, 103, 104, 105, 106, 165, 220, 221, 235
 - major_radius 99, 100, 105
 - major_version 48
 - margin_horiz_spacing 231
 - margin_override_flags 231
 - margin_vert_spacing 231
 - mat_absref 219
 - material 173, 220, 242, 261
 - material_count 194
 - material_flags 261
 - material_handle 219
 - materials 25, 43, 56, 67, 69, 77, 82, 98, 112
 - MATERIAL 177
 - max_assoc_dep_index 107, 109, 118, 126
 - max_extent 186
 - max_intensity 248
 - max_points 182
 - max_regen_threads 205
 - MAXACTVP 15
 - maximum 229
 - mdoc_class_version 158, 196
 - MEASUREMENT 15
 - memory_amount 194
 - memory_limit 181
 - MENTALRAYRENDERSETTINGS 179
 - MENU 15
 - MENUEXT 15
 - merge_flags 231
 - merged_cells 236
 - merged_height_flag 254
 - merged_width_flag 254
 - MESH 59
 - min_extent 186
 - min_intensity 248
 - minimum 229
 - minor 96, 97, 99, 100, 101, 102, 103, 104, 105, 106, 165, 220, 221, 222, 235
 - minor_major_ratio 238
 - minor_radius 99, 100, 105
 - MININSERT 59

- minute 158
 - MIRRTEXT 15
 - miter_direction 246
 - miter_option 101, 105
 - mleader_order 182
 - MLEADEROBJECTCONTEXTDATA 181
 - mleaderstyle 64
 - MLEADERSTYLE 182
 - mlinestyle 61
 - MLINE 60
 - MLINESTYLE 184
 - mode 68, 178
 - model_edge 160
 - model_space 155
 - modeler_format_version 44, 57, 70, 78, 83
 - month 158
 - morehandles 165
 - MOTIONPATH 184
 - MPOLYGON 61
 - mr_description 181
 - mr_version 179
 - msec 158
 - msecs 201, 251
 - mtext 46
 - mtext_style 30, 31
 - mtext_visible 46
 - MTEXT 62
 - MTEXTATTRIBUTEOBJECTCONTEXTDATA 185
 - MTEXTOBJECTCONTEXTDATA 185
 - MULTILEADER 63
- N**
- n_density 75
 - name 32, 46, 53, 61, 72, 79, 107, 109, 111, 113, 114, 116, 119, 120, 121, 124, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 147, 148, 149, 150, 151, 152, 153, 155, 161, 169, 171, 173, 176, 177, 179, 184, 192, 195, 196, 200, 203, 205, 206, 215, 217, 218, 228, 229, 239, 241, 252, 256, 258, 259
 - named_ucs 95, 175, 206, 208, 217
 - names 173
 - namidx 227
 - NAVISWORKSMODEL 65
 - NAVISWORKSMODELDEF 186
 - network_action_index 118
 - network_version 118
 - next_entity 261
 - nextid 234, 235
 - no_twist 57
 - node 114, 235
 - nodeid 229, 235
 - nodes 108, 166
 - nolinks 261
 - normal 244
 - north_dir 168
 - north_dir_angle_deg 169
 - north_dir_angle_rad 169
 - NORTHDIRECTION 15
 - notes 45
 - num_actions 108, 117, 118, 131, 134, 140, 141, 144, 147, 149
 - num_areafillparms 246
 - num_arrowheads 65
 - num_attr_defs 256
 - num_attrs 258
 - num_blocklabels 65
 - num_blocks 25, 42, 56, 66, 68, 76, 81, 97, 111, 153, 229
 - num_blverts 79
 - num_borders 231, 253
 - num_boundary_handles 62, 238
 - num_break_heights 90
 - num_break_rows 91
 - num_breaks 240, 241
 - num_bulges 58, 248
 - num_cell_contents 257
 - num_cells 85, 157, 203, 259
 - num_childs 166
 - num_childval 167
 - num_classification_colorramps 189
 - num_clip_inverts 33
 - num_clip_verts 33, 49, 96, 199
 - num_clippings 71
 - num_codes 145, 150
 - num_col_sizes 245
 - num_colorramps 189
 - num_colors 46, 61
 - num_cols 50, 60, 85, 158, 242, 257
 - num_column_heights 63, 186
 - num_connections 228, 230
 - num_control_points 239
 - num_crease 59
 - num_croppings 73
 - num_cross_sections 58
 - num_crosssects 102
 - num_ctrl_pts 48, 81
 - num_customdata 158
 - num_customdata_items 257, 259
 - num_dashes 238
 - num_dates 202
 - num_deflines 47, 62
 - num_deps 108, 109, 118, 126, 131, 134, 140, 141, 144, 147, 149, 222
 - num_edges 59, 99, 101, 166
 - num_eed 261, 262
 - num_endsetbacks 102
 - num_entries 107, 154, 164, 174, 176, 187, 201, 206, 208, 217, 225, 230
 - num_ents 199
 - num_faces 59
 - num_field_refs 242
 - num_fields 167
 - num_fit_pts 48, 81
 - num_fitpts 239

