

# Octave CFITSIO Toolkit 0.0.6

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FITS file functionality for GNU Octave.

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To download a copy of the GNU Octave CFITSIO package, please visit <https://gnu-octave.github.io/octave-cfitsio//index>.

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# 1 Installing and loading

The GNU Octave CFITSIO toolkit must be installed and then loaded to be used.

It can be installed in GNU Octave directly from octave-cfitsio, or can be installed in an off-line mode via a downloaded tarball.

The toolkit has a dependency on the cfitsio library (<https://heasarc.gsfc.nasa.gov/fitsio/>), so it must be installed in order to successfully install the GNU Octave toolkit.

For Fedora: `yum install cfitsio-devel`

The toolkit must be then be loaded once per each GNU Octave session in order to use its functionality.

## 1.1 Windows install

If running in Windows, the package may already be installed, to check run:

```
pkg list cfitsio
```

Otherwise it can be installed by installing the requirements and then using the online or offline install method.

## 1.2 Online Direct install

With an internet connection available, the package can be installed from octave-cfitsio using the following command within GNU Octave:

```
pkg install https://sourceforge.net/projects/octave-cfitsio/files/v0.0.6/octave-cfitsio-
```

On GNU Octave 7 and higher, the package can be installed in the simpler form of:

```
pkg install -forge cfitsio
```

The latest released version of the toolkit will be downloaded and installed.

## 1.3 Off-line install

With the toolkit package already downloaded, and in the current directory when running GNU Octave, the package can be installed using the following command within GNU Octave:

```
pkg install octave-cfitsio-0.0.6.tar.gz
```

## 1.4 Loading

Regardless of the method of installing the toolkit, in order to use its functions the toolkit must be loaded using the pkg load command:

```
pkg load cfitsio
```

The toolkit must be loaded on each GNU Octave session.

## 2 Basic Usage Overview

### 2.1 Overview

The octave-cfitsio toolkit provides high and low level functionality for reading and writing FITS format files.

The high level functions provide base read and write of data to octave.

The low level functions almost direct access to the cfitsio API and are provided under the matlab.io.fits namespace.

Since GNU Octave does not support the matlab import command, a import\_fits function is provided.

Running the statement:

```
import_fits
```

Is the equivalent of running in matlab:

```
import matlab.io.fits;
```

### 2.2 Using the toolkit

The package must be loaded each time a GNU Octave session is started:

```
pkg load cfitsio
```

After loading the toolkit, the toolkit functions are available.

#### 2.2.1 Reading Data

To read the primary image data of a fits file, use the fitsread function:

```
imagedata = fitsread("thefitsfile.fits");
```

#### 2.2.2 Reading Information

To read information about the content in a fits file, use the fitsinfo functions.

```
info = fitsinfo("thefitsfile.fits");
```

#### 2.2.3 Low level functionality

Where functionality is required that is not met by the high level functions, most of the cfitsio functions are available in the matlab.io.fits namespace.

```
# import the fits functions so don't have to use the full namespace each time
import_fits;

# open the file
fd = fits.openFile('tst0012.fits');

# get number of hdus in the file
n = fits.getNumHDUs (fd);

# for each hdu, go to it, print out the type
for j = 1:n
    hdutype = fits.movAbsHDU (fd, j);
    printf ('HDU %d:  "%s"\n', j, hdutype);
endfor

# close the file
fits.closeFile (fd);
```



## 3 Function Reference

The functions currently available in the toolkit are described below:

### 3.1 High Level File Functions

#### 3.1.1 fitsdisp

```
info = fitsdisp(filename)
info = fitsdisp(filename, propertyname, propertyvalue)
```

Display metadata about fits format file

##### Inputs

*filename* - filename to open.

*propertyname*, *propertyvalue* - property name/value pairs

Known property names are:

'Index'      Value is a scalar or vector of hdu numbers to display

'Mode'      display mode of 'standard' (default), 'min' or 'full'

'standard' display mode shows the standard keywords for the selected HDUs.

'min' display mode shows only the type and size of the selected HDUs.

'full' display shows all keywords for the selected HDU.

##### Outputs

*info* - the metadata of the file. If no output variable is provided, it displays to the screen.

##### Examples

```
filename = file_in_loadpath("demos/tst0012.fits");

fitsdisp(filename);
```

#### 3.1.2 fitsinfo

```
info = fitsinfo(filename)
```

Read information about fits format file

##### Inputs

*filename* - filename to open.

##### Outputs

*info* - a struct containing the structure and information about the fits file.

