

Datatype Changes in SAGUARO v1.3

Datatypes

The types of datasets that SAGUARO supports have been changed in SAGUARO v1.3. These changes are intended to increase flexibility and make the SAGUARO programming experience easier. In most cases only the header section of each dataset file has changed. However, some of the old datatypes have been merged, and two new datatypes (Coordinates and Vectormap) have been introduced. The following datatypes now exist in SAGUARO.

NOTE 1: All datatypes now use \$ instead of % for identifying header fields. Old SAGUARO dataset files will need to be updated. This can be done by opening them in a text editor (e.g. Notepad) and replacing any % characters at the start of each line near the top of the file with \$.

NOTE 2: The header fields have been changed for most datatypes. Existing datasets will need to be modified as described in the details section below.

Summary

- ✧ **Map:** Header has been changed. X, Y and Z unit fields added. Half Width replaced with X and Y Size. Data may be non-square.
- ✧ **FreqMap:** Similar to Map. Max Frequency replaced with X and Y Max Frequency.
- ✧ **Zernike:** ZernikeAnnular and ZernikeStd have been merged. Units have been added.
- ✧ **Mask:** Mask uses 1 and NaN, not 1 and 0.
- ✧ **Coordinates:** XYZ and Profile are now Coordinates. Added support for units and custom column labels. Arbitrary number of columns supported.
- ✧ **Vectormap:** New datatype intended to store data such as slopes. Several maps stored as layers.
- ✧ **General:** No changes.

Details

Map

The old header:	The new header:
%Date Created=08/20/11 1:14 PM %Half Width (mm)=910 %Data Points=177	\$Date Created=08/20/11 1:14 PM \$X size=1820 \$Y size=1820 \$X unit=mm \$Y unit=mm \$Z unit=mm

The “Half Width (mm)” field has been replaced by “X size” and “Y size” fields so that the Map dataset can store non-square map data. These fields are defined as the FULL width of the map,

from the outer edge of the pixels on one side to the outer edge of the pixels on the other side.

Previously all the units in the map were assumed to be millimeters. The units must now be explicitly specified using the “X unit”, “Y unit”, and “Z unit” fields, but they can be set to any desired units. The new UnitConvert module can be used to change the data from one unit to another. When importing data using GenDataConvert, GenDataConvert will ask the user for the units of the dataset.

The “Data Points” field, which formerly defined the size of the map in pixels (across and down), has been removed. Instead, SAGUARO now determines the number of pixels in the map directly from the data. This change was made to remove the risk of incorrect values in the “Data Points” field.

FreqMap

The old header:	The new header:
<pre>%Date Created=08/20/11 3:03 PM %Max Frequency (1/mm)=0.048626 %Data Points=177</pre>	<pre>\$Date Created=08/20/11 3:03 PM \$X Max Frequency=0.048626 \$Y Max Frequency=0.048626 \$X unit=1/mm \$Y unit=1/mm \$Z unit=mm</pre>

FreqMap has been redefined in the same fashion as Map. See the Map datatype above for details. The X and Y maximum frequencies are now specified separately, and they can use units other than 1/mm.

Zernike

The old ZernikeStd header:	The new Zernike header:
<pre>%Date Created=08/20/11 5:03 PM %Radius (mm)=910 %Terms=11</pre> <p>The old ZernikeAnnular header:</p> <pre>%Date Created=08/20/11 5:03 PM %Radius (mm)=910 %Terms=11 %Obscuration Ratio=0.24884</pre>	<pre>\$Date Created=08/20/11 5:03 PM \$Radius=910 \$Radius unit=mm \$Height unit=mm \$Obscuration Ratio=0</pre>

The ZenikeStd and ZernikeAnnular datatypes have been merged into a single new datatype: Zernike. This new datatype provides more information in the header, including separate units for the radius and the height. The number of Zernike terms, previously specified in the “Terms” field, is now determined directly from the data in the file.