- num_frozen_layers 94
 - num_gentextures 178
 - num_geom 251
 - num_geomesh_faces 168
 - num_geomesh_pts 168
 - num_geometry 252, 258
 - num_geoms 250
 - num_groups 171
 - num_guide_curves 58
 - num_guides 102
 - num_hatch_angles 198
 - num_hdls 145, 150, 200
 - num_hours 202
 - num_ididx 227
 - num_ididxs 227
 - num_index 225
 - num_inserts 155
 - num_intsectobj 233
 - num_items 110, 219
 - num_knots 48, 81, 239
 - num_leaders 243
 - num_lights 175
 - num_lines 60, 184, 241, 246
 - num_m_verts 74, 75
 - num_materials .. 25, 43, 56, 67, 69, 77, 82, 98, 112
 - num_merged_cells 236
 - num_morehandles 165
 - num_n_verts 74, 75
 - num_names 173
 - num_nodes 108, 166
 - num_obj_ids 171
 - num_objects 166
 - num_objid_handles 218
 - num_objids 76, 191
 - num_orthopts 206
 - num_owned 49, 60, 73, 74, 75, 85, 155
 - num_owned_actions 118
 - num_owned_params 108, 109, 118, 126
 - num_pages 224
 - num_params 113, 120, 121, 124, 229
 - num_paths 46, 61
 - num_pointrefs 156
 - num_points 52, 58, 175, 220, 240, 248
 - num_prop_entries 226
 - num_propinfos 132, 141, 142, 150, 152
 - num_propnames 226
 - num_props 212, 226, 264
 - num_pts 145, 149, 247
 - num_radiuses 102
 - num_ramps 247
 - num_reactors 261, 262
 - num_rows 50, 60, 85, 158, 242, 257
 - num_rowstyles 204
 - num_schemas 226
 - num_search 227
 - num_sections 198
 - num_seeds 47
 - num_segidx 223
 - num_segparms 246
 - num_segs_or_paths 238
 - num_silhouettes .. 25, 43, 56, 66, 69, 77, 82, 98, 111
 - num_sortedidx 227
 - num_source_files 70
 - num_sources 251
 - num_startsetbacks 102
 - num_states 153
 - num_steps 121, 187
 - num_subdiv_vertex 59
 - num_subents 122, 187
 - num_submgrs 157
 - num_types 198
 - num_uprops 226
 - num_valuelist 229
 - num_values 108, 109, 118, 127, 222, 227
 - num_vars 259
 - num_vertex 59
 - num_vertexids 58
 - num_vertices 248
 - num_verts 60, 79
 - num_viewports 175
 - num_widths 59, 248
 - num_wires .. 25, 43, 56, 66, 69, 77, 82, 98, 111, 219
 - num_xdata 218
 - num_xrefpaths 233
 - num_xrefs 233
 - num1 200
 - numassocsteps 187
 - numassocsubents 187
 - numcols 42, 140, 202, 203
 - numdashes 176
 - numelems 140
 - numentities 21
 - numfaces 75
 - numfragments 63
 - numgaps 249
 - numitems 160, 161, 219
 - numlayers 239
 - numlevels 219
 - numoverrides 204
 - numpoints 71, 190
 - numrows 42, 140, 202, 203, 219
 - numsections 249
 - numverts 75
 - numvports 202
 - NURBSURFACE 66
- O**
- obj_ids 172
 - objdata_algn_offset 228
 - object 229, 247
 - OBJECT_PTR 186
 - objectcontext 157
 - objects 166
 - objid 261, 262
 - objid_handles 218

objids 76, 191
 oblique_angle 29, 31, 34, 39, 80, 91, 200
 obs_pt 167
 OBSCOLOR 15
 observation_coverage_tag 168
 observation_from_tag 168
 observation_to_tag 168
 OBSLTYPE 15
 obsolete_false 169
 offset .. 144, 147, 149, 172, 225, 226, 228, 238, 245
 offset_from_arc 27
 oldCECOLOR_hi 21
 oldCECOLOR_lo 21
 OLE2FRAME 67
 oleclient 68
 OLEFRAME 68
 OLESTARTUP 15
 oleversion 68
 on 173
 on_off 93
 opacity_percent 177
 opacitymap 177
 operand1 97
 operand2 97
 operation 97
 option 115, 157
 opts_r11 261
 ORDDIMOBJECTCONTEXTDATA 186
 order 114
 orientation 129, 134, 138
 orientation_on_both_grips 131, 133
 origin 52, 70, 199
 ORTHOMODE 15
 orthopts 206
 OSMODE 15
 osnap_dist 233
 osnap_mode 120
 osnap_pt 233
 osnap_type 233
 other_dist 99
 out_edge 234
 output_type 202
 override_code 246
 ovr 204
 ovr_center 51, 191
 owned_actions 118
 owned_params 108, 109, 118, 126
 owner 102
 ownerhandle 261, 262
 owningnetwork 107, 109, 118, 126

