CONVERTING EUVE DATA PRODUCTS TO FITS FORMAT

Users who come to the EGO Center to reduce their data may have new data products to transport when they leave. To convert most IRAF data products to FITS format, the general rule is: IRAF image ⇒ basic FITS file and ST table ⇒ FITS file with binary table extension. Many GO's like to transport the new FITS files directly to their home machines via *ftp*, and make a tape copy to take with them as backup. QPOE files may be *tar*'ed directly onto tape if you are going to read them back on a `SUN` Sparcstation with the same binary encoding conventions. Otherwise, it is possible to create FITS files from EUVE QPOE files, using a special task which first packs the QPOE into a number of ST tables. We will deal with the more general cases first.

6.1 Creating FITS Files with STWFITS

The EGO Center recommends using only **fitsio.stwfits** to convert any new IRAF images or ST tables, to FITS files before putting them on tape. A sample parameter file for **stwfits** is shown below in figure 6-1. Some of the parameters should be changed from their default values to write a table to a binary extension. Read the help page for more details on the parameter options.

Notes on running **stwfits**

- To convert ordinary IRAF images (as opposed to GEIS or STF images) to FITS, supply the *.imh* extension with the header file name. Likewise, supply the *.tab* extension when converting ST tables.
- `format_file` is an option to customize what appears on `STDOUT` as the task runs, by pointing at file of user-defined ouput. It has no effect on the format of the output FITS file.
- Letting `bitpix` equal zero (the default) causes the task to take the data type from the type of the input.
- The `extensions` and `binary_tables` parameters should be set to "yes" for translating ST tables to binary-encoded table extensions with full precision. `binary_tables` should be set to "no" for converting images.
- The parameter `gftoxdim` is used only for translating certain Space Telescope data formats, and should be turned off (not the default) for converting EUVE data files.

```
ta> lpar stwfits

   iraf_files = mw_mygt.tab     IRAF image
   fits_files = mw_mygt.FITS    FITS filename
      newtape =                 Blank tape?
 (long_header = no)             Print FITS header cards?
(short_header = yes)            Print short header?
 (format_file = "default")      Format filename
    (log_file = "none")         Log filename
      (bitpix = 0)              IRAF data type
(blocking_fac = 1)              FITS tape blocking factor
  (extensions = yes)            Allow FITS extensions in the same file?
(binary_table = yes)            Binary FITS tables?
    (gftoxdim = no)             Multigroup to xtra dimension?
        (ieee = yes)            Convert to ieee standard?
       (scale = yes)            Scale data?
   (autoscale = yes)            Auto_scaling?
      (bscale = 1.)             FITS bscale
       (bzero = 0.)             FITS bzero
    (dadsfile = "null")         Internal use.
    (dadsclas = "null")         Internal use.
    (dadsdate = "null")         Internal use.
        (mode = "ql")
```

Figure 6-1: Sample parameter file for **stwfits**. The task is set to write a good times table to tape in a FITS file with a binary table extension.

- ☐ EUVE ST tables use the **IEEE** floating point format, so `ieee` should be "yes" (the default).

Running **stwfits** by typing `:go` from **eparam** with the above parameters is equivalent to typing:

```
fi> stwfits mw_mygt.tab mw_mygt.FITS no exten+ binary+ gftoxd-
```

6.2 QPWST converts QPOE files to sets of ST tables

Users who create new QPOE files at some remote site, like the EGO Center, may wish to transport them between different machines in a portable format. EUVE QPOE files can be converted to FITS files using the two tasks **euvtools.qpwst** and **fitsio.stwfits** in the **tables** packages. The same process in reverse was used to create the FITS-encoded QPOE files on your data tape, and it generally ensures that QPOE files you create will be usable when transported to another system [1].

[1] GO's with DEC computers, such as VAX, should take care to follow the special instructions for unpacking FITS'd QPOE files in VMS systems. See section 0.3.2 of the *EGO Center Data Products Guide*.