To convert an existing ZenikeStd and ZernikeAnnular datatype to the new Zernike datatype, first modify the header fields appropriately using a text editor such as Notepad. Then change the extension on the filename from “.zernikestd” or “.zernikeannular” to “.zernike”. For example, if the old file was called “Data3.zernikestd”, rename it to “Data3.zernike”.

Mask

The old header:	The new header:
<code>%Date Created=08/20/11 4:24 PM %Data Points=421</code>	<code>\$Date Created=08/20/11 4:24 PM</code>

Mask datatypes are now defined as pixel-wise masks. Each value in the mask data is either 1 (“not masked”) or NaN (“masked”). The old value of 0 for “masked” is deprecated: although masks containing zeros will still be handled correctly by v1.3 of SAGUARO, future versions may require masks to use 1 and NaN only. Any new masks created by SAGUARO will use NaN.

Coordinates

The old XYZ header:	The new Coordinates header:
<code>%Date Created=08/20/11 12:48 PM %Data Points=6991</code> <code>The old Profile header:</code> <code>%Date Created=08/20/11 2:38 PM %Length (mm)=682.2651 %Data Points=66</code>	<code>\$Date Created=08/20/11 12:48 PM \$Column unit=mm, mm, mm \$Column Label=X, Y, Z</code>

The XYZ and Profile datatypes have been merged into a new datatype: Coordinates. The Coordinates datatype is designed for storing data organized into tuples (ordered pairs, triplets, etc.) consisting of an arbitrary number of fields (or columns). The dataset header defines the units and a label for each column. These are stored as a comma separated list.

Converting old Profile datasets to the new Coordinates datatype will require several steps. The new Coordinates dataset will contain two columns of data. The first column, labeled “X”, will be the positions along the length of the optic where the profile was sampled. The second column, labeled “Z”, will be the height of the profile at each point. First, edit the file using a text editor and reformat the existing array of data into a single column of numbers. This will become the second column. Then, using the “Length (mm)” field and the “Data Points” field as a guide, calculate the position of each point and enter these values in the first column of the data. Finally, update the header fields and change the extension of the file from “.profile” to “.coordinates”. An example is shown below:

The old Profile file “FlatB.profile”:	The new Coordinates file “FlatB.coordinates”:
<code>%Date Created=08/20/11 2:38 PM %Length (mm)=682.2651 %Data Points=66</code> <code>-0.000132 -0.000750 -0.001624 -0.002429 ... -0.001248 -0.000765</code>	<code>\$Date Created=08/20/11 12:48 PM \$Column unit=mm, mm \$Column Label=X, Z</code> <code>0.000000 -0.000132 10.496386 -0.000750 20.992772 -0.001624 31.489158 -0.002429 ... 671.768714 -0.001248 682.265100 -0.000765</code>

The format of the data in old XYZ datatype files is already identical to the format of the data in the Coordinates datatype, so it is only necessary to update the header (typically specifying “X”, “Y” and

“Z” as the labels for the three columns of data), and to change the extension of the file from “.xyz” to “.coordinates”.

Vectormap

	<p>The new Vectormap datatype:</p> <pre>\$Date Created=08/20/11 12:56 PM \$X size=100 \$Y size=100 \$X unit=mm \$Y unit=mm \$Layer unit=mm, mm \$Layer Label=X slope, Y slope NaN 1 NaN 1 2 3 NaN 1 NaN NaN 1 NaN 1 2 3 NaN 1 NaN</pre>
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A Vectormap is a new datatype that essentially consists of an arbitrary number of maps, called layers. Vectormaps can be used for storing slope data by placing one component of the slope in each layer. The names of the layers are specified in the header field “Layer Label”. See the Map datatype above for more details about the other fields in the header.

General

<p>The typical General datatype format:</p> <pre>Comment 1.0 2.0 3.0 4.0</pre>	
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The General datatype is unchanged and has the same functionality as in previous versions of SAGUARO.