P

pab 108, 110, 112, 115, 116, 117, 118, 119, 120,
 124, 125, 126
 padding 228, 250
 page_count 224
 page_data 224
 page_data_size 224
 page_index 224
 page_setup_wizard 203
 page_size 224, 225
 page_start_offset 224
 pages 225
 paper_height 188
 paper_image_origin 189
 paper_size 188
 paper_space 155
 paper_units 188, 196
 paper_width 188
 param 114, 120
 paramblock 110
 parameter_base_location 128, 130, 131, 133,
 135, 136, 137, 139, 144, 146, 148, 151, 154
 params 113, 120, 121, 124, 229
 parent 24, 26, 28, 29, 30, 32, 33, 34,
 35, 37, 38, 39, 40, 42, 45, 46, 47, 48, 49, 50, 51, 53,
 55, 58, 59, 60, 61, 62, 63, 65, 66, 67, 68, 70, 71, 73,
 74, 75, 76, 78, 79, 80, 81, 84, 91, 92, 93, 95, 96, 97,
 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109,
 110, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121,
 123, 124, 125, 126, 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,
 157, 158, 160, 161, 164, 165, 166, 167, 169, 170, 171,
 172, 173, 174, 175, 176, 177, 179, 181, 182, 184, 185,
 186, 187, 189, 190, 191, 192, 193, 194, 195, 196, 198,
 199, 200, 201, 203, 204, 205, 206, 208, 214, 217, 218,
 219, 220, 221, 222, 228, 229, 230, 231, 232, 233, 234,
 236, 237, 238, 239, 240, 241, 242, 243, 245, 246, 247,
 248, 250, 251, 252, 253, 254, 258, 259
 parentid 235
 PARTIAL_VIEWING_INDEX 187
 path 186
 path_curve 58
 path_entity 45, 84
 path_entity_id 83
 path_entity_transform_computed 45, 84
 path_entity_transmatrix 44, 84
 path_flags 45, 84
 path_option 158
 path_type 51
 pathdata 83
 pathdata_size 83
 pathentity_transform 101, 105
 paths 46, 61
 pattern_len 176
 pattern_type 46, 61
 pbsab_status ... 112, 115, 116, 117, 118, 119, 120,
 124, 125, 126

- PDFDEFINITION 218
 PDFUNDERLAY 68
 PDMODE 15
 PDSIZE 15
 PELEVATION 15
 PELLIPSE 16
 periodic 47, 81
 PERSUBENTMGR 187
 PEXTMAX 16
 PEXTMIN 16
 photon_trace_depth1 180
 photon_trace_depth2 180
 photon_trace_depth3 180
 physical_intensity 54
 physical_intensity_method 54
 PICKSTYLE 16
 PINSBASE 16
 pixel_size 47, 172
 PLACEHOLDER 187
 plane_line_color 197
 plane_linewt 197
 plane_ltype 197
 plane_normal_lofting_type 57
 PLANESURFACE 68
 PLIMCHECK 16
 PLIMMAX 16
 PLIMMIN 16
 PLINEGEN 16
 PLINEWID 16
 plot_flags 188
 plot_glyph 53
 plot_origin 188
 plot_paper_unit 188
 plot_rotation_mode 188
 plot_type 188
 plot_window_ll 188
 plot_window_ur 188
 plotflag 173
 plotsettings 174
 PLOTSETTINGS 187
 plotstyle 173, 250, 261
 plotstyle_flags 261
 plotview 188
 plotview_name 188
 point 25, 43, 56, 66, 69, 76, 77, 82, 92, 93, 97,
 111, 190, 237, 239
 point_present .. 25, 43, 56, 66, 69, 77, 82, 97, 111
 POINT 70
 POINTCLOUD 70
 POINTCLOUDCOLORMAP 189
 pointclouddef 71
 POINTCLOUDDEF_REACTOR 190
 POINTCLOUDDEF_REACTOR_EX 190
 pointclouddefex 72
 POINTCLOUDDEF 189
 POINTCLOUDDEFEX 190
 POINTCLOUDEX 71
 POINTPARAMETERENTITY 73
 POINTPATH 190
 pointrefs 156
 points 52, 58, 175, 220, 240, 248
 POLARGRIPENTITY 73
 polyline_paths 238
 POLYLINE_2D 73
 POLYLINE_3D 74
 POLYLINE_MESH 74
 POLYLINE_PFACE 75
 position 45, 53, 254
 position_desc 142
 position_name 142
 predef_presets_first 195
 preset_name 193
 prev_entity 261
 prev_entry 218
 preview 156, 261
 preview_exists 261
 preview_is_proxy 261
 preview_size 156, 261
 printer_cfg_file 187
 procedure 195
 projection 242
 PROJECTNAME 16
 prompt 30
 prop_entries 226
 prop_states 128, 130, 133, 135, 136, 137, 139,
 144, 146, 148, 151, 154
 prop1 .. 128, 129, 130, 132, 133, 135, 136, 137, 139,
 141, 142, 143, 146, 148, 150, 151, 152, 154
 prop2 .. 128, 130, 132, 133, 135, 136, 137, 139, 141,
 142, 143, 146, 148, 150, 151, 152, 154
 prop3 .. 128, 130, 133, 135, 136, 137, 139, 143, 146,
 148, 151, 154
 prop4 .. 128, 130, 133, 135, 136, 137, 139, 143, 146,
 148, 151, 154
 property_flags 232
 property_override_flags 230, 231
 propnames 226
 props 226, 264
 PROXY_ENTITY 75
 PROXY_OBJECT 190
 PROXYGRAPHICS 16
 prvsav_segidx 223
 PSLTSCALE 16
 PSOLHEIGHT 16
 PSOLWIDTH 16
 PSTYLEMODE 16
 PSVPSCALE 16
 pt 79, 127, 132, 259
 pt0 48, 95, 169, 237
 pt1 68, 116
 pt2 68, 101, 105, 116
 pts 145, 149, 247
 PUCSBASE 16
 PUCSNAME 16
 PUCSORG 16
 PUCSORGBACK 16

