READPDS STATUS REPORT

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1.1 READPDS v4.3 (Online Version)

1.1.1 Updates to AAREADME.TXT

The online version of the AAREADME.TXT file available on the SBN's website at http://pdssbn.astro.umd.edu/ftp/tools/readpds_4.3.txt is different from the AAREADME.TXT file provided with the READPDS v4.3 package. All the updates mentioned in this section refer to the online version at http://pdssbn.astro.umd.edu/ftp/tools/readpds_4.3.txt.

Once all changes listed below have been agreed and applied, the "aareadme.txt" in the READPDS v4.3 package and the file http://pdssbn.astro.umd.edu/ftp/tools/readpds_4.3.txt should be replaced with the new version.

- DESCRIPTION section:

The list of READPDS functions needs to be updated: - GET_IDL_TYPE does not exist in the package - READSPREADSHEET is missing in the list of routines
Replace "As of this version" with "As of version 4.1" in comment: `"As of this version, it is intended to be used on MSB and LSB architectures, i.e.,'big-endian' and 'little-endian,' respectively.`

- CHANGE LOGS section:

Entry for version 4.2 missing in this section. Copy entry for version 4.2 from aareadme.txt in CVS repository.
There is more than one entry for version 4.3. The purpose of this section is to provide a general description of the new and modified capabilities of the READPDS library in current and past releases and only one entry per release is expected. Replace all the 4.3 entries with one entry summarizing the new and modified capabilities in v4.3. E.g. 4.3 2009-01-19 P. Choganwala Enhanced to look into the LABEL directory for resolving include pointers (references to structure files). Added function to read SPREADSHEET. Improved function to read QUBE objects. Resolved data type range overflow in binary and ASCII tables. Fixed bugs in PDSPAR reading values spanned across multiple lines or containing '=' signs. TABLEPDS was split again into TASCPDS and TBINPDS. Removed verification of PDS label included in 4.2 that will be incorporated as optional in next releases. Incorporated testing regression routines.
`4.3 2008-12-12 P. Choganwala Added PDS lable in the output structure to do this set /LBL option`

```
                                    while reading dataset using
                                    readpds.pro. See usage of the
                                    readpds command.
```

Do not include this update in the AAREADME.TXT or CHANGELOG.TXT files. Not implemented.

Elliot mentioned in his report that this should be added to the CHANGELOG.TXT in the readpds.pro file. I've checked the readpds 4.3 package and I couldn't find this implementation. In which version of the readpds.pro file are these two new lines? I couldn't find them.

I haven't seen any SPR related to this issue. Did anyone request this? I'm just wondering if this could have been a misunderstanding of Parin with SPR10 (Add the verify label functionality to the current CVS version as an optional functionality). He set the status of SPR10 to CLOSED (updated files: readpds.pro) but the SPR has not been implemented. Label verification routines where introduced in v4.2 (see verify_*.pro in readpds 4.2 package). These routines were not very stable. When we first set up the CVS repository we agreed that label verification should be optional. The idea described in SPR10 was to incorporate the verify_*.pro routines from v4.2 to the CVS version (which are not currently in the CVS) and update the readpds.pro to include an optional keyword to verify the label if needed.

If this was a misunderstanding we should not include this changes in the READPDS library. Please, let me know your opinion.

Check status with SBN.

```
4.3     2008-10-07  P. Choganwala    Reading data spanned across multiple
                                     lines. pdspar.pro was not able to
                                     read if value of a keyword is
                                     spanned across multiple lines in
                                     lable. Fixed this problem by
                                     modifying pdapar.pro
```

Already mentioned in the 4.3 entry of the CHANGE LOGS section example.

```
4.3     2008-04-25  P. Choganwala    Resolved all the problems reading
                                     BINARY MIRO data sets. These include
                                     following.

- Enhanced pointpds to look into /label directory for format files(both
upper and lower case).
```

Already mentioned in the 4.3 entry of the CHANGE LOGS section example.

```
- Modified output data structure to properly read level-2 and level-3
MIRO data sets.
```

I don't know anything about this. Not listed in the SPR list. I don't think this is implemented in the readpds 4.3 package. Check status with SBN.

```
- Fixed the problem of data type while reading large BINARY tables.
```

