

AutoCAD Map 3D Object Data Reader/Writer

Overview

The AutoCAD® Map™ 3D Object Data Reader and Writer modules allow the Feature Manipulation Engine (FME) to read and write Autodesk Map 3D's Object Data found in Autodesk DWG files.

AutoCAD Map 3D Object Data Quick Facts

Format Type Identifier	AUTOCAD_OD
Reader/Writer	Both
Licensing Level	Professional
Dependencies	None
Dataset Type	File
Feature Type	Object Data Table name or Entity Layer name
Typical File Extensions	.dwg, .dxf
Automated Translation Support	Yes
User-Defined Attributes	Yes
Coordinate System Support	No
Generic Color Support	Yes
Spatial Index	Never
Schema Required	N/A
Transaction Support	No
Geometry Type Attribute	autocad_entity
Rich Geometry	No
Encoding Support	Yes (object data attributes only)

Geometry Support			
Geometry	Supported?	Geometry	Supported?
aggregate	no	point	yes
circles	yes	polygon	yes
circular arc	yes	raster	no
donut polygon	yes	solid	no
elliptical arc	yes	surface	no
ellipses	yes	text	yes
line	yes	z values	yes
none	no		

Reader Overview

This reader provides almost all the functionality available within the AutoCAD RealDWG Reader except for the following exception:

- Schemas are generated based on the setting of object data reading mode rather than on layers, geometries, or attribute schemas. The data features read by the AutoCAD Map 3D Object Data reader are also created based on the object data reading mode, and are structured to match the schema generated. See the `OD_READING_MODE` reader directive below for details.

The Autodesk Map Reader uses the reader type `AUTOCAD_OD`.

Reader Directives

All AutoCAD RealDWG Reader directives can be used by the AutoCAD Map 3D Object Data reader. In addition to these directives, the AutoCAD Map 3D Object Data reader introduces some new directives not used by the AutoCAD RealDWG Reader. All directives must be prefixed by the current `<ReaderKeyword>_`.

DATASET

Required/Optional: *Required*

Contains the directory name of the input Autodesk Map files.

Workbench Parameter: `<Source AutoCAD File>`

OD_READING_MODE

Required/Optional: *Optional*

Specifies the overall structure of the schema and data for object data reading. If `od_mode_entity` is specified, then the schema will be generated using layers in the source dataset as *FME feature types*, and one data feature will be read for each entity. This mode can be thought of as 'Group by Entity' mode since each data feature read in this mode uniquely represents an entity with all its referencing object data table records resolved onto it as attributes. This is the recommended default reading mode for translating from the Autocad Map 3D Object Data reader to another FME format.

If a certain entity contains object data in n different object data tables, then only one feature is created, which stores the entity information and has all the attributes of the n associated object data tables. If an entity does not have object data associated with it, it simply has no object data attributes on it.

If `od_mode_raw` is specified, then the schema will be generated using a combination of both layers and object data tables as *FME feature types*, as they are arranged in the source dataset. The data features read according to the layer-based feature types will each represent an entity in the source dataset, and the data features read according to the object data table feature types will represent an object data table record in that table. This mode can be thought of as 'Raw Relational' since the each data feature read in this mode represents either the object data or the entities of the source dataset, and the referential relationship between them that is specified by `autocad_od_entity_key`.

If a certain entity contains n different object data tables with a total of m object data records associated with it, then one entity feature is created with an *FME feature type* of based on the entity's layer. At the same time, at least m non-geometric object data features are created, each having the object data attributes of one the m object data records. These object data record features will use the object data table name *FME feature type*. They will have an `autocad_entity` attribute with a value of `autocad_od_table`, and an `autocad_od_entity_key` attribute that can be used to reference the feature that stores the the associated entity information. This is the recommended reading mode for translating from the Autocad Map 3D Object Data reader to the Autocad Map 3D Object Data writer.

If `od_mode_classic` is specified, then the schema will be generated using a combination of both layers and object data tables as *FME feature types*. This mode can be thought of as 'Group by Object Data' since each data feature read in this mode uniquely defines an object data table record with the referenced entity information resolved onto it as geometry and entity attributes.

If a certain entity contains n different object data tables with a total of m object data records associated with it, then m different features are created, one for each object data table record. Each feature will store a copy of the entity information referenced and have object data from only the object data table record that it represents. Data features created for two different object data table records that reference the same entity will have identical values for the `autocad_od_entity_key` attribute. If a feature does not have any object data associated with it, the feature uses the referenced entity's layer name as the *FME feature type*.