PUCSORGBOTTOM 16
 PUCSORGFRONT 16
 PUCSORGLEFT 16
 PUCSORGRIGHT 17
 PUCSORGTOP 17
 PUCSORTHOREF 17
 PUCSORTHOVIEW 17
 PUCSXDIR 17
 PUCSYDIR 17

Q

QTEXTMODE 17

R

r_node 108, 110, 119, 125
 r11_prev_entry_index 218
 r11_viewport_index 218
 RADIMLGOBJECTCONTEXTDATA 191
 RADIMOBJECTCONTEXTDATA 191
 radius 26, 27, 32, 45, 48, 103, 104, 238
 radiuses 102
 ramps 247
 rapidrt_version 192
 RAPIDRTRENDERSETTINGS 192
 RASTERVARIABLES 193
 rational 47, 81
 ray_trace_depth1 180
 ray_trace_depth2 180
 ray_trace_depth3 180
 ray_tracing_enabled 180
 RAY 76
 reactor 71, 72
 reactors 262
 readdep 114
 REALWORLDSCALE 17
 record_hdrs 224
 record_history 102
 record_size 224, 225
 records 224
 rect_height 62, 185
 rect_width 62, 185
 ref 161, 224
 ref_pt 167
 ref_pt2d 169
 refcount 236
 reference_vector_for_
 controlling_twist 45, 84
 reflectance 221
 reflectance_scale 177
 reflectionmap 177
 reflectivity 178
 refraction_index 177
 refractionmap 177
 REGENMODE 17
 REGION 76
 rel_transform 222

render_level 192
 render_mode 94, 207, 215
 render_target 192
 render_time 192, 193
 RENDERENTRY 193
 RENDERENVIRONMENT 194
 RENDERGLOBAL 194
 RENDERSETTINGS 195
 REPEAT 76
 REQUIREDVERSIONS 17
 reserved 46, 61
 resunits 172
 revision_bytes .. 26, 43, 57, 67, 69, 77, 82, 98, 112
 revision_guid .. 25, 43, 56, 67, 69, 77, 82, 98, 112
 revision_major .. 26, 43, 57, 67, 69, 77, 82, 98, 112
 revision_minor1 .. 26, 43, 57, 67, 69, 77, 82, 98, 112
 revision_minor2 .. 26, 43, 57, 67, 69, 77, 82, 98, 112
 REVISIONNUMBER 264
 revolve_angle 78, 103
 revolved_entity_transmatrix 78
 REVOLVEDSURFACE 76
 rgb 242
 right_col 236
 right_grid_color 255
 right_grid_linewt 255
 right_margin 188, 231
 right_offset 27
 right_visibility 255
 root_tree_node_gap 249
 rotated_type 161
 rotation ... 29, 31, 49, 60, 79, 80, 85, 91, 127, 169,
 170, 171, 185, 204, 232, 241, 244, 254
 ROTATIONGRIPENTITY 78
 ROTATIONPARAMETERENTITY 78
 row_heights 85
 row_offset 132
 row_parent 256, 258
 row_spacing 50, 60
 rows 232, 242
 rowspacing 42
 rowstyles 204
 RTEXT 79
 ruled_surface 58

S

sab .. 112, 115, 116, 117, 118, 119, 120, 124, 125, 126
 sab_size 25, 43, 56, 66, 68, 76, 81, 97, 111
 sampling_contrast_color1 179
 sampling_contrast_color2 179
 sampling_contrast_color3 179
 sampling_contrast_color4 180
 sampling_filter1 179
 sampling_filter2 179
 sampling_mr_filter 179
 sampling1 179
 sampling2 179
 save_enabled 195