##### Examples

```
filename = file_in_loadpath("demos/tst0012.fits");

info = fitsinfo(filename);
```

### 3.1.3 fitsread

```
data = fitsread(filename)
data = fitsread(filename, 'raw')
data = fitsread(filename, extname)
data = fitsread(filename, extname, index)
data = fitsread(filename, ____, propertyname, propertyvalue)
```

Read the primary data, or specified extension data. It scales the data and applied Nan to any undefined values.

#### Inputs

*filename* - filename to open.

*exttype* - can be 'primary', 'asciitable', 'binarytable', 'image', 'unknown'.

*index* - can be used to specify which table when more than one of a given type exists.

'raw'- If the 'raw' keyword is used, the raw data from the file will be used without replacing undefined values with Nan

Known property names are:

Info            input info from fitsinfo call.

PixelRegion

pixel region to extract data for in an image. It expects a cell array of same size as the number of axis in the image. Each cell should be in vector format of: start, [start stop] or [start, increment, stop].

TableColumns

A list of columns to extract from a ascii or binary table.

TableRows

A list of rows to extract from an ascii or binary table.

#### Outputs

*data* - The read data from the table or image.

#### Examples

```
filename = file_in_loadpath("demos/tst0012.fits");

# read the primary image data
imagedata = fitsread(filename);

# read the 1st non primary image
imagedata = fitsread(filename, "image");

# read the first binary table, selected columns
tbldata = fitsread(filename, "binarytable", "TableColumns", [1 2 11]);

# read the first ascii table
atbldata = fitsread(filename, "asciitable");
```

### 3.1.4 fitswrite

```
fitswrite(data, filename)
fitswrite(data, filename, propertyname, propertyvalue)
```

Write image data *data* to FITS file *filename*. If the file already exists, overwrite it.

## Inputs

*data* - imagedata to write to a file.

*filename* - filename to write to.

*propertyname*, *propertyvalue* - property name/value pairs

Additional properties can be set as *propertyname*, *propertyvalue* pairs. Known property names are:

WriteMode

Set mode for writing to image as 'overwrite' (default) or 'append' to append images.

Compression

Set compression type to use for image as 'none' (default), 'gzip', 'rice', 'hcompress' or 'plio'.

## Outputs

None

## Examples

```
filename = tempname();
X = double([1:3;4:6]);
fitswrite(X, filename);
```

## 3.2 Low Level File Functions

### 3.2.1 matlab.io.fits.closeFile

`closeFile(file)`

Close the opened fits file

This is the equivalent of the `fits_close_file` function.

## Inputs

*file* - opened file returned from `openFile` or `createFile`.

## Outputs

None

## Examples

```
import_fits;
filename = file_in_loadpath("demos/tst0012.fits")

fd = fits.openFile(filename);
fits.closeFile(fd);
```

**See also:** `matlab.io.fits.createFile`, `matlab.io.fits.openFile`.

### 3.2.2 matlab.io.fits.createFile

`file = createFile(filename)`

Attempt to create a file of the given input name.

If the filename starts with ! and the file exists, it will create a new file, otherwise, if the file exists, the create will fail.

This is the equivalent of the `cfitsio fits_create_file` function.

### Inputs

*filename* - filename to open.

### Outputs

*file* - opened file identifier.

### Examples

```
import_fits;

fd = fits.createFile("myfitsfile.fits");
fits.createImg(fd, 'uint16', [100 100]);
fits.closeFile(fd);
```

See also: `matlab.io.fits.openFile`.

## 3.2.3 `matlab.io.fits.deleteFile`

`deleteFile(file)`

Force a close and delete of a fits file.

This is the equivalent of the `fits_delete_file` function.

### Inputs

*file* - opened fits file.

### Outputs

None

## 3.2.4 `matlab.io.fits.fileMode`

`mode = fileMode(file)`

Return the file mode of the opened fits file.

This is the equivalent of the `fits_file_mode` function.

### Inputs

*file* - opened fits file.

### Outputs

*mode* - The mode will return as a string 'READWRITE' or 'READONLY'

## 3.2.5 `matlab.io.fits.fileName`

`filename = fileName(file)`

Return the file name of the opened fits file.

This is the equivalent of the `fits_file_name` function.

### Inputs

*file* - opened fits file.

### Outputs

*filename* - name of the fits file.

### 3.2.6 matlab.io.fits.openDiskFile

```
file = openDiskFile(filename)  
file = openDiskFile(filename, mode)
```

Attempt to open a file of the given input name, ignoring any special processing of the filename.

This is the equivalent of the cfitsio fits\_open\_diskfile function.

#### Inputs

*filename* - filename to open.

*mode* - If the option mode string 'READONLY' (default) or 'READWRITE' is provided, open the file using that mode.