Value: **od_mode_entity** | **od_mode_raw** | **od_mode_classic**

Default: **od_mode_entity**

QUALIFY_OD_RECORDS_WITH_TABLE_NAME

Required/Optional: *Optional*

Specifies whether attributes, should have their names prefixed with the object data table from which they came. This applies to both the attributes on FME feature types which corresponding to columns in object data tables, and the attributes on FME data features which corresponding to fields of object data records in object data tables.

Value: *yes* | *no*. The default value is *no*.

OD_TABLE_NAME_SEPARATOR

Required/Optional: *Optional*

Specifies a character that will be used to separate the object data table name from the object data information when the `QUALIFY_OD_RECORDS_WITH_TABLE_NAME` directive is set to *yes*.

Value: *Any character*.

Default: `_`

Tips for AutoCAD Object Data Reading

Note that the AutoCAD Map 3D Object Data reader directives list defaults that will produce the best generic result to any non-AutoCAD destination format, resulting in the best presentation at the cost of some of the original AutoCAD types being lost. For example, blocks and dimensions will be resolved into their component parts. If an AutoCAD-to-AutoCAD translation is desired, the following set of options should be used for best preservation of the original drawing.

```
STORE_BULGE_INFO = YES
STORE_SPLINE_DEFS = YES
RESOLVE_BLOCKS = NO
RESOLVE_DIMENSIONS = NO
VISIBLE_ATTRIBUTES_AS_TEXT = NO
IGNORE_UCS = YES
PRESERVE_COMPLEX_HATCHES = YES
IGNORE_HIDDEN_LAYERS = NO
RESOLVE_ENTIY_COLOR = NO
OD_READING_MODE = od_mode_raw or od_mode_classic
```

These are also noted on each individual directive description.

Writer Overview

All AutoCAD RealDWG Writer directives can be used by the AutoCAD Map 3D Object Data Writer. In addition to these directives, the AutoCAD Map 3D Object Data Writer introduces some new directives not used by the AutoCAD RealDWG Writer. All directives must be prefixed by the current `<WriterKeyword>_`.

When creating AutoCAD files, the AutoCAD Map 3D Object Data Writer first defines the linetypes, layers, and object data tables defined within the FME mapping file. The writer then reads in a template file, if specified, and copies the linetypes, layer definitions, shape file header information, and block information from the template file to the output data set. Any object data tables in the template file will not be copied.

The AutoCAD Map 3D Object Data Writer takes each feature that is given to it and outputs it to the output file according to the appropriate entity type. In addition, all entity types will be checked for object data information according to the attributes defined on their DEF line. See the DEF directive below for more information.

The attribute information on features is written to object data for each feature written to the dataset, in addition to the attribute storage specified by the use of the `autocad_attributes` attribute.

Writer Directives

This section describes the directives the AutoCAD Map 3D Object Data Writer module recognizes. Each of the directives is prefixed by the current `<WriterKeyword>_` when they are placed in a mapping file. By default, the `<WriterKeyword>` for the AutoCAD writer is the same as the `<WriterType>`. The following directives are used by all AutoCAD.

All AutoCAD RealDWG Writer directives can be used by the AutoCAD Map 3D Object Data Writer. In addition to these directives, the AutoCAD Map 3D Object Data Writer introduces some new directives not used by the AutoCAD RealDWG Writer.

DATASET

Required/Optional: *Required*

The dataset into which feature data is to be written.

Workbench Parameter: <Destination AutoCAD File>

VERSION

Required/Optional: *Required*

The version of AutoCAD file to be produced. The value corresponds with the release number of the AutoCAD file that is produced.

Values:

- *same_as_template* - This option takes the version from the template file. (**not applicable to AUTOCAD_OD**)
- *Release14*
- *Release2000*
- *Release2004*
- *Release2007*

Default value: *Release2007*

Example:

The example statement below instructs the AutoCAD Map 3D Object Data writer to produce a release 12 AutoCAD file:

```
DWG_VERSION Release12
```

Workbench Parameter: <AutoCAD Version>

TEMPLATEFILE

Required/Optional: *Optional*

This statement specifies the name of the existing AutoCAD DXF or DWG file that contains linetype, layer, shape header, block definitions and a codepage to be copied to the destination AutoCAD file. Any object data tables in the template file will not be copied. Some AutoCAD users also refer to this as a *prototype file*. This is an optional parameter. If the parameter is not defined, then the output file uses the linetype defined in the mapping file along with the predefined type of `CONTINUOUS` which is always present in an AutoCAD drawing.