- save_filename 195
- saved_filename 70
- SAVEIMAGES 17
- scale... 32, 49, 59, 60, 80, 85, 106, 127, 165, 166, 172, 175, 182, 183, 185, 186, 191, 204, 220, 241, 244
- scale_est 168
- scale_factor... 44, 65, 83, 101, 104, 127, 170, 243
- scale_flag 49, 59, 85
- scale_spacing 47, 61
- scale_vec 167
- SCALE 196
- scenario 47, 80
- schdat 223
- schema 160
- schema_namidx 227
- schemas 226
- schidx 223, 225
- schidx_segidx 223
- sea_level_elev 168
- search 223, 227
- search_segidx 223
- second_endpoint 238
- second_seg_angle 182
- secondary_background 171
- secondheader_address 249
- seconds 158
- section_array_size 250
- section_info_id 250
- section_map_address 249
- section_map_id 249
- section_settings 79
- section_type 250
- SECTION_MANAGER 198
- SECTION_SETTINGS 198
- SECTIONOBJECT 79
- sections 198
- SECTIONVIEWSTYLE 196
- seeds 47
- segidx 223, 225, 226
- segidx_offset 223
- segidx_unknown 223
- segment_idx 228
- segments 224
- separms 246
- segs 238
- segsz 228
- select_dates_from_calendar 202
- select_range_of_dates 202
- selectable 171
- selection_marker 220
- self_illumination 178
- seqend 49, 60, 73, 74, 75, 90
- SEQEND 79
- setup_name 202
- shade_plot_type 202
- SHADEDGE 17
- SHADEDIF 17
- shadeplot 95, 189
- shadeplot_customdpi 189
- shadeplot_mode 94
- shadeplot_reslevel 189
- shadeplot_type 189
- shadow 262
- shadow_flags 262
- shadow_map_size 53
- shadow_map_softness 54
- shadow_maps_enabled 180
- shadow_mapsize 201
- shadow_mode 180
- shadow_softness 201
- shadow_type 53, 201
- SHADOWPLANELOCATION 17
- shape_flag 241
- SHAPE 80
- sheet_set_name 202
- sheet_subset_name 202
- shift_value 237
- short 6
- short170 67
- shorts 145, 150
- show_clipping 71
- show_cropping 73
- show_history 102
- show_intensity 71, 72
- show_properties 128, 129, 130, 132, 135, 136, 137, 139, 141, 142, 143, 146, 148, 150, 151, 152, 153
- show_rotation 170
- SHOWHIST 17
- shsw_b294 101, 105
- shsw_b295 101, 105
- shsw_b296 101, 105
- shsw_b193 100, 104
- shsw_text 100, 104
- shsw_text_size 100, 104
- shsw_text2 100, 104
- shsw_text2_size 100, 104
- si_tag 226
- si_unknown_1 226
- si_unknown_2 226
- sides 103
- signature 228
- silhouettes 25, 43, 56, 66, 69, 77, 82, 98, 111
- simple_surfaces 58
- single_color_gradient 46, 61
- size 21, 48, 95, 169, 225, 226, 228, 248
- SKETCHINC 17
- SKPOLY 17
- SKYLIGHT_BACKGROUND 198
- sm_axis 42
- SNAPANG 17, 93, 216
- SNAPBASE 17, 93, 216
- SNAPISOPAIR 17, 216
- SNAPMODE 17, 216
- SNAPSTYLE 17, 216
- SNAPUNIT 17, 93, 216
- solid 58, 78

- SOLID..... 80
 SOLID_BACKGROUND..... 199
 SOLIDHIST..... 18
 sort_ents..... 199
 sortedidx..... 227
 SORTENTS..... 18
 SORTENTSTABLE..... 199
 source..... 242
 source_filename..... 189, 190
 source_files..... 70
 source_pt..... 237
 sources..... 251
 spacing..... 202
 SPATIAL_FILTER..... 199
 SPATIAL_INDEX..... 200
 specular_color..... 177
 specular_gloss_factor..... 177
 specularmap..... 177
 SPLFRAME..... 18
 splineflags..... 47, 80
 SPLINE..... 80
 SPLINESEGS..... 18
 SPLINETYPE..... 18
 start..... 24, 55, 240, 241, 254
 start_angle..... 26, 27, 42, 78, 103, 184, 238
 start_day..... 193
 start_draft_angle..... 57
 start_draft_dist..... 100, 104
 start_draft_magnitude..... 57
 start_minute..... 193
 start_month..... 193
 start_msec..... 193
 start_pt..... 48
 start_second..... 193
 start_tangent..... 239
 start_time..... 202
 start_width..... 73, 74, 92
 start_year..... 193
 startsetbacks..... 102
 state..... 79, 134
 states..... 153
 status..... 53, 110, 113, 116, 120, 186, 229
 status_flag..... 94
 std_scale_factor..... 189
 std_scale_type..... 189
 step_id..... 220
 steps..... 122, 187
 STEPSIZE..... 18
 STEPSPERSEC..... 18
 strings_area..... 176
 strokes..... 214
 strokes_int..... 214
 struct..... 7
 strvalue..... 160
 sty..... 204
 style... 27, 30, 31, 46, 61, 62, 79, 80, 91, 241, 244
 style_attachment..... 65
 style_content..... 64
 style_id..... 80, 257, 259
 style_parent..... 258
 style_sheet..... 94
 style_type..... 208
 STYLE_CONTROL..... 201
 STYLE_CONTROL_OBJECT..... 18
 stylesheet..... 188
 STYLE..... 200
 STYLESHEET..... 18
 stylization_type..... 72
 subdiv_vertex..... 59
 subent..... 115
 subents..... 122, 187
 SUBJECT..... 264
 submgrs..... 157
 sun..... 95, 208, 217
 sunid..... 199
 SUN..... 201
 SUNSTUDY..... 201
 SURFTAB1..... 18
 SURFTAB2..... 18
 SURFTYPE..... 18
 SURFU..... 18
 SURFV..... 18
 sweep_alignment_flags..... 44, 84
 sweep_entity..... 45, 84, 103
 sweep_entity_id..... 83
 sweep_entity_transform_computed..... 45, 84
 sweep_entity_transmatrix..... 44, 83
 sweep_transmatrix..... 45
 sweep_vector..... 45
 sweepdata..... 83
 sweepdata_size..... 83
 sweepentity_transform..... 101, 105
 SWEPTSURFACE..... 81
- ## T
- t2..... 27
 t3..... 27
 t58..... 127
 t78..... 127
 tab_order..... 174
 table_flag_override..... 85
 table_name..... 158
 TABLECONTENT..... 203
 tabledatacolumn_parent..... 231
 tablegeometry..... 252, 258
 TABLEGEOMETRY..... 203
 tablerow_parent..... 231
 tablestyle..... 84, 203
 TABLE..... 84
 TABLESTYLE..... 203
 tag..... 30, 31, 251
 tangent_dir..... 92
 target..... 53, 232
 target_path..... 184
 TARGET..... 18