The conversion from QPOE files to FITS files is a two-stage process. First, each QPOE file is converted to a standard set of ST tables using the IRAF/EUV task **qpwst**. A sample parameter file is shown below in figure 6-2.

```
eu> lpar qpwst


  qpfilename = "newsw.qp"      input QP filename
      tabdir = "/tmp1/drego1/" directory to put the ST tables in
  (tabprefix = "newsw_qp_")    prefix to use on ST table filenames
   (parmtable = "pars")         Name of table to contain QP parameters
    (verbose = yes)            Verbose processing information
       (mode = "al")
```

Figure 6-2: Sample parameter file for **qpwst**, to convert a QPOE file into ST tables in the directory */tmp1/drego1/*.

Alternatively, convert the new short wavelength QPOE to a set of ST tables in the directory */tmp1/drego1/*, from the command line by typing:

```
eu> qpwst sw.qp /tmp1/drego1/ newsw_qp_pars
```

Notes on running **qpwst**

- Make sure the output directory specified by `tabdir` has more than enough room for the QPOE file. We have used a temporary location in the example. IRAF requires the trailing slash for directory locations.
- The parameter file is quite simple, and the task itself specifies all the table names, using the prefix specified by `tabprefix`. To distinguish new QPOE's don't use a prefix like "sw" that is used elsewhere on the data tape.
- The parameter `parmtable` names a table where the task writes the QPOE file's internal parameters. The user needs to supply the `parmtable` value later, when unpacking the QPOE file in IRAF.

The list of ST tables resulting from the parameters in figure 6-2 would be:

```
newsw_qp_pars.tab       newsw_qp_lambda.tab      newsw_qp_modtime.tab
newsw_qp_EQUINOX.tab    newsw_qp_dc_flag.tab     newsw_qp_naxes.tab
newsw_qp_INSTRUME.tab   newsw_qp_defattr1.tab    newsw_qp_qpwcs.tab
newsw_qp_OBSERVAT.tab   newsw_qp_dispaxis.tab    newsw_qp_sw_adct.tab
newsw_qp_TELESCOP.tab   newsw_qp_dx.tab          newsw_qp_mysw_gt.tab
newsw_qp_axlen.tab      newsw_qp_dy.tab          newsw_qp_theta.tab
newsw_qp_cretime.tab    newsw_qp_earth.tab       newsw_qp_time.tab
newsw_qp_datamax.tab    newsw_qp_events.tab      newsw_qp_x.tab
newsw_qp_datamin.tab    newsw_qp_limtime.tab     newsw_qp_y.tab
```

You may want to compare this list to the one produced by **strfits** from an EUVE QPOE FITS file, shown in section 0.3.2 of the *EGO Center Data Products Guide*.

The table *newsw_qp_events.tab* contains the event data, while other tables contain various parameters that are stored in areas of the QPOE called the header and symbol table. You will recognize many of these from the listings produced by **imhead**. In addition, each macro contained in the QPOE file is transformed into a separate table. The tables *newsw_qp_(time,x,y).tab*, *newsw_qp_sw_gt.tab*, and several others are made from the standard EUVE QPOE file macros. For instance the list above implies that the person who created *newsw.qp* chose to insert the EGO Center macros `earth` and `sw_adct`, in addition to a (user-defined) `mysw_gt`.

The second step is to convert the set of ST tables to a single FITS file, with **fitsio.stwfits**. It may be helpful to move the ST tables into their own directory with an obvious name, like *newsw_qp_tables* first. Each table will be attached to the file as a separate binary table extension.

Notes on making FITS files from **qpwst**tables

- All the ST tables should be selected by running **stwfits** with the value of `iraf_files` equal to "`tabprefix*.tab`".
- The parameter `fits_files` should contain the original name of the QPOE file, as in "newsw_qp.FITS." File extensions will be shortened to three characters.
- Set the parameter `extensions` to "yes", to pack all the tables as extensions to a single file.
- Other parameters may be set as in the example in figure 6-1.

The resulting FITS table contains an empty image and one binary table extension for each of the ST tables. It will be slightly larger than the QPOE file.