TIP:

- `LINETYPE` definitions found in the mapping file override any linetype definitions found in the template file.
 - The template file can also be used to set the codepage of the resulting AutoCAD file.
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Note: Since object data tables are not copied from the template file, but block definitions are, the block definitions that are copied will have any related object data removed.

Note: The template file will be skipped for AUTOCAD_OD in certain cases to avoid name conflicts. If the reader format is AUTOCAD_OD, and the AUTOCAD_OD writer is the first writer in a multiple writer translation, the template file will be skipped.

The example below specifies that the file called `c:\tmp\test.dwg` contains the block, layer, shape header definitions, and linetype definitions for the output data set.

```
AUTOCAD_OD_TEMPLATEFILE c:/tmp/test.dwg
```

TIP: Many AutoCAD users refer to the template files as *prototype* files.

Workbench Parameter: <Template File>

DEF

Required/Optional: *Optional*

It is important to note that the AutoCAD Map 3D Object Data writer makes use of destination DEF lines in the FME mapping file in a different way than the AutoCAD RealDWG writer. In the AutoCAD Map 3D Object Data writer DEF lines without user attributes are treated as layer definitions, while any DEF lines with user attributes are treated as object data table definitions where each attribute will become a column.

Not only does the AutoCAD Map 3D Object Data writer require that every feature written to the AutoCAD file be stored within a predefined AutoCAD layer, all object data information must be stored within a predefined AutoCAD object data table. In AutoCAD, the layers are used to store collections of logically related attributes, and the object data tables are used to associate additional information with the entities stored on those layers.

Within the FME, AutoCAD layers and AutoCAD object data tables are both made from FME feature types.¹ An FME feature with a feature type that defines an object data table may write both entity and object data information to the output file, and may dynamically create a layer for the entity information if necessary. An FME feature with a feature type that defines a layer will only write entity information to the output file.

The DEF line statement is of the following form:

```
<WriterKeyword>_DEF <def line name> \
  autocad_color <default color> \
  autocad_linetype <default linetype> \
  [autocad_layer_frozen no] \
  [autocad_layer_hidden no] \
  [autocad_layer_locked no] \
  [autocad_od_entity_key_attr autocad_od_entity_key] \
[<attribute name> <attribute type>]
```

where:

- <def line name> is the name of the layer being defined if the DEF line contains no user attributes. If the DEF line contains user attributes def line name is the name of

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the object data table being defined. This is the name which is used throughout the remainder of the FME mapping files. The def line name cannot be empty.

- `<autocad_layer_frozen>` is the frozen state of the layer to create. If specified, then the created layer is frozen; otherwise, the layer is not frozen.
- `<autocad_layer_hidden>` is the hidden state of the layer to create. If specified, then the created layer is hidden; otherwise, the layer is not hidden.
- `<autocad_layer_locked>` is the locked state of the layer to create. If specified, then the created layer is locked; otherwise, the layer is not locked.
- `<attribute name> <attribute type>` is the definition of an attribute to be stored within the object data table. The presence of these attributes define this DEF line as an object data table definition instead of a layer definition. The attributes will define the columns in the output object data table. Additional attribute storage to object data can be specified with the `autocad_attributes` feature attribute. For additional information on the DEF directive, see AutoCAD DWG documentation.

The example below defines a layer called `boundary` in which entities are drawn using color 13 (unless otherwise specified) and a linetype called dash-dot (unless otherwise specified).

```
AUTOCAD_OD_DEF boundary \
  autocad_color 13 \
  autocad_linetype dash-dot
```

The example below defines an object data table called `boundary_info` with columns named FEATCODE, PPID, DATECHNG and SURVEYDIST. Attributes will be written as records for each feature within the object data table definition. The entity information for features within this object data table definition will still be written to a layer. See the `autocad_layer` attribute.

```
DWG_DEF boundary_info \
  autocad_color 13 \
  autocad_linetype dash-dot \
  FEATCODE char(12) \
  PPID char(10) \
  DATECHNG date \
  SURVEYDIST number(8,2)
```

APPEND_TO_TEMPLATEFILE

Required/Optional: *Optional*

This directive can be used to allow the file specified by the `DATASET` directive to be written as the concatenation of the full contents of the file specified by the `TEMPLATEFILE` directive with all written data. By default it is set to `NO`, so only header information but no data is used from the template file if one is specified. If this directive is set to `YES` then the full header and data information is used from the template file.

Note: The template file may be skipped for `AUTOCAD_OD` writing in certain cases. See the `TEMPLATEFILE` writer directive for more information.

Values: `YES` | `NO`

Default value: `NO`

Workbench Parameter: Append Data to Template File

BLOCK_OBJECT_DATA_STORAGE

Required/Optional: *Optional*

This directive can be used specify how an FME feature with composite geometry will store its attribute information as object data. A value of "Insert" indicates that object data will only be stored on the AutoCAD insert entity (block reference) that will be created from the composite geometry. A value of "All" indicates that copies of the object data will be stored on the AutoCAD insert as well as on every entity part that is created within the AutoCAD block definition. "All" is a good option if the insert will later be exploded into parts and object data is desired on each part.

Values: *Insert | All*

Default value: *Insert*

Workbench Parameter: Write block object data to

Feature Representation

In addition to the generic FME feature attributes that FME Workbench adds to all features (see *About Feature Attributes*), this format adds the format-specific attributes described in this section.

The AutoCAD Map 3D Object Data reader and writer support all of the same features supported by the AutoCAD RealDWG reader and writer and additionally uses the exact same attributes (i.e., all the format-specific attributes are prefixed by `autocad`, not by `autocad_od`). Unlike the AutoCAD RealDWG format, the feature representation used by the AutoCAD Map 3D Object Data format is based on the setting of the `OD_READING_MODE`. See the `OD_READING_MODE` reader directive above for details.

Although the AutoCAD RealDWG reader and writer does not currently have support for encoded character strings, the AutoCAD Map 3D Object Data reader and writer supports encoded character strings specifically in FME feature attributes that represent object data field values.

Object data fields whose type is `Point` will be converted by the Autodesk Map D Object Data reader into three attributes: one for each of the `x,y,z` coordinates. For example, if the name of a `Point` field is `LOCATION`, the AutoCAD Map 3D Object Data reader will split the field into the following attributes: `LOCATION.x`, `LOCATION.y`, and `LOCATION.z`. The `'x'`, or `'y'` or `'z'` characters which specify the dimension of each point attribute, must be lowercase.

All AutoCAD Map 3D Object Data features that have some object data associated with them will have the attribute described in the table below. The table below lists the attributes that may be contained in object data features.

Attribute Name	Contents
autocad_layer	<p>The name of the feature's layer. This is the same value as the feature's type and is stored when reading for reasons of convenience. This value is ignored when entities are being written to a DEF line that defines a layer. However, if a feature is being written to a DEF line that defines an object data table, this attribute specifies the name of the layer to which entity information will be written. In the absence of this attribute, features written to a DEF line that defines a layer will be written to a layer with the same name.</p> <p>Value: char(33) Default: No default</p>
autocad_entity	<p>The FME name for the type of entity this feature represents. The AutoCAD Map 3D Object Data reader and writer make use of an additional value <i>autocad_od_table</i> to represent FME features that do not have entity information but that store object data information on their attributes.</p> <p>Range: See the table <i>AutoCAD Entity Types and Descriptions</i> Default: No default</p>
autocad_map_odtable	<p>The name of the object data table from which the object data, stored on the feature as attributes, was retrieved. The AutoCAD Map 3D Object Data reader will create all FME features with this value in all settings of OD_READING_MODE.</p> <p>Value: char(30)</p>
autocad_od_entity_key	<p>A unique value per entity that is used to associate object data features with duplicate entity information or associated object data information together. The AutoCAD Map 3D Object Data reader will create all FME features that have object data with this value when the OD_READING_MODE is set to <i>od_mode_raw</i> or <i>od_mode_classic</i>. The AutoCAD Map 3D Object Data writer will only write entity information for each unique value of this attribute.</p> <p>Value: char(30)</p>

Note: If blocks that have associated object data are exploded, the object data will still be read. However, if attribute entities or insert attribute entities are expanded into text entities when reading, the object data will not be read. The object data on insert attribute entities can be found on the non-geometric attribute definition features that result from exploding a block that contains insert attributes.