#### Outputs

*file* - opened file identifier.

#### Examples

```
import_fits;  
filename = file_in_loadpath("demos/tst0012.fits")  
  
fd = fits.openDiskFile(filename, 'READONLY');  
fits.closeFile(fd);
```

See also: openFile, createFile.

### 3.2.7 matlab.io.fits.openFile

```
file = openFile(filename)  
file = openFile(filename, mode)
```

Attempt to open a file of the given input name.

This is the equivalent of the cfitsio fits\_open\_file function.

#### Inputs

*filename* - filename to open.

*mode* - If the option mode string 'READONLY' (default) or 'READWRITE' is provided, open the file using that mode.

#### Outputs

*file* - opened file identifier.

#### Examples

```
import_fits;  
filename = file_in_loadpath("demos/tst0012.fits")  
  
fd = fits.openFile(filename, 'READONLY');  
fits.closeFile(fd);
```

See also: matlab.io.fits.openDiskFile, matlab.io.fits.createFile.

## 3.3 Low Level HDU Functions

### 3.3.1 matlab.io.fits.copyHDU

`copyHDU(infile, outfile)`

Copy current HDU from one infile to another.

This is the equivalent of the cfitsio `fits_copy_hdu` function.

#### Inputs

*filename* - filename to open.

#### Outputs

*infile* - opened input file identifier.

*outfile* - opened output file identifier.

#### Examples

```
import_fits;

# open input and output files
infilename = file_in_loadpath("demos/tst0012.fits");
infile = fits.openFile(infilename);

outfile = fits.createFile("myfitsfile.fits");
# copy first hdu
fits.copyHDU(infile, outfile);
# move to and then copy 2nd hdu
fits.movAbsHDU(infile,2);
fits.copyHDU(infile, outfile);

# close files
fits.closeFile(infile);
fits.closeFile(outfile);
```

### 3.3.2 matlab.io.fits.deleteHDU

`type = deleteHDU(file)`

Delete the current HDU and go to next HDU.

Returns the newly current HDU type as a string.

This is the equivalent of the cfitsio `fits_delete_hdu` function.

#### Inputs

*file* - opened fits file.

#### Outputs

*type* - string value for type of the next HDU.

### 3.3.3 matlab.io.fits.getHDU num

`num = getHDU num(file)`

Return the index of the current HDU.

This is the equivalent of the cfitsio `fits_get_hdu_num` function.

#### Inputs

*file* - opened fits file.

## Outputs

*num* - current hdu number.

### 3.3.4 matlab.io.fits.getHDUoff

```
[headtstart, datastart, dataend] = getHDUoff(file)
```

Return offsets of the current HDU.

This is the equivalent of the cfitsio fits\_get\_hduoff function.

## Inputs

*file* - opened fits file.

## Outputs

*headtstart, datastart, dataend* - offset information for the current HDU.

### 3.3.5 matlab.io.fits.getHDUtype

```
type = getHDUtype(file)
```

Return the current HDUs type as a string.

This is the equivalent of the cfitsio fits\_get\_hdu\_type function.

## Inputs

*file* - opened fits file.

## Outputs

*type* - current hdu type

### 3.3.6 matlab.io.fits.getNumHDUs

```
num = getNumHDUs(file)
```

Return the count of HDUs in the file.

This is the equivalent of the cfitsio fits\_get\_num\_hdus function.

## Inputs

*file* - opened fits file.

## Outputs

*num* - return the number of HDUs in the file.

## Examples

```
import_fits;
testname = file_in_loadpath("demos/tst0012.fits");
fd = fits.openFile(testname);
hducount = getNumHDUs(fd), 5);
fits.closeFile(fd);
```

### 3.3.7 matlab.io.fits.movAbsHDU

```
type = movAbsHDU(file, hdunum)
```

Go to absolute HDU index *hdunum*

Returns the newly current HDU type as a string.

This is the equivalent of the cfitsio fits\_movabs\_hdu function.

**Inputs**

*file* - opened fits file.

*hdunum* - HDU number to move to.

**Outputs**

*type* - hdu type of the now current HDU.

**3.3.8 matlab.io.fits.movNamHDU**

*hdutype* = movNamHDU(*file*, *hdutype*, *extname*, *extver*)

Go to HDU matching *hdutype*, *extname*, *extver*.

This is the equivalent of the cfitsio fits\_movnam\_hdu function.

**Inputs**

*file* - opened fits file.

*hdutype* - HDU number to move to. Valid *hdutype* values are 'IMAGE\_HDU', 'ASCII\_TBL', 'BINARY\_TBL', 'ANY\_HDU'.