This refers to SPR20 and SPR22. Fixed in version 4.3 and already reported in the 4.3 entry of the CHANGE LOGS section example.

```
- Added get_idl_type routine.This routine converts data type from label
file to correct idl data type.
```

I don't know anything about this. Not listed in the SPR list. I don't think this is implemented in the readpds 4.3 package. The function get_idl_type does not exist in the readpds 4.3 package. It was introduced in version 4.2 but removed in 4.3 when we set up the CVS. Not used by current source code. Check status with SBN.

```
4.3     2008-02-25   P. Choganwala      Resolved BYTE specification problem
                                        in tascpds.pro. The program was not
                                        reading ASCII tables correctly
                                        because of BYTE specification
                                        error. The problem was solved by
                                        stucturing if-else statements in
                                        tascpds.pro.
```

This refers to SPR14 which is supposed to be fixed in version 4.3. I don't know anything about this SPR and I don't understand the description. Check details with SBN.

```
4.3     2007-10-14   P. Choganwala       Fixed leading zero problem in
                                         pdspar.pro. This program was
                                         trimming off the leading zeros
                                         while reading keywords.The
                                         function was corrected which was
                                         removing leading zeros.
```

This refers to SPR6. Do not include this update in the AAREADME.TXT or CHANGELOG.TXT files for this version. Not implemented in readpds 4.3. Already implemented in CVS.

- EXAMPLE section:

TABLES example.

```
** Note: For PDS tables, the IDL routines access the "structure" file
(.fmt) automatically as long as the "structure" file is in the same
directory.
```

Remove this note. This is no longer true as pointpds.pro was updated to look in the DATA or LABEL directory in this version.

1.1.2 Updates to READPDS.TXT and PDSREAD.TXT

Updates to the readpds.txt and pdsread.txt files in readpds v4.3 needed to be consistent with the 4.3 package are listed below:

- Change SOFTWARE_VERSION_ID and PUBLICATION_DATE to

```
SOFTWARE_VERSION_ID     = "4.3"
PUBLICATION_DATE        = 2009-01-19
```

- Copy CHANGE LOGS section from new AAREADME.TXT file (see section 1.1.1 in this document).

- Remove note:

```
NOTE: Additional programs not written at SBN are required to
properly access binary table data. They are 'conv_vax_unix.pro' and
```

```
'ieee_to_host.pro', and may be found in NASA/Goddard's IDL Astronomy
Users Library (anonymous ftp at idlastro.gsfc.nasa.gov
/pub/astron.tar.Z or WWW URL listed below).
```

As far as I know, this is obsolete.

- Add SPREADSHEET to the list of PDS supported objects.

1.1.3 Updates to CHANGELOG.TXT

The changelog.txt file in readpds 4.3 is older than the changelog.txt in readpds 4.2 and therefore all updates listed below should be applied to changelog.txt version 4.2.

Filename	**First Version**	**Updates in this version (v4.3)**
addeobj.pro	4.0	* Replaced wrong [LF,CR] line delimiters with [CR,LF]. Already reported in Elliot's document.
apply_bitmask.pro	4.1	None.
arascpds.pro	1.0 (removed)	None.
arbinpds.pro	1.0 (removed)	None.
arbinpds2.pro	3.3.x (removed)	None.
arr_struct.pro	4.1	None.
arrcol_struct.pro	4.1	None.
arrcolpds.pro	4.1	None.
break_string.pro	4.2 (removed)	* Removed from distribution in this version. Used by label verification routines.
btabvec.pro	1.0 (removed)	None.
btabvect2.pro	4.0	None.
check_axes.pro	3.3.x (removed)	None.
clean.pro	3.0	None.
cleanarr.pro	3.1	None.
colaspds.pro	1.0 (removed)	None.
colbipds.pro	1.0 (removed)	None.
col_struct.pro	4.2 (superseded by coll_struct.pro)	None.
coll_struct.pro	4.1	None.

