

# S-57 (ENC) Hydrographic Data Reader

## FORMAT NOTES:

- This format is not supported by FME Base Edition.
- This chapter also contains information that is applicable to the AML reader .

## Overview

The S-57 Reader module provides the Feature Manipulation Engine (FME) with access to data in International Hydrographic Organization (IHO) S-57 formatted file sets. While any S-57 dataset should be supported, this reader has only been fully tested with S-57 Electronic Navigational Chart (ENC) profile products. Note that S-57 Editions 3.0 and 3.1 are supported.

The S-57 format is a standard published by IHO and more information can be found at:

<http://www.iho.shom.fr/>

An online, browsable web interface to the S-57 Object and the Attribute Catalog can be found on the Universal Systems website at:

<http://www.universal.ca/S-57/frames/S57catalog.htm>

Some aspects of an S-57 transfer, such as data quality information, is not accessible via the S-57 reader, however, a user well-versed in the S-57 format can extract it using the ISO8211 reader.

## S-57 Quick Facts

Format Type Identifier	S57
Reader/Writer	Reader
Licensing Level	Professional
Dependencies	None
Dataset Type	Directory/File/Catalog
Feature Type	Object class
Typical File Extensions	.000, 030
Automated Translation Support	Yes
User-Defined Attributes	No
Coordinate System Support	Yes
Generic Color Support	Yes
Spatial Index	Never
Schema Required	Not applicable
Transaction Support	No
Geometry Type	s57_type

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

## Reader Overview

The S-57 Reader module produces FME features for all S-57 features in one or more related S-57 data files. An S-57 dataset can be a directory in which case, all S-57 files in the directory are selected, an S-57 catalog file in which case, all files referred to from the catalog are selected, or an individual S-57 data file.

S-57 feature objects are translated into FME features. S-57 geometry objects are automatically collected and formed into geometries on the features. Geometry objects are not separately accessible with the S-57 reader.

The FME S-57 reader supports S-57 update files. S-57 update files contain information on how to update a distributed S-57 data file. Update files have a file extension of 001, 002, etc.

## Reader Directives

The directives processed by the S-57 reader are listed below. The suffixes shown are prefixed by the current `<ReaderKeyword>` in a mapping file. By default, the `<ReaderKeyword>` for the S-57 reader is `s57`.

### DATASET

**Required/Optional:** *Required*

The dataset may be specified as a directory, S-57 data file or S-57 catalog file. In the case of a directory, all S-57 data files in the directory are part of the dataset. If a single data file is selected, only that file will be in the dataset. If an S-57 catalog file – normally called `CATALOG.030` – is selected, all S-57 data files listed in it will be selected.

For example:

```
S57_DATASET NEWFILES\I
```

or

```
S57_DATASET NEWFILES\I\CA39995I.000
```

or

```
S57_DATASET NEWFILES\I\CATALOG.030
```

**Workbench Parameter:** [<WorkbenchParameter>](#)

### IDs

**Required/Optional:** *Optional*

This optional specification is used to limit the available and defined S-57 files read. If no IDs are specified, then all available S-57 files in the dataset are read. The syntax of the `IDs` keyword is:

```
<ReaderKeyword>_IDs<baseName1>          \  
      <baseName2> ...                      \  
      <baseNameN>
```

The example below selects only the `CA39995I.000` file for input during a translation:

```
S57_IDS CA39995I
```

**Workbench Parameter:** [<WorkbenchParameter>](#)

### FORCE\_GENERIC

**Required/Optional:** *Optional*

The FME is programmed to recognize all feature object classes defined as part of the S-57 standard and to provide a feature schema for each object class with the set of attributes defined in the standard. However, in some cases it may be convenient to discard object class specific attributes and group all features in a small set of feature types based on the geometry type, rather than the S-57 object class.

The `FORCE_GENERIC` keyword can be used to force all features to be treated as one of the feature types `Point`, `Line`, `Area` or `Meta` depending on their geometry. In this case, object-class-specific attributes are discarded, but the attributes `GRUP`, `OBJL`, `RVER`, `AGEN`, `FIDN`, `DSNM`, `LNAM`, and `LNAM_REFS` common to all features are still generated.

For example:

```
S57_FORCE_GENERIC ON
```

If the `$FME_HOME/s57/*.csv` files used to define the S-57 object classes cannot be found at run-time, the `FORCE_GENERIC` flag will automatically be turned on and an appropriate warning will be generated in the reader's log output.

**Workbench Parameter:** [<WorkbenchParameter>](#)

## UPDATES

**Required/Optional:** *Optional*

The S-57 reader will by default apply all updates available for the datasets read. That is, if there are files ending in `.001`, `.002` and so on, in the same directory with base datasets (ending in `.000`), these update files will be read and applied to the base feature set in accordance with S-57 update rules. The `UPDATES` directive in the mapping file may be set to `IGNORE` to ignore all updates. The default value is `APPLY` indicating that updates should be applied.

**Workbench Parameter:** [<WorkbenchParameter>](#)

## FULL\_STRUCTURE

**Required/Optional:** *Optional*

This keyword allows primitives to be read as individual features whereby each feature has some extra information which could be used in future for writing to a S-57 dataset (not available yet). By default, this keyword is `OFF`.

For example:

```
S57_FULL_STRUCTURE ON
```

**Workbench Parameter:** [<WorkbenchParameter>](#)

## PROFILE

**Required/Optional:** *Optional*

This specifies which enhanced version of S-57 dataset to read. This is used only during schema generation (mapping file or workspace generation) and has no effect during normal reading. The original specifications for S-57 could be modified by adding additional object classes or adding more attributes therefore marking it as a different flavor of original S-57. By setting this keyword to either `Default`, `Additional_Military_Layers` or `Inland_Waterways` the reader can then process the schema accordingly. By default, this keyword is set to `Default` which means the dataset is interpreted as the original S-57.