*extname*, *extver* - EXTNAME and EXTVER keywords to match.

**Outputs**

*hdutype* - hdu type of the now current HDU.

**3.3.9 matlab.io.fits.movRelHDU**

*type* = movRelHDU(*file*, *hdunum*)

Go to relative HDU index *hdunum*.

Returns the newly current HDU type as a string.

This is the equivalent of the cfitsio fits\_movrel\_hdu function.

**Inputs**

*file* - opened fits file.

*hdunum* - relative HDU number to move to.

**Outputs**

*type* - hdu type of the now current HDU.

**3.3.10 matlab.io.fits.writeChecksum**

writeChecksum(*file*)

Recalculate the HDU checksum and if required, write the new value.

This is the equivalent of the cfitsio fits\_write\_chksum function.

**Inputs**

*file* - opened fits file.

**Outputs**

None



## 3.4 Low Level Keyword Functions

### 3.4.1 matlab.io.fits.deleteKey

`deleteKey(file, key)`

Delete a key in the fits file.

This is the equivalent of the cfitsio `fits_delete_key` function.

#### Inputs

*file* - opened fits file.

*key* - Key name to remove.

#### Outputs

None

### 3.4.2 matlab.io.fits.deleteRecord

`deleteRecord(file, keynum)`

Delete a key in the fits file.

This is the equivalent of the cfitsio `fits_delete_record` function.

#### Inputs

*file* - opened fits file.

*keynum* - Record number to remove.

#### Outputs

None

### 3.4.3 matlab.io.fits.getHdrSpace

`[numkeys, freekeys] = getHdrSpace(file)`

Get the number of keyword records used and available.

This is the equivalent of the cfitsio `fits_get_hdrspace` function.

#### Inputs

*file* - opened fits file.

#### Outputs

*numkeys* - number of existing keys.

*freekeys* - number of free key space.

### 3.4.4 matlab.io.fits.readCard

`card = readCard(file, recname)`

Read the keyword card for name *recname*

This is the equivalent of the cfitsio `fits_read_card` function.

#### Inputs

*file* - opened fits file.

*recname* - record name to read

## Outputs

*card* - unparsed record value string

### 3.4.5 matlab.io.fits.readKey

`[keyvalue, keycomment] = readKey(file, recname)`

Read the keyword value and comment for name *recname*.

This is the equivalent of the cfitsio `fits_read_key_str` function.

## Inputs

*file* - opened fits file.

*recname* - keyword name.

## Outputs

*keyvalue* - string value of record.

*keycomment* - comment string

### 3.4.6 matlab.io.fits.readKeyCmplx

`[value, comment] = readKeyCmplx(file, recname)`

Read the key value *recname* as a complex double.

This is the equivalent of the cfitsio `fits_read_key_dblcmp` function.

## Inputs

*file* - opened fits file.

*recname* - keyword name.

## Outputs

*value* - complex value of record.

*comment* - comment string

### 3.4.7 matlab.io.fits.readKeyDbl

`[value, comment] = readKeyDbl(file, recname)`

[Function File]

Read the key value *recname* as a double.

This is the equivalent of the cfitsio `fits_read_key_dbl` function.\n \

## Inputs

*file* - opened fits file.

*recname* - keyword name.

## Outputs

*value* - double value of record.

*comment* - comment string

### 3.4.8 matlab.io.fits.readKeyLongLong

`[value, comment] = readKeyLongLong(file, recname)`

Read the key value *recname* as a long long.

This is the equivalent of the cfitsio `fits_read_key_lnglng` function.

## Inputs

*file* - opened fits file.

*recname* - keyword name.

## Outputs

*value* - int64 value of record.

*comment* - comment string

### 3.4.9 matlab.io.fits.readKeyLongStr

```
[value, comment] = readKeyLongStr(file, recname)
```

Read the key value *recname* as a string.

This is the equivalent of the cfitsio fits\_read\_key\_longstr function.

## Inputs

*file* - opened fits file.

*recname* - keyword name.

## Outputs

*value* - string value of record.

*comment* - comment string

### 3.4.10 matlab.io.fits.readKeyUnit

```
keyunit = readKeyUnit(file, recname)
```

Read the physical key units value *recname*.

This is the equivalent of the cfitsio fits\_read\_key\_unit function.

## Inputs

*file* - opened fits file.

*recname* - keyword name.

## Outputs

*keyunit* - units value of record.

### 3.4.11 matlab.io.fits.readRecord

```
rec = readRecord(file, recidx)
```

Read the keyword record at *recidx*.

This is the equivalent of the cfitsio fits\_read\_record function.

## Inputs

*file* - opened fits file.