elem_struct.pro	4.1	None.
extract_keyword.pro	4.2 (removed)	* Removed from distribution in this version. Used by label verification routines. Answer to Elliot query.
get_idl_type.pro	4.2 (removed)	* Removed from distribution in this version.
get_index.pro	3.3.x	None.
headpds.pro	1.0	* Modified to be able to read include pointers (^STRUCTURE) pointers inside TABLE objects. * Replaced wrong [LF,CR] line delimiters with [CR,LF]. * Fixed to do not crash when file not found. Elliot reported that updates from 2009 are not on the online version. The changes listed above are implemented in the online version. Check with Elliot.
imagepds.pro	1.0	* Fixed to free and close previously allocated file units before exiting when an error occurs reading the file (ioerror). This bug does not make the function to crash but precludes mass processing. * Implemented /SILENT option.
objpds.pro	3.0	None.
pdspar.pro	1.0	* Fixed to handle '=' characters in DESCRIPTION keywords. * Fixed to read data spanned across multiple lines. Already reported in Elliot's document (although it was reported as an update to pointpds instead of pdspar). Elliot reported that a modification listed at the end of the online version is not present in the procedure. I couldn't find it. Check with Elliot.
pointpds.pro	3.0	* Fixed to be case-insensitive when reading ^STRUCTURE pointers.
preplabel.pro	4.2 (removed)	* Removed from distribution in this version.
qubepds.pro	3.0	* Fixed compilation bug, "obtain_item_idltype" coded before "obtain_qube_structure". Changes reported in Elliot's document couldn't be found. Check with Elliot. Online version and CVS version do not differ.
readpds.pro	1.0	None.

		Update reported in Elliot's document has not been found in readpds.pro v4.3. Check with Elliot.
readspreadsheet.pro	4.3	First release. Description: This function reads data in a PDS SPREADSHEET object into an IDL structure.
remove.pro	3.0	None.
str2num.pro	1.0	None.
tablepds.pro	1.0 (removed)	* Removed from distribution in this version. This routine was not stable and therefore TABLEPDS was replaced by the old TASCPDS and TBINPDS routines.
tascpds.pro	1.0	* Removed in version 4.2 and introduced again in this version. * Increased range of columns, rows, and row_bytes data type by using ULONG and LONG64. Related to incorrect error message ("ROWS OR ROW_BYTES OR COLUMNS <= 0") due to data type range of variables. * In OBTAIN_TBIN_REQ increased range of columns, rows, and row_bytes data type by using ULONG and LONG64. * Fixed to free and close previously allocated file units before exiting when an error occurs reading the file (ioerror). * Increased range of the data type for variables row_prefix_bytes and row_suffix_bytes. Elliot reported that updates from 2009 are not on the online version. The changes listed above are implemented in the online version. Check with Elliot.
tbinpds.pro	1.0	* Removed in version 4.2 and introduced again in this version. * Fixed to free and close previously allocated file units before exiting when an error occurs reading the file (ioerror). * Increased range of the data type for variables row_prefix_bytes and row_suffix_bytes. Elliot reported that updates from 2009 are not on the online version. The changes listed above are implemented in the online version. Check with Elliot.

test_integer.pro	4.2 (removed)	* Removed from distribution in this version. Used by label verification routines.
timepds.pro	1.0	None.
verify_arr.pro	4.2 (removed)	* Removed from distribution in this version.
verify_arrcol.pro	4.2 (removed)	* Removed from distribution in this version.
verify_col.pro	4.2 (removed)	* Removed from distribution in this version.
verify_elem.pro	4.2 (removed)	* Removed from distribution in this version.
verify_image.pro	4.2 (removed)	* Removed from distribution in this version.
verify_label.pro	4.2 (removed)	* Removed from distribution in this version.
verify_qube.pro	4.2 (removed)	* Removed from distribution in this version.
verify_table.pro	4.2 (removed)	* Removed from distribution in this version.
readpdsTest.pro	4.3	First release. Description: Testing routines used for the validation of the READPDS library. A set of sample files has been defined for validation purposes in order to ensure that a new release of the READPDS library reads all PDS files read by previous versions of the library.

1.1.4 SPRs Cleared

SPRs cleared in this version: 5, 7, 8, 12, 14, 15, 16, 17, 20, 21, 22, 23, 25, 26, 27.