For example:

```
Generate S57 NULL "<source dataset>" "<mapping file name>" ----
Source_PROFILE_IN "Inland_Waterways"
```

---

**Note:** PROFILE\_IN is the macro to use to set the value for the keyword PROFILE.

---

**Workbench Parameter:** [<WorkbenchParameter>](#)

## Feature Representation

Normally, all features read from S-57 are assigned a feature type based on the name of the object class (OBJL) to which they belong. For instance, with an OBJL value of 2, the feature is an Airport/airfield and has a short name of AIRARE which is used as the FME feature type. A typical S-57 transfer may have in excess of 100 feature types.

Each feature type has a predefined set of attributes as defined by the S-57 standard. For instance, the airport (AIRARE) object class can have the AIRARE, CATAIR, CONDTN, CONVIS, NOBJNM, OBJNAM, STATUS, INFORM, NINFOM, NTXTDS, PICREP, SCAMAX, SCAMIN, TXTDSC, RECDAT, RECIND, SORDAT, and SORIND attributes. These short names can be related to longer, more meaningful names using an S-57 object/attribute catalog, such as the S-57 standard document itself or the files in the `fme/s57` directory. Such a catalog can also be used to establish all available object classes and their attributes.

In addition to the generic FME feature attributes that FME Workbench adds to all features (see *About Feature Attributes* on page 7) the following common attributes are also added – these include generic attributes that appear on all features, regardless of whether object class is turned on.

Attribute Name	Description	Defined On
s57_type	Geometry type of this feature. One of the S57_point, s57_point3d, s57_line, s57_polygon or s57_no_geom files. Note that this relates closely to the S-57 PRIM field.	All features
COLOUR	FME will interpret the color value and set the <code>fme_color</code> attribute. COLOUR is a list type attribute (i.e. the value may be "2,6,2"). FME will select the first color value in the list as the default color for the feature.	Some features
GRUP	Group number	All features
OBJL	Object label code This number indicates the object class of the features.	All features
RVER	Record Version	All features
AGEN	Numeric agency code, such as 50 for the Canadian Hydrographic Service. A potentially outdated list is available in <code>\$FMEHOME/s57/agencode.txt</code> .	All features
FIDN	Feature identification number	All features
FIDS	Feature identification subdivision	All features

Attribute Name	Description	Defined On
LNAM	Long name. An encoding of AGEN, FIDN, and FIDS used to uniquely identify these features within an S-57 file.	All features
LNAM_REFS{ }	List of LNAM values of other features related to this feature.	Some features
DSNM	Dataset name. The file name where the feature came from. Used with LNAM to form a unique dataset wide identifier for a feature.	All features
INFORM	Informational text	Some features
NINFOM	Informational text in national language	Some features
OBJNAM	Object name	Some features
NOBJNM	Object name in national language	Some features
SCAMAX	Maximum scale for display	Some features
SCAMIN	Minimum scale for display	Some features
SORDAT	Source date	Some features

The S-57 reader also depends on CSV text files with definitions of S-57 object classes, and their attributes. These are located in the files `s57attributes.csv`, `s57objectclasses.csv`, and `s57expectedinput.csv`. These CSV files are installed in `$FME_HOME/s57`. If, for some reason, they aren't found, the reader will default to reading all objects using the `FORCE_GENERIC ON` schema.

The S-57 ENC format supports "list" attributes. FME represents list attributes as a comma-separated list for the attribute value. For example, `COLOUR` is a list type attribute and may have a value `"2,6,2"`.

## Soundings

Depth soundings are handled somewhat specially in the S-57 format to efficiently represent the many available data points. In S-57, one sounding feature can have many sounding points. The FME S-57 reader splits each of these out into its own feature type, `SOUNDG` feature, with an `s57_type` of `s57_point3d`. All soundings from a single feature record have the same `AGEN`, `FIDN`, `FIDS`, and `LNAM` values.

## Feature Relationships (LNAM)

The S-57 format has a concept of features being related to one another by way of the `LNAM` subfield of the `FFPT` (Feature to Feature Object Pointer) field. These relationships are encoded in the `LNAM_REFS{ }` list attribute of FME features when such relationships exist.

In the S-57 format, these relationships are marked as being *master*, *slave*, or *peer-to-peer*. In practice, though, the only values that exist are *master-to-slave* pointers, so the explicit relationship is not preserved.

Each feature is also tagged with an LNAM value, which is the unique identifier for the feature within a single file. The FME ReferenceFactory can be used to associate the geometry of slave features with their master as shown in this example.

```

#=====
# Collect geometries for C_AGGR objects.

FACTORY_DEF * TeeFactory \
FACTORY_NAME AggrGeomDuplicate \
INPUT FEATURE_TYPE * s57_type s57_point \
INPUT FEATURE_TYPE * s57_type s57_line \
INPUT FEATURE_TYPE * s57_type s57_polygon \
OUTPUT FEATURE_TYPE * \
OUTPUT FEATURE_TYPE GeomSource \
@KeepAttributes(LNAM,DSNM)

FACTORY_DEF * ReferenceFactory \
FACTORY_NAME AggrCollector \
INPUT REFERENCEE FEATURE_TYPE GeomSource \
INPUT REFERENCER FEATURE_TYPE C_AGGR \
REFERENCEE_FIELDS LNAM \
REFERENCER_FIELDS LNAM_REFS{} \
REFERENCE_INFO GEOMETRY \
GROUP_BY DSNM \
AGGREGATE_ONLY \
OUTPUT COMPLETE FEATURE_TYPE * \
OUTPUT INCOMPLETE FEATURE_TYPE *

```