- tdata..... 84, 203
- TDCREATE..... 18, 264
- TDINDWG..... 18, 264
- TDUCREATE..... 18
- TDUPDATE..... 18, 264
- TDUSRTIMER..... 18
- TDUPDATE..... 18
- text..... 62, 230, 232, 241, 254
- text_align_type..... 183
- text_alignment..... 45, 64, 243, 253
- text_always_left..... 183
- text_angle_type..... 183
- text_angletype..... 64, 243
- text_bottom..... 244
- text_color..... 64, 183, 253
- text_default..... 183
- text_direction..... 27
- text_extended..... 184
- text_height..... 62, 183, 232, 243, 253, 255
- text_left..... 64, 243
- text_midpt.. 28, 33, 34, 36, 37, 38, 39, 41, 50, 233
- text_position..... 27
- text_right..... 64, 243
- text_rotation... 28, 33, 35, 36, 37, 38, 40, 41, 50, 234, 246
- text_size..... 26, 200
- text_style..... 64, 183, 203, 232, 253, 255
- text_top..... 244
- text_value..... 27, 31, 79, 91, 92, 255
- texts..... 160, 161
- TEXT..... 91
- TEXTOBJECTCONTEXTDATA..... 204
- TEXTQLTY..... 18
- TEXTSIZE..... 18
- TEXTSTYLE..... 18
- texturemode..... 243
- thickness... 24, 26, 29, 31, 32, 55, 58, 70, 73, 80, 91, 92, 248
- thickness_r11..... 262
- THICKNESS..... 18
- tile_order..... 181
- tile_size..... 181
- TILEMODE..... 19
- TILEMODELIGHTSYNCH..... 19
- tiling..... 242
- timestamp..... 236
- TIMEZONE..... 19
- title_horiz_bottom_color..... 87
- title_horiz_bottom_linewt..... 88
- title_horiz_bottom_visibility..... 89
- title_horiz_ins_color..... 87
- title_horiz_ins_linewt..... 88
- title_horiz_ins_visibility..... 89
- title_horiz_top_color..... 87
- title_horiz_top_linewt..... 88
- title_horiz_top_visibility..... 89
- title_row_alignment..... 86
- title_row_color..... 86
- title_row_fill_color..... 86
- title_row_fill_none..... 86
- title_row_height..... 86
- title_row_style_override..... 90
- title_suppressed..... 85
- title_text_style..... 86
- title_vert_ins_color..... 87
- title_vert_ins_linewt..... 88
- title_vert_ins_visibility..... 89
- title_vert_left_color..... 87
- title_vert_left_linewt..... 88
- title_vert_left_visibility..... 89
- title_vert_right_color..... 87
- title_vert_right_linewt..... 88
- title_vert_right_visibility..... 89
- TITLE..... 264
- TOLERANCE..... 91
- tooltip..... 136, 157, 257
- top_grid_color..... 255
- top_grid_linewt..... 255
- top_height..... 79
- top_margin..... 188
- top_row..... 236
- top_visibility..... 255
- topradius..... 103
- total_data_size..... 224
- total_segments..... 223
- TRACE..... 92
- TRACEWID..... 19
- trans..... 220
- trans_space_flag..... 161
- transform..... 200, 244
- transform_present..... 220
- translation..... 220
- translucence..... 178
- transmatrix..... 66, 110, 222, 242
- transmittance_scale..... 178
- transparency..... 170, 221
- TREEDEPTH..... 19
- triangle_count..... 194
- TSTACKALIGN..... 19
- TSTACKSIZE..... 19
- turn_height..... 48
- turns..... 48
- TVDEVICEPROPERTIES..... 204
- twist_angle.... 44, 78, 83, 93, 101, 103, 105, 207
- two_sided_material..... 178
- txt..... 260
- type.... 30, 31, 53, 64, 68, 150, 182, 220, 227, 228, 230, 232, 240, 244, 247, 251, 252, 254, 258, 259
- type_size..... 227
- types..... 198