1.2 READPDS CVS Version

1.2.1 Updates to AAREADME.TXT, READPDS.TXT and PDSREAD.TXT

PDSREAD.TXT has been removed from the CVS (superseded by READPDS.TXT). See section 1.2.2 for updates to AAREADME.TXT and READPDS.TXT in this version.

1.2.2 Proposal to merge AAREADME.TXT and READPDS.TXT

There are two files in the readpds library that are intended to describe the content of the library: AAREADME.TXT and READPDS.TXT. Both files contain similar information. This section describes a proposal to merge the AAREADME.TXT and READPDS.TXT into one file.

Find below the list of sections included in each file and a list of proposed sections for the new AAREADME.TXT file (merged version). See Appendix A for a draft version of the new AAREADME.TXT file.

AAREADME.TXT	READPDS.TXT	New AAREADME.TXT (merged version)
(1) Description	(1) Description	(1) About READPDS
(4) Changes Log	(3) Changes Log	(2) Release Notes
(3) Functions Listing	(2) File Listing	(3) Library Contents
	(4) Compatibility Warnings	(4) Installation Instructions
(2) Command Syntax	(6) Reference to AAREADME.TXT file for instructions on using the routines.	(5) Operations Instructions
	(5) PDS Objects supported	(6) PDS Objects supported by READPDS
(5) Examples		(7) Examples
	(7) Additional Information about the IDL's Astronomy Library	(8) Additional Information
	(8) Licensing Information	(9) Licensing Information

1.2.3 Updates to CHANGELOG.TXT

Filename	First Version	Updates in this version (v4.3)
addeobj.pro	4.0	None.
apply_bitmask.pro	4.1	None.
arascpds.pro	1.0 (removed)	None.
arbinpds.pro	1.0 (removed)	None.
arbinpds2.pro	3.3.x (removed)	None.
arr_struct.pro	4.1	None.
arrcol_struct.pro	4.1	None.
arrcolpds.pro	4.1	None.
break_string.pro	4.2 (removed)	None.
btabvec.pro	1.0 (removed)	None.
btabvect2.pro	4.0	None.

check_axes.pro	3.3.x (removed)	None.
clean.pro	3.0	None.
cleanarr.pro	3.1	None.
colaspds.pro	2.0 (removed)	None.
colbipds.pro	2.0 (removed)	None.
col_struct.pro	4.2 (superseded by coll_struct.pro)	None.
coll_struct.pro	4.1	None.
elem_struct.pro	4.1	* Fixed to handle properly unsigned intergers in ARRAY objects. Function determine_element_type in elem_struct.pro modified to check if SIGNED or UNSIGNED integer and return correct type. Added "warning message" to flag if number of bytes is not correct (only 1-, 2- and 4-byte signed/unsigned integers allowed in PDS v3.8). Already reported in Elliot's document.
extract_keyword.pro	4.2 (removed)	None.
get_idl_type.pro	4.2 (removed)	None.
get_index.pro	3.3.x	None.
headpds.pro	1.0	None.
imagepds.pro	1.0	None.
objpds.pro	3.0	None.
pdspar.pro	1.0	None.
pointpds.pro	3.0	None. Locally modified by Elliot. Changes to be uploaded to the CVS and reported in the changelog.txt file. Already mentioned in Elliot's report.
preplabel.pro	4.2 (removed)	None.
qubepds.pro	3.0	None.
readpds.pro	1.0	None.
readspreadsheet.pro	4.3	None.
remove.pro	3.0	None.
str2num.pro	1.0	* Fixed to do not trim off leading zeros when reading

		keyword values.
tablepds.pro	1.0 (removed)	None.
tascpds.pro	1.0	None.
tbinpds.pro	1.0	* Fixed to handle properly the endianess for binary tables. Modified to reverse byte order when needed.
test_integer.pro	4.2 (removed)	None.
timepds.pro	1.0	None.
verify_arr.pro	4.2 (removed)	None.
verify_arrcol.pro	4.2 (removed)	None.
verify_col.pro	4.2 (removed)	None.
verify_elem.pro	4.2 (removed)	None.
verify_image.pro	4.2 (removed)	None.
verify_label.pro	4.2 (removed)	None.
verify_qube.pro	4.2 (removed)	None.
verify_table.pro	4.2 (removed)	None.
readpdsTest.pro	4.3	* Fixed to print READPDS version used for validation. * Modified to handle comments in configuration files.