*recidx* - record number.

## Outputs

*rec* - full keyword record

### 3.4.12 matlab.io.fits.writeComment

`writeComment(file, comment)`

Append a comment to to the fits file.

This is the equivalent of the cfitsio `fits_write_comment` function.

#### Inputs

*file* - opened fits file.

*comment* - comment to append

#### Outputs

None

### 3.4.13 matlab.io.fits.writeDate

`writeDate(file)`

Write the date keyword.

This is the equivalent of the cfitsio `fits_write_date` function.

#### Inputs

*file* - opened fits file.

#### Outputs

None

### 3.4.14 matlab.io.fits.writeHistory

`writeHistory(file, history)`

Append a history to to the fits file.

This is the equivalent of the cfitsio `fits_write_history` function.

#### Inputs

*file* - opened fits file.

*history* - history string.

#### Outputs

None

### 3.4.15 matlab.io.fits.writeKey

`writeKey(file, key, value)`

`writeKey(file, key, value, comment)`

`writeKey(file, key, value, comment, decimals)`

Append or replace a key in the fits file.

This is the equivalent of the cfitsio `fits_write_key` and `fits_update_key` function.

#### Inputs

*file* - opened fits file.

*key* - keyword name.

*value* - keyword value.

*comment* - keyword comment.

*decimals* - number of decimals.

## Outputs

None

### 3.4.16 `matlab.io.fits.writeKeyUnit`

`writeKeyUnit(file, key, unit)`

Write a key unit to the fits file.

This is the equivalent of the cfitsio `fits_write_key_unit` function.

## Inputs

*file* - opened fits file.

*key* - keyword name.

*unit* - keyword units as string.

## Outputs

None

## 3.5 Low Level Image Manipulation

### 3.5.1 `matlab.io.fits.createImg`

`createImg(file, bitpix, naxis)`

create a new primary image or image extension.

This is the equivalent of the cfitsio `fits_create_imgll` function.

## Inputs

*file* - file previously opened with `openFile`, `openDiskFile` or `createFile`.

*bitpix* - type for the data as a string in either matlab or cfitsio naming.

*naxis* - axis values for the image.

## Outputs

None

## Examples

```
import_fits;
fd = fits.createFile("test.fits");
fits.createImg(fd,'int16',[10 20]);
fits.close(fd);
```

### 3.5.2 `matlab.io.fits.getImgSize`

`size = getImgSize(file)`

Return size of a Image HDU.

This is the equivalent of the cfitsio `fits_get_img_size` function.

## Inputs

*file* - opened fits file.

## Outputs

*size* - vector containing the image dimensions.

### 3.5.3 matlab.io.fits.getImgType

`type = getImgType(file)`

Return datatype of a Image HDU

This is the equivalent of the cfitsio `fits_get_img_type` function.

#### Inputs

*file* - opened fits file.

#### Outputs

*type* - datatype as a string for the image type.

### 3.5.4 matlab.io.fits.insertImg

`insertImg(file, bitpix, naxis)`

Insert a new primary image or image extension at current HDU position.

This is the equivalent of the cfitsio `fits_insert_imgll` function.

#### Inputs

*file* - file previously opened with `openFile`, `openDiskFile` or `createFile`.

*bitpix* - type for the data as a string in either matlab or cfitsio naming.

*naxis* - axis values for the image.

#### Outputs

None

### 3.5.5 matlab.io.fits.readImg

`data = readImg(file)`

`data = readImg(file, firstpix, lastpix)`

`data = readImg(file, firstpix, lastpix, inc)`

Read Image data.

This is the equivalent of the cfitsio `fits_read_subset` function.

#### Inputs

*file* - opened fits file.

*firstpix* - first pixel coordinate

*lastpix* - last pixel coordinate

*inc* - pixel increment

#### Outputs

*data* - image data read

#### Examples

```
import_fits;
filename = file_in_loadpath("demos/tst0012.fits");
fd = fits.openFile(filename);
# read the image
imagedata = fits.readImg(fd);
# read a 70x80 part of the image
imagedata = fits.readImg(fd, [11 11],[80 90]);
fits.closeFile(fd);
```

### 3.5.6 matlab.io.fits.setBscale

`setBscale(file, bscale, bzero)`

Reset bscale and bzero to be used with reading and writing Images.

This is the equivalent of the cfitsio `fits_set_bscale` function.

#### Inputs

*file* - opened fits file.

*bscale* - bscale value

*bzero* - bzero value

#### Outputs

None

### 3.5.7 matlab.io.fits.setTscale

`setTscale(file, col, scale, zero)`

Reset scale and zero to be used with reading and writing table data.