U

u.bd	235
u.bl	235
u.bs	235
u.handle	236
u.rc	235
u.text	235
u_isolines	44, 57, 67, 70, 78, 83
ucs_at_origin	94, 216
ucs_elevation	94, 174, 205, 207, 216
ucs_name	71
ucs_origin	71
ucs_x_dir	71, 72
ucs_y_dir	71, 72
ucs_z_dir	71, 72
UCS_CONTROL	206
UCS_CONTROL_OBJECT	19
UCSBASE	19
UCSFOLLOW	216
UCSICON	19, 216
UCSNAME	19
ucsorg	94, 205, 207, 216
UCS	205
UCSORG	19, 174
UCSORGBACK	19
UCSORGBOTTOM	19
UCSORGFRONT	19
UCSORGLEFT	19
UCSORGRIGHT	19
UCSORGTOP	19
UCSORTHOREF	19
UCSORTHOVIEW	19, 94, 174, 205, 207, 216
UCSVP	94, 216
ucsxdir	94, 205, 207, 216
UCSXDIR	19, 174
ucsydir	94, 205, 207, 216
UCSYDIR	19, 174
ui_index	240
uint64_t	6
UNDERLAY	32
UNDERLAYDEFINITION	218
unit_scale_horiz	167
unit_scale_vert	168
unit_type	254, 257, 259
unit1_name	21
unit1_ratio	21
unit2_name	21
unit2_ratio	21
unit3_name	22
unit3_ratio	22
unit4_name	22
unit4_ratio	22
unitfactor	66
UNITMODE	19
units	193
units_value_horiz	167
units_value_vert	168
unknown	25, 28, 34, 35, 36, 37, 39, 40, 41, 42, 51, 56, 66, 68, 76, 81, 97, 107, 111, 167, 171, 225, 227, 230, 234, 245, 256, 257
unknown_0	121, 187
unknown_1	223, 224, 225, 227, 249
unknown_10	22
unknown_11	22
unknown_12	22
unknown_13	22
unknown_14	22
unknown_14b	22
unknown_15	22
unknown_16	22
unknown_17	22
unknown_2	121, 187, 223, 224, 225, 227, 228, 249
unknown_20	22
unknown_21	22
unknown_22	22
unknown_23	22
unknown_3	121, 228, 249
unknown_4f2	22
unknown_5	22
unknown_51e	23
unknown_520	23
unknown_52c	23
unknown_52e	23
unknown_530	23
unknown_54	23
unknown_55	23
unknown_56	23
unknown_57	23
unknown_59	23
unknown_6	23
unknown_6a	23
unknown_6b	23
unknown_6c	23
unknown_8	23
unknown_9	23
unknown_b	84, 169, 231
unknown_b0	62
unknown_b1	59, 198
unknown_b2	59, 198
unknown_b37	123
unknown_bit_1	51
unknown_bit_2	52
unknown_bit_3	52
unknown_bit_4	52
unknown_bit_5	53
unknown_b1	84, 231
unknown_b10	73
unknown_b11	73, 85, 204
unknown_b110	122
unknown_b111	122
unknown_b112	122
unknown_b113	122
unknown_b114	122
unknown_b115	122
unknown_b116	122

- unknown_bl17 122
 - unknown_bl18 122
 - unknown_bl19 122
 - unknown_bl2 204
 - unknown_bl20 122
 - unknown_bl21 123
 - unknown_bl22 123
 - unknown_bl23 123
 - unknown_bl24 123
 - unknown_bl25 123
 - unknown_bl26 123
 - unknown_bl27 123
 - unknown_bl28 123
 - unknown_bl29 123
 - unknown_bl3 204
 - unknown_bl30 123
 - unknown_bl31 123
 - unknown_bl32 123
 - unknown_bl33 123
 - unknown_bl34 123
 - unknown_bl35 123
 - unknown_bl36 123
 - unknown_bl6 122
 - unknown_bl6a 122
 - unknown_bl7 122
 - unknown_bl7a 122
 - unknown_bl8 122
 - unknown_bl9 122
 - unknown_bool 152
 - unknown_bs 90
 - unknown_day 23
 - unknown_h 84
 - unknown_hour 23
 - unknown_long 249
 - unknown_min 23
 - unknown_mon 24
 - unknown_ms 24
 - unknown_r11 55, 156, 176, 208
 - unknown_r2 208
 - unknown_rc 84, 204
 - unknown_sec 24
 - unknown_short 91
 - unknown_short_1 52
 - unknown_string 24
 - unknown_t 141
 - unknown_year 24
 - unknown1 169, 265
 - unknown2 169, 265
 - UNKNOWN_ENT 92
 - UNKNOWN_OBJ 206
 - unnamed 171
 - up_dir 168
 - upd_basept 128, 130, 131, 133, 135, 136, 138, 139, 144, 146, 148, 151, 154
 - upd_endpt .. 128, 130, 131, 133, 135, 137, 138, 139, 144, 146, 148, 151, 154
 - upd_state 134
 - update_option 157
 - update_status 158
 - upper_right 216
 - uprops 226
 - use_attenuation_limits 53
 - use_block_rotation 183
 - use_block_scale 183
 - use_default_lights 94, 207, 215
 - use_lut_palette 205
 - use_subset 202
 - use_tiling 172
 - used ... 107, 155, 161, 173, 176, 200, 205, 206, 215, 217
 - user_scale_factor 168
 - user_text ... 28, 33, 34, 36, 37, 38, 39, 41, 50, 234
 - USERI1 19
 - USERI2 20
 - USERI3 20
 - USERI4 20
 - USERI5 20
 - USERR1 20
 - USERR2 20
 - USERR3 20
 - USERR4 20
 - USERR5 20
 - USRTIMER 20
 - uvec 48, 95
 - uvec1 67
 - uvec2 67
- ## V
- v_isolines 44, 57, 67, 70, 78, 83
 - value .. 127, 128, 137, 138, 150, 151, 167, 221, 232, 236, 251, 256, 258, 260
 - value.handle91 235
 - value.long90 235
 - value.num40 235
 - value.pt2d 235
 - value.pt3d 235
 - value.short70 235
 - value.text1 235
 - value_code 235
 - value_data_type 232
 - value_format_string 232
 - value_set ... 129, 131, 133, 137, 138, 139, 146, 151
 - value_string 167, 257
 - value_string_length 167
 - value_unit_type 232
 - valuelist 229
 - values 108, 109, 118, 127, 222, 227
 - vars 259
 - VBA_PROJECT 206
 - vector 76
 - version ... 25, 42, 56, 66, 68, 76, 81, 97, 108, 111, 121, 191, 222, 223, 236
 - VERSIONGUID 20
 - vert_alignment 30, 31, 91
 - vert_cell_margin 86, 203