1.2.4 SPRs Status

SPR No.	Status	Remarks
1	IN PROGRESS	Ready to be uploaded to CVS.
2	IN PROGRESS	Ready to be uploaded to CVS.
3	IN PROGRESS	Ready to be uploaded to CVS.
4	OPEN	PSA thinks this is not needed. READPDS already handles objects defined inside different FILE objects. Check with SBN.
5	CLOSED	Closed in v4.3.
6	CLOSED	Closed in current CVS version.
7	CLOSED	Closed in v4.3.

8	CLOSED	Closed in v4.3.
9	REJECTED	Wrong interpretation of SAMPLE_BIT_MASK on PSA side. READPDS already handles SAMPLE_BIT_MASK.
10	IN PROGRESS	Ready to be uploaded to CVS.
11	CLOSED	Results to be discussed with SBN in a separate document/email.
12	CLOSED	Closed in v4.3.
13	OPEN	
14	CLOSED	Closed in v4.3.
15	CLOSED	Closed in v4.3.
16	CLOSED	Closed in v4.3.
17	CLOSED	Closed in v4.3.
18	CLOSED	Check status with SBN. Listed as CLOSED in the SPR list but the updated file in not correct and the DATA mentioned in the SPR is MIRO. Data from this instrument is not a QUBE object.
19	REJECTED	Rejected in current CVS version.
20	CLOSED	Closed in v4.3.
21	CLOSED	Closed in v4.3.
22	CLOSED	Closed in v4.3.
23	CLOSED	Closed in v4.3.
24	OPEN	
25	CLOSED	Closed in v4.3.
26	CLOSED	Closed in v4.3.
27	CLOSED	Closed in v4.3.
28	IN PROGRESS	Elliot is working on this.
29	CLOSED	Closed in current CVS version.
30	CLOSED	Closed in current CVS version.

1.2.5 Next Release

Version No. TBD

1.3 APPENDIX

1.3.1 Appendix A: AAREADME.TXT

```
PDS_VERSION_ID        = PDS3

RECORD_TYPE            = STREAM

OBJECT                 = TEXT

  NOTE                   = "New Release of READPDS"

  SOFTWARE_VERSION_ID    = "TBD"
  PUBLICATION_DATE       = TBC

END_OBJECT             = TEXT

END



+============================================================================+
                       THE SBN's READPDS LIBRARY (vTBD)
                               for IDL 6.x

                                 AAREADME
+============================================================================+


*============================================================================*
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*============================================================================*


==============================================================================
1. About READPDS
==============================================================================

READPDS is a set of IDL procedures created at the Small Bodies Node (SBN) of
the Planetary Data System (PDS) for reading PDS data files. The latest release
is version TBD. This package is intended primarily for end-users of PDS data.

IMPORTANT: As of version 4.2, READPDS requires IDL version 6.0 or later. The
previous version of the library will remain available with minimal support for
a while.


The homepage for the READPDS library is:

               http://pdssbn.astro.umd.edu/nodehtml/software.shtml


READPDS is still under development. User feedback is very important and will be
appreciated. To propose new features or to report any comments or problems,
please contact:

   Ludmilla Kolokolova
```

The Small Bodies Node
Department of Astronomy
University of Maryland College Park

Email address: ludmilla "at" astro.umd "dot" edu

2. Release Notes

The purpose of this section is to provide a description of the current and past releases of the READPDS library including any impact that the new or modified capabilities will have on the PDS user community.

See the 'changelog.txt' file for detailed information on the modifications made to the IDL procedures since they were first written.