This is the equivalent of the cfitsio `fits_set_tscale` function.

#### Inputs

*file* - opened fits file.

*col* - column number

*scale* - scale value

*zero* - zero value

#### Outputs

None

### 3.5.8 matlab.io.fits.writeImg

`writeImg(file, imagedata)`

`writeImg(file, imagedata, fpixel)`

write imagedata to a FITS file. The rows and column size must match the size of NAXIS, NAXIS etc

This is the equivalent of the cfitsio `fits_write_subset` function.

#### Inputs

*file* - opened fits file.

*imagedata* - Image data.

*fpixel* - start pixel to write from.

#### Outputs

None

#### Examples

Create a fits file and write a 10x10 image in the primary and image ext:

```
import_fits;  
fd = fits.createFile("myfitsfile.fits");
```

```

data = int16(zeros(10,10));
# primary
fits.createImg(fd,class(data), size(data));
fits.writeImg(fd,data);
# image ext
fits.createImg(fd,class(data), size(data));
fits.writeImg(fd,data);
# close file
fits.closeFile(fd);

```

## 3.6 Low Level Utility Functions

### 3.6.1 matlab.io.fits.getConstantNames

*namelist* = getConstantNames()

Return the names of all known fits constants.

#### Inputs

None

#### Outputs

*namelist* - cell array of all known fits constant names

**See also:** getConstantValue.

### 3.6.2 matlab.io.fits.getConstantValue

*value* = getConstantValue(*name*)

Return the value of a known fits constant.

#### Inputs

*name* - name of the constant to retrieve value of.

#### Outputs

*value* - value of the constant

**See also:** getConstantNames.

### 3.6.3 matlab.io.fits.getOpenFiles

*files* = getOpenFiles()

Get the file handles of all open fits files.

#### Inputs

None

#### Outputs

*files* list of opened fits file handles.

**See also:** openFile.

### 3.6.4 matlab.io.fits.getVersion

*ver* = getVersion()

Return the version number of the cfitsio library used.

This is the equivalent of the cfitsio fits\_get\_version function.



**Inputs**

*file* - opened fits file.

**Outputs**

*ver* - version

## 3.7 Low Level Compression Functions

### 3.7.1 matlab.io.fits.imgCompress

`imgCompress(infile, outfile)`

Copy HDU and image data from one infile to another, using the outfile's compression type. This is the equivalent of the cfitsio `fits_img_compress` function.

**Inputs**

*infile* - opened input fits file.

*outfile* - opened writable output fits file.

**Outputs**

None

### 3.7.2 matlab.io.fits.isCompressedImg

`comp = isCompressedImg(file)`

Return true if image is compressed.

This is the equivalent of the cfitsio `fits_is_compressed_image` function.

**Inputs**

*file* - opened fits file.

**Outputs**

*comp* - boolean for whether image is compressed or not.

### 3.7.3 matlab.io.fits.setCompressionType

`setCompressionType(file, comptype)`

Set compression type for writing FITS images.

This is the equivalent of the cfitsio `fits_set_compression_type` function.

**Inputs**

*file* - opened fits file.

*comptype* - compression type. Valid *comptype* values are: 'GZIP', 'GZIP2', 'RICE', 'PLIO', 'HCOMPRESS' or 'NOCOMPRESS'.

**Outputs**

None

### 3.7.4 matlab.io.fits.setHCompScale

`setHCompScale(file, scale)`

Set scale to be used with HCOMPRESS compression.

This is the equivalent of the cfitsio `fits_set_hcomp_scale` function.

**Inputs***file* - opened fits file.*scale* - scale value**Outputs**

None

**3.7.5 matlab.io.fits.setHCompSmooth**`setHCompSmooth(file, smooth)`

Set smooth value to be used with HCOMPRESS compression.

This is the equivalent of the cfitsio `fits_set_hcomp_smooth` function.**Inputs***file* - opened fits file.*smooth* - smooth value**Outputs**

None

**3.7.6 matlab.io.fits.setTileDim**`setTileDim(file, tiledims)`

Set compression tile dims for writing FITS images.

This is the equivalent of the cfitsio `fits_set_tile_dim` function.**Inputs***file* - opened fits file.*tiledims* - tile dimensions**Outputs**

None

**3.8 Low Level Binary and ASCII Tables****3.8.1 matlab.io.fits.createTbl**`createTbl(file, tbltype, nrows, ttype, tform)``createTbl(file, tbltype, nrows, ttype, tform, tunit)``createTbl(file, tbltype, nrows, ttype, tform, tunit, extname)`

Create a new ASCII or bintable extension.