- vert_dir 79
 - vert_margin 231
 - vertex 59, 73, 74, 75, 246
 - vertex_direction 246
 - VERTEX_2D 92
 - VERTEX_3D 93
 - VERTEX_MESH 93
 - VERTEX_PFACE 93
 - VERTEX_PFACE_FACE 93
 - vertexids 59
 - vertices 248
 - vertind 93
 - verts 60, 79
 - view 32, 203
 - view_name 193
 - view_target 93, 207, 215
 - view_twist 215
 - view_width 206, 215
 - VIEW 206
 - VIEW_CONTROL 208
 - VIEW_CONTROL_OBJECT 20
 - VIEWCTR 20, 93, 207, 215
 - VIEWDIR 20, 93, 207, 215
 - viewlabel_alignment 160, 198
 - viewlabel_attachment 160, 197
 - viewlabel_offset 160, 197
 - viewlabel_pattern 160, 198
 - viewlabel_text_color 159, 197
 - viewlabel_text_height 159, 197
 - viewlabel_text_style 159, 197
 - VIEWMODE 20, 207, 215
 - viewport 218, 262
 - viewports 175
 - VIEWPORT 93
 - VIEWSIZE 20, 93, 206, 215
 - viewstyle_flags 159, 196
 - viewtable 184
 - VIEWTWIST 20
 - virtual_edge_flag 255
 - virtual_guide 58
 - VISIBILITYGRIPENTITY 95
 - VISIBILITYPARAMETERENTITY 95
 - visible 237, 253
 - VISRETAIN 20
 - visualstyle 95, 173, 203, 208, 217
 - VISUALSTYLE 208
 - void* 7
 - vp_dir_from_target 219
 - vp_id 219
 - vp_perspective 219
 - vp_target 219
 - vp_up_dir 219
 - VPOINTX 20
 - VPOINTXALT 20
 - VPOINTY 20
 - VPOINTYALT 20
 - VPOINTZ 20
 - VPOINTZALT 20
 - vport_entity_address 218
 - vport_entity_header 94
 - VPORT 214
 - VPORT_CONTROL 217
 - VPORT_CONTROL_OBJECT 20
 - vvec 48, 95
 - vvec1 67
 - vvec2 67
 - VX_CONTROL 217
 - VX_CONTROL_OBJECT 20
 - VX_TABLE_RECORD 21, 217
- ## W
- w 251
 - wchar* 7
 - web_angle1 55
 - web_angle2 55
 - web_angle3 55
 - web_angle4 55
 - web_angle5 55
 - web_flux 55
 - web_rotation 54
 - web_symmetry 54
 - webfile 54
 - webfile_type 54
 - weight 237
 - weighted 47, 81
 - width 93, 97, 106, 170, 230, 240, 244, 259
 - width_factor 30, 31, 80, 91, 200
 - width_w_gap 252, 258
 - widths 59, 248
 - WIPEOUT 95
 - WIPEOUTVARIABLES 218
 - wireframe_data_present 25, 43, 56, 66, 69, 77, 82, 97, 111
 - WIREFRAME 21
 - wires 25, 43, 56, 66, 69, 77, 82, 98, 111, 220
 - wizard_flag 27
 - word_break 245
 - workplane 108
 - WORLDVIEW 21
- ## X
- x 70, 251
 - x_ang 70
 - x_axis_dir 62, 185
 - x_dir 62, 222
 - x_direction 52, 92, 175
 - x_label 154
 - x_label_desc 154
 - x_offset 241
 - x_radius 99, 100
 - x_value 154
 - x_value_set 154
 - x04 249
 - x20 249

x40	249	xscale	26
x80	249	XYGRIPENTITY	96
XCLIPFRAME	21	XYPARAMETERENTITY	96
xdata	218		
xdata_size	218	Y	
xdicobjhandle	262	y	70, 251
XEDIT	21	y_label	154
xline1_pt	29, 34, 36, 39	y_label_desc	154
xline1end_pt	35	y_offset	241
xline1start_pt	35	y_value	154
xline2_pt	29, 34, 37, 39	y_value_set	154
xline2end_pt	35, 37	year	158
xline2start_pt	35		
XLINE	96	Z	
XRECORD	218	z	70, 251
xref ... 107, 155, 161, 173, 176, 200, 205, 206, 215,	217	z_is_zero	24, 55
xref_pname	32, 155	z_max	248
xrefoverlaid	155	z_min	248
xrefpaths	233	zero1	169
xrefs	233		