Version	Date	Programmer	Description
TBD	TBC	E. Teichman	This release incorporates functions to read BIT_COLUMN, BIT_ELEMENT and CONTAINER objects. Fixed to do not trim off leading zeros when reading keyword values. Modified to handle properly unsigned integers in ARRAY objects. Fixed to reverse bytes if needed when reading binary tables to handle endianness. Improved pdspar to resolve include pointer references.
4.3	2009-01-19	P. Choganwala	Enhanced to look into the LABEL directory for resolving include pointers (references to structure files). Added function to read SPREADSHEET. Improved function to read QUBE objects. Resolved data type range overflow in binary and ASCII tables. TABLEPDS was split again into TASCPDS and TBINPDS. Removed verification of PDS label included in 4.2 that will be incorporated as optional in next releases. Incorporated testing regression routines.
4.2	2005-07-15	P. Khetarpal	This release is for IDL v. 6.0 and above. Combined TASCPDS and TBINPDS into TABLEPDS routine, which now handles both ascii and binary data processing. Reorganized the processing line by including verification of PDS label before any other action is performed. All routines were rewritten to stabilize the program. As of version 4.2 READPDS is intended to be used on MSB and LSB architectures, i.e. 'big-endian' and 'little-endian' respectively.
4.1.1	2005-04-18	P. Khetarpal	Fixed problem with headpds changing the name of the input file. Resolved row suffix bytes and padding bytes conflict, and fixed some minor errors in table object reading.
4.1	2005-01-28	P. Khetarpal	Resolved compatibility for both MSB and LSB architectures of all routines. Array and collection objects routine was rewritten for updated standards. Re-instated the NOSCALE keyword for images and qubes. Included bit masking

			for signed and unsigned integers.
4.0	2004-08-01	P. Khetarpal	Rewrote the major routines for reading images, tables, and qubes by using IDL structures to read data directly, instead of reading data element by element. Also, rewrote routines using many levels of subroutines, and thorough error-checking. Heavy comments were added to almost all routines. The previous releases of version 3.3.x are compiled into one in this release of pdsread.
3.3.x	2004-03-18	P. Khetarpal	Fixed bugs for reading array objects included with other non-array objects for IDL. Wrote a new binary array routine to read arrays with axes greater than 2.
3.2	2003-12-02	P. Khetarpal	Fixed bugs for reading tables with long int number of rows or columns; fixed item byte issue for reading tables.
3.1	2003-10-03	P. Khetarpal	Updated for standards changes; fixed minor bugs; increased robustness of subroutines; added a subroutine to handle cleaning of string arrays.
3.0	2003-08-05	P. Khetarpal	Updated for standards changes; added WINDOW support; added "examples" directory; included ARRAY and COLLECTION object support.

3. Library Contents

READPDS.PRO is the top-level function that all of the others in this set are written to serve.

The READPDS package contains the following files:

```
addeobj.pro          - inserts END_OBJECT keyword values in label if not present
apply_bitmask.pro    - applies bitmask on integer arrays or scalars
arr_struct.pro       - populates an IDL structure for array object to be read
arrcol_struct.pro    - populates IDL structure for a given array/collection
                       object from PDS label
arrcolpds.pro        - reads a PDS binary array or collection into IDL array or
                       structure
btabvect2.pro        - retrieves vectors from PDS binary tables
clean.pro            - removes non-printable characters from scalar strings
cleanarr.pro         - removes non-printable characters from string arrays
coll_struct.pro      - populates an IDL structure for collection object to be
                       read
elem_struct.pro      - populates an IDL structure for element object to be read
get_index.pro        - retrieves viable end_object index position in a PDS label
headpds.pro          - retrieves the PDS label from a file
imagepds.pro         - retrieves image data from PDS image files
objpds.pro           - retrieves viable PDS objects from the labels
pdspar.pro           - retrieves specified data from the PDS labels
pointpds.pro         - retrieves pointer information for PDS object from label
qubepds.pro          - retrieves qube data from PDS qube files
readpds.pro          - calls other routines to obtain images, tables, arrays,etc
readspreadsheet.pro - retrieves data from PDS spreadsheet files
remove.pro           - removes specified characters from a string
tascpds.pro          - retrieves data from PDS ascii table files
tbinpds.pro          - retrieves data from PDS binary table files
timepds.pro          - retrieves time from PDS labels or ASCII tables
```

NOTE: An examples directory is included with the distribution. It can be downloaded separately or as part of the complete package.

For complete explanations regarding the use of any of these programs, check the headers of the program source files, which end in '.pro'.

4. Installation Instructions

All the functions listed in the previous section must be present in the IDL path for READPDS.PRO to function properly.

IDL commands to add the READPDS library directory to the IDL path are:

Under Windows
```
IDL> PREF_SET, 'IDL_PATH', 'C:\your\path\here;<IDL_DEFAULT>',/COMMIT
```

Under UNIX
```
IDL> PREF_SET, 'IDL_PATH', '/your/path/here:<IDL_DEFAULT>',/COMMIT
```

For more information on how to setup the IDL environment, see the IDL User's Guide.

COMPATIBILITY WARNINGS: These programs have only been tested on IDL version 6.1 for SunOS 8.0 and Mandrake Linux 10, they may not work as well on other systems/versions.

5. Operation Instructions

READPDS.PRO is an IDL function that reads data from a PDS file and stores it in an IDL structure.

NOTE: Multiple data objects can be embedded in one file. For example, one can have an image and a table in the same data file. The "result" would be returned as a structure of three objects containing the number of objects, the image array and the table structure.

For more information on IDL structures, see the IDL User's Guide.

The calling syntax of READPDS.PRO is as follows:

```
result = READPDS( filename,[ /SILENT, /NOSCALE] )
```

where:

- 'result' is the data returned from the PDS image or data table file being read by READPDS.
- 'filename' is a scalar string containing the name of the PDS file to be read.
- 'SILENT' is an optional argument to READPDS that will suppress the default display of the size of the array or structure.
- 'NOSCALE' is an optional argument to READPDS that will suppress the default application of SCALING_FACTOR and OFFSET values to and PDS IMAGE or QUBE object array.

6. PDS Objects supported by READPDS

PDS attached, detached and combined-detached labels as well as include pointers to structure files (FMT) are supported by these programs.

As of version 4.3, READPDS looks in LABEL subdirectory for files referenced by include pointers that are not included directly at the location of the PDS file

(both upper and lower case). See Rules for Resolving Pointers in the PDS Standards document for reference.

PDS objects supported by these programs:

Major Objects

ARRAY
CONTAINER
ELEMENT
IMAGE
TABLE
INDEX_TABLE
GAZETTEER_TABLE
PALETTE
SPECTRAL_QUBE
QUBE
SERIES
SPECTRUM
SPREADSHEET

Sub-objects

BIT_COLUMN
BIT_ELEMENT
COLLECTION
COLUMN
WINDOW
ELEMENT

PDS objects not supported by these programs:

CATALOG
HISTOGRAM
HISTORY
IMAGE_MAP_PROJECTION
SPICE_KERNEL

PDS objects not needed by these programs:

DATA_PRODUCT
DATA_SUPPLIER
DIRECTORY
DOCUMENT
FILE
HEADER
VOLUME

See Appendix A in the PDS Standards document for reference of approved PDS data object definitions.

==========

7. Examples
==========

Examples included in this section are:

7.1 LABEL:

```
----------
- to obtain a PDS label information as a string array variable, type

   > label = HEADPDS('pdsfile.lbl')

which will return a string array of the entire pdsfile.lbl and put it into
the variable label.

- to obtain a PDS ASCII file that may not contain a header, type

   > label = HEADPDS('asciifile.txt', /FILE)

which will return the entire text file and store it into variable label.

- to obtain only the associated ^STRUCTURE file FORMAT.FMT from a label, type

   > fmt = HEADPDS('format.fmt', /FORMAT)

which will return the entire format.fmt contents and store it into
the variable fmt.

* Note: headpds will extract the ^STRUCTURE files by default from a label
if the keyword is present.


7.2 IMAGE:
----------
- to read a PDS image file for viewing, type

   > img = READPDS('image.lbl')

which will read data from the file and put it into the variable, 'img'. If
there are any OFFSET or SCALING_FACTOR keywords present in the IMAGE object,
then it will apply them to the image array by default. If you would like to
obtain the image without the OFFSET or SCALING_FACTOR values applied, then type

   > img = READPDS('image.lbl', /NOSCALE)

The following message will be displayed:

   Now reading header: image.lbl
   Now reading 128 by 128 array
   ** Structure <cbde0>, 2 tags, length=32770, data length=32770, refs=1:
      OBJECTS         INT             1
      IMAGE           INT       Array[128, 128]

- to view, type

   > tvscl, img.image

which should bring up an idl window with an image of the data from

'image.lbl' in it.

NOTE: Multiple images would be returned as an IDL structure with the first
element named 'images' being the number of images contained and the other
elements being the images in order found.


7.3 TABLE:
----------
- to read a PDS ascii table to read or extract information from later, type

   > data = READPDS('ascii.lbl')

- to read a PDS binary table to read or extract information from later, type

   > data = READPDS('binary.lbl')

in either case, READPDS will return the data as an IDL structure:

   Now reading header: ascii.lbl
   Now reading table with 2 Columns and 20 Rows
```

```
   ** Structure <d5820>, 2 tags, length=368, data length=358, refs=1:
      OBJECTS         INT              1
      TABLE           STRUCT    -> <Anonymous> Array[1]

To access the table, type:

   > help, /STRUCTURE, data.table
   ** Structure <c8918>, 3 tags, length=360, data length=356, refs=2:
      COLUMN_NAMES    STRING    Array[3]
      COLUMN1         DOUBLE    Array[20]
      COLUMN2         DOUBLE    Array[20]

Here's how to access columns:

To access
   entire table:  print, result.table
   column names:  print, result.table.column_names
   first column:  print, result.table.column1
   second column: print, result.table.column2

which should cause the contents to print to the screen.


7.4 QUBE:
---------
- to read a PDS cube to read or extract information from later, type

   > cube = READPDS ('qube.lbl')

which should return a three dimensional array.


   Now reading header: qube.lbl
   Now reading 256 by 98 by 432 qube array
   ** Structure <ce9b0>, 2 tags, length=21676034, data length=21676034, refs=1
      OBJECTS         INT              1
      QUBE            INT       Array[256, 98, 432]

- to view the data from any of the frames, type

   > frame = cube[*,*,0]
   > tvscl, frame

which should display the first frame on the screen.


7.5 ARRAY:
----------
- to read a PDS 6D image array with 1 ELEMENT sub-object and the last
  axis is set to NAXIS6 = 1, type

   array = READPDS ('array.lbl')

which should return a five dimensional array of data.  Since NAXIS6 = 1, IDL
ignores this axis (for example, a 128 x 128 x 1 image cube is equivalent to a
128 x 128 image).

   Now reading header: array.lbl
   Now constructing ARRAY/COLLECTION structure to be read
   Now reading ARRAY/COLLECTION object
   ** Structure <a20e8>, 2 tags, length=262148, refs=1:
      OBJECTS         INT              1
      ARRAY           LONG      Array[128, 128, 2, 1, 2]


The above description is from an example KECK data file in FITS format. The
FITS file contains 2 stacked sets (chop-nod sets), each containing 2,
two-dimensional images. The PDS label was written as an array object to be read
and then displayed as an image.

- to view the first image, type:

  > tvscl, result.array[*,*,0,0,0,0]
```

or

```
  > tvscl, result.array[*,*,0,0,0]
```

which should display the first frame on the screen.

==========

8. Additional Information

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FITS: I/O software in the comercial language IDL is available from the IDL Astronomy Library (Landsman 1995), which is accessible from the WWW site http://idlastro.gsfc.nasa.gov/homepage.html

Landsman, W.B. 1995, "The IDL Astronomy User's Library" in "Astronomical Data Analysis Software and Systems IV", ed. R. Shaw, H.E. Payne, J.J.E. Hayes, ASP Conference Series 77, p. 437

A listing of some particularly useful 'idlastro' procedures follow:

```
headfits.pro    - retrieves the FITS header from a file
readfits.pro    - reads a FITS file, returns data
sxaddpar.pro    - add or modify a parameter in a FITS array
sxpar.pro       - retrieves specified data from FITS headers
wherenan.pro    - finds the position of the IEEE NaN special values
```

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9. Licensing Information

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