This is the equivalent of the cfitsio `fits_create_tbl` function.**Inputs***file* - opened fits file.*tbltype* - table type 'binary' or 'ascii'.*nrows* - initial number of rows (normally 0)*ttype* - cell array of column type*tform* - cell array of column format

*tunit* - cell array of column units

*extname* - optional extension name

*ttype*, *tform*, *tunit* are expected to be the same size.

## Outputs

None

## Examples

```
import_fits;
fd = fits.createFile("test.fits");
ttype = {'Col1','Col2','Col3','Col4'};
tform = {'A9','A4','A3','A8'};
tunit = {'m','s','kg','km'};
fits.createTbl(fd,'binary',0,ttype,tform,tunit,'table-name');
fits.closeFile(fd);
```

### 3.8.2 matlab.io.fits.deleteCol

`deleteCol(file, colnum)`

Delete a column from a table.

This is the equivalent of the cfitsio `fits_delete_col` function.

## Inputs

*file* - opened fits file.

*colnum* - Column to delete from current table.

## Outputs

None

### 3.8.3 matlab.io.fits.deleteRows

`deleteRows(file, firstrow, numrows)`

Delete rows from a table.

This is the equivalent of the cfitsio `fits_delete_rows` function.

## Inputs

*file* - opened fits file.

*firstrow* - Start row to delete.

*numrows* - Number of rows to delete.

## Outputs

None

### 3.8.4 matlab.io.fits.getAColParms

```
[ttype,tbcol,tunit,tform,scale,zero,nulstr,tdisp] =
    getAColParms(file, colnum)
```

Get ASCII table parameters.

This is the equivalent of the cfitsio `fits_get_acolparms` function.

**Inputs**

*file* - opened fits file.

*colnum* - Column to retrieve.

**Outputs**

*ttype, tbcol, tunit, tform, scale, zero, nulstr, tdisp* column information in same format as provided by `fits_get_acolparms`.

**3.8.5 matlab.io.fits.getBColParms**

```
[ttype, tunit, typechar, repeat, scale, zero, nulval, tdisp] =  
    getBColParms(file, colnum)
```

Get binary table parameters.

This is the equivalent of the cfitsio `fits_get_bcolparms` function.

**Inputs**

*file* - opened fits file.

*colnum* - Column to retrieve.

**Outputs**

*ttype, tunit, typechar, repeat, scale, zero, nulval, tdisp* column information in same format as provided by `fits_get_bcolparms`.

**3.8.6 matlab.io.fits.getColName**

```
[colnum, colname] = getColName(file, template)  
[colnum, colname] = getColName(file, template, casesens)
```

Get column name.

This is the equivalent of the cfitsio `fits_get_colname` function.

**Inputs**

*file* - opened fits file.

*template* - template string for matching column name.

*casesens* - boolean whether to be case sensitive in match.

**Outputs**

*colnum* - column number of match.

*colname* - column name of match.

**Examples**

```
import_fits;  
filename = file_in_loadpath("demos/tst0012.fits");  
fd = fits.openFile(filename);  
fits.movAbsHDU(fd, 2);  
[colnum, colname] = fits.getColName(fd, "C*");  
# returned 3, "COUNTS"  
fits.closeFile(fd);
```

### 3.8.7 matlab.io.fits.getColType

```
[dtype,repeat,width] = getColType(file, colnum)
```

Get column type.

This is the equivalent of the cfitsio fits\_get\_coltypell function.

#### Inputs

*file* - opened fits file.

*colnum* - Column to delete from current table.

#### Outputs

*dtype,repeat,width* - column information.

### 3.8.8 matlab.io.fits.getEqColType

```
[dtype,repeat,width] = getEqColType(file, colnum)
```

Get column type.

This is the equivalent of the cfitsio fits\_get\_eqcoltypell function.

#### Inputs

*file* - opened fits file.

*colnum* - Column number.

#### Outputs

*dtype,repeat,width* - column type

### 3.8.9 matlab.io.fits.getNumCols

```
ncols = getNumCols(file)
```

Get number of columns.

This is the equivalent of the cfitsio fits\_get\_num\_cols function.

#### Inputs

*file* - opened fits file.

#### Outputs

*ncols* - the number of columns in the table.

### 3.8.10 matlab.io.fits.getNumRows

```
nrows = getNumRows(file)
```

Get number of rows.

This is the equivalent of the cfitsio fits\_get\_numrowsll function.

#### Inputs

*file* - opened fits file.

#### Outputs

*nrows* - the number of rows in in the current table.

### 3.8.11 matlab.io.fits.getRowSize

`nrows = getRowSize(file)`

Get optimum number of rows to read/write at one time.

