

NASA/TM—2005–209997/VER200404.0/VOL. 6d



ICESat (GLAS) Science Computing Facility Document Series

Volume 6d

**I-SIPS Interface Software Operator's Guide for
UTCSR**

Version 200404.0

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April 2004

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SECTION 1: INTRODUCTION

A series of Perl scripts have been written to move data from the ICESat Science Investigator-led Processing System (I-SIPS) to the University of Texas Center for Space Research (UTCSR). This document gives an overview of how the scripts are run and troubleshooting techniques for when there are problems.

SECTION 2: RELATED DOCUMENTATION

- *SCF Architectural Design Document*
- *SCF Data Request Software Detailed Design Document*
- *SCF Data Request Software User's Guide*
- *SCF Data Visualization Software User's Guide*
- *SCF Operator's Guide*
- *SCF Interface Control Document*
- *SCF Interface Software Update Document*
- *SCF Interface Software Installation Guide*
- *SCF Interface Software Detailed Design Document*
- *SCF Interface Software Operator's Guide for rSCF*
- *SCF Interface Software Operator's Guide for mSCF*
- *I-SIPS Interface Software Operator's Guide for ISF*
- *I-SIPS Interface Software Operator's Guide for UTCSR*
- *Interface Control Document Between I-SIPS/ISF and CSR*

SECTION 3: OVERVIEW

All data transferred from the I-SIPS to the UTCSR will be put in an UTCSR output cache on the I-SIPS to be pulled by the UTCSR. A Product Delivery Record (PDR) will be placed in the cache listing the files contained in the distribution along with validation information. Once the files and PDR are placed in the output cache, a PDR transfer file (XFR) is created denoting that the files and PDR are ready to be transferred. After the files have been pulled by the UTCSR to its input cache, the UTCSR will place a Product Acceptance Notice (PAN) and its associated XFR into the UTCSR input cache on the I-SIPS. The PAN will indicate whether the files were successfully transferred or if an error occurred. If the files were successfully transferred to the UTCSR, then the I-SIPS will remove the files from its output cache. If the file transfer was unsuccessful, email will be sent to the I-SIPS explaining the error in detail. Once the data is in the input cache on the UTCSR, the data will be moved to an appropriate subdirectory based upon information in the PDR. Once the files in the subdirectory are validated against the PDR, the PDR and XFR will be removed from the input cache.

Conversely, all data transferred from the UTCSR to the I-SIPS, along with a PDR and XFR, will be put in an output cache on the UTCSR and be pushed by the UTCSR. Once the push is complete, the I-SIPS will put a PAN and XFR in the UTCSR output cache on the I-SIPS. The UTCSR will then pull the PAN into its input cache and read it. If the PAN indicates that the files were successfully transferred to the I-SIPS, then the UTCSR will remove the PAN and the files from its output cache. If the file transfer was unsuccessful, email will be sent to the UTCSR explaining the error in detail.

SECTION 4: DIRECTORY STRUCTURE

Data to be pushed to the I-SIPS must be placed in the output cache on the UTCSR. The data is then pushed to the UTCSR input cache on the I-SIPS. Likewise, the UTCSR will pull data from the UTCSR output cache on the I-SIPS to its input cache. Below is a table indicating the directory names of the input and output caches on the I-SIPS and the UTCSR.

Host	Input Cache	Output Cache
I-SIPS	/external/utcsr/incoming	/external/utcsr/outgoing
UTCSR	/home/utcsr/incoming	/home/utcsr/outgoing

SECTION 5: DATA

Data created by the I-SIPS and transferred to the UTCSR includes:

- Level 0 product GLA00 APID1088 (GPS package from EDOS) (4 per day)
- Level 0 product GLA00 APID1984 (PRAP package from EDOS) (4 per day)
- Level 1A product GLA04 (4 per day)

Data created by the UTCSR and transferred to the I-SIPS includes:

- ANC08 - Precision Orbit Determination file (POD) (daily)
- ANC09 - Precision Attitude Determination file (PAD) (daily)
- ANC20 - Predicted Orbit Determination file (daily)
- ANC04 - IERS rotation file (1 per week)
- ANC39 – GPS data file (daily)
- ANC25 - UTC - GPS time differential tables (1 per year)

SECTION 6: PDR CREATION

Once a distribution set has been created at the UTCSR for transfer to I-SIPS, a Product Delivery Record (PDR) must be created to accompany it. This PDR contains benchmark information about the data including number of files, file sizes, and file checksums so that the data may be verified after transfer.

To create a PDR, a PDR Input File must be created and the script, `create_pdr.pl`, must be invoked. Refer to the *SCF Interface Software Detailed Design Document* for a description of the script and for the PDR Input File format. The PDR Input File and PDR must be created in the directory where the data is originally created since the data may become corrupt during first move or copy. Once the PDR Input File has been created, its name should be put as the input argument to the script in the file `/SCF/src/perl/ops/run_create_pdr.ksh`. The script then must be invoked with the command:

```
/home/utcsr/src/perl/ops/run_create_pdr.ksh
```

The script creates a PDR with the file name "CSR.DISTRIBUTION_ID.PDR". The determination of the DISTRIBUTION_ID is TBD. This script also generates a PDR Transfer File (XFR) with the name "PDR_filename.XFR" denoting the completion of the PDR file.

Once the PDR is created, the distribution set, PDR, and XFR must be moved, copied, or linked to the output cache, so that the data may be pushed to the I-SIPS via the cron job (explained in the next section).

SECTION 7: DATA TRANSFER CRON JOB

The data transfer scripts to push, pull, and move data are invoked automatically at set time intervals via a cron job on the UTCSR system. Access to the cron job can only be done under the "utcsr" account. To view the cron file which has the times of invocation type *crontab -l*. If the cron times need to be changed, refer to the crontab man page on how to setup a cron job. Below is an example of how a cron job is setup:

- To edit the cron file in vi: *crontab -e*
- Type the following line in the file to invoke the run_scripts.ksh script every 10 minutes starting at 5 minutes after the hour, every hour, everyday at the UTCSR:

```
05,15,25,35,45,55 * * * * * /home/utcsr/src/perl/ops/run_scripts.ksh
```
- Write and quit out of the file to invoke
- To view the cron file: *crontab -l*
- To remove the cron file: *crontab -r*

All output will be appended to the files /home/utcsr/tmp/cron.log####. There are 10 log files and they are overwritten in turn as they reach their maximum size limit. A grep on the date may be done to determine which file contains information for that date.

The cron invokes all scripts called from the main script, run_scripts.ksh. On the UTCSR system, the following scripts are performed when the cron job is invoked:

- pull_from_remote.pl: Files are pulled from the I-SIPS to the input cache and a PAN is sent back to the I-SIPS
- pull_pan_from_remote.pl: PAN Files are pulled from the I-SIPS to the input cache
- run_files_to_subdir_from_pull.ksh: Files are moved from the input cache to a subdirectory
- run_push_to_remote.ksh: Files in the output cache are pushed to the I-SIPS
- run_check_for_pan.ksh: Files in the output cache are removed if a PAN in the input cache indicates that they were successfully transferred to the I-SIPS

SECTION 8: OPERATION

Since the scripts run automatically via the cron job, the operator only needs to ensure that incoming files have been received and outgoing files have been received and deleted from the output cache.

No file will be transferred until there is a PDR for the file and an XFR present to ensure that the PDR file is complete.

When files are pulled from the I-SIPS, they are first put in the input cache then moved to a subdirectory. Below is a table showing the subdirectory where the different files received from the I-SIPS should be expected based on the data type in the PDR:

Data Received from I-SIPS	Expected Subdirectory	Data Type
Level 0 product GLA00 APID1088	/home/utcsr/apid1088	GLA0GPS
Level