This is the equivalent of the cfitsio `fits_get_rowsize` function.

#### Inputs

*file* - opened fits file.

#### Outputs

*nrows* - number of rows.

### 3.8.12 matlab.io.fits.insertATbl

`insertATbl(file, rowlen, nrows, ttype, tbc col, tform)`

`insertATbl(file, rowlen, nrows, ttype, tbc col, tform, tunit)`

`insertATbl(file, tbltype, nrows, ttype, tbc col, tform, tunit, extname)`

Insert a new ASCII table after current HDU.

This is the equivalent of the cfitsio `fits_insert_atbl` function.

#### Inputs

*file* - opened fits file.

*rowlen* - row length. If set to 0, the function will calculate size based on *tbc col* and *ttype*.

*nrows* - initial number of rows (normally 0)

*ttype* - cell array of column type

*tbc col* - array containing the start indices for each column.

*tform* - cell array of column format

*tunit* - cell array of column units

*extname* - optional extension name

#### Outputs

None

### 3.8.13 matlab.io.fits.insertBTbl

`insertBTbl(file, nrows, ttype, tform, tunit, extname, pcount)`

Insert a new bintable extension.

This is the equivalent of the cfitsio `fits_insert_btbl` function.

#### Inputs

*file* - opened fits file.

*nrows* - initial number of rows (normally 0)

*ttype* - cell array of column type

*tform* - cell array of column format

*tunit* - cell array of column units

*extname* - optional extension name

*pcount* - heap size.

*ttype*, *tform*, *tunit* are expected to be the same size.

## Outputs

None

### 3.8.14 matlab.io.fits.insertCol

`insertCol(file, colnum, ttype, tform)`

Insert a column into a table.

This is the equivalent of the cfitsio `fits_insert_col` function.

## Inputs

*file* - opened fits file.

*colnum* - Column to delete from current table.

*ttype, tform* - column type to insert

## Outputs

None

### 3.8.15 matlab.io.fits.insertRows

`insertRows(file, firstrow, numrows)`

Insert rows into a table.

This is the equivalent of the cfitsio `fits_insert_rows` function.

## Inputs

*file* - opened fits file.

*firstrow* - Start row to insert from.

*numrows* - Number of rows to add.

## Outputs

None

### 3.8.16 matlab.io.fits.readATblHdr

`[rowlen,nrows,ttype,tbcol,tform,tunit,extname] = readATblHdr(file)`

Get ASCII table parameters.

This is the equivalent of the cfitsio `fits_read_atablhdrll` function.

## Inputs

*file* - opened fits file.

## Outputs

*rowlen,nrows,ttype,tbcol,tform,tunit,extname* - table properties

### 3.8.17 matlab.io.fits.readBTblHdr

`[nrows,ttype,tform,tunit,extname,pcount] = readBTblHdr(file)`

Get Binary table parameters.

This is the equivalent of the cfitsio `fits_read_btablhdrll` function.

## Inputs

*file* - opened fits file.

## Outputs

*nrows, ttype, tform, tunit, extname, pcount*] - table properties

### 3.8.18 matlab.io.fits.readCol

```
[coldata, nullval] = readCol(file, colnum)
[coldata, nullval] = readCol(file, colnum, firstrow, numRows)
```

Get table row data.

This is the equivalent of the cfitsio fits\_read\_col function.

## Inputs

*file* - opened fits file.

*firstrow* - Start row

*numrows* - Number of rows to read

## Outputs

*coldata* - the column data rows

*nulldata* - the null value flags

## Examples

```
import_fits;

# open file
filename = file_in_loadpath("demos/tst0012.fits");
fd = fits.openFile(filename);

# move to binary table and get column for flux
fits.movAbsHDU(fd, 2);
colnum = fits.getColName(fd, 'flux');

# read all rows in column
fluxdata = fits.readCol(fd, colnum);
# read data starting at 2nd value
fluxdata = fits.readCol(fd, colnum, 2);
# read rows 3 rows starting at row 2
fluxdata = fits.readCol(fd, colnum, 2, 3);
fits.closeFile(fd);
```

### 3.8.19 matlab.io.fits.writeCol

```
writeCol(file, colnum, firstrow, data)
```

Write elements to a table.

This is the equivalent of the cfitsio fits\_write\_col function.

## Inputs

*file* - opened fits file.

*colnum* - column number.

*firstrow* - first row number.

*data* - data to write to column



## Outputs

None

## 3.9 Import functions

### 3.9.1 `import_fits`

#### `import_fits`

Import the fits functions into a `fits.xxxxx` variable, to emulate importing the fits namespace.

# Appendix A GNU General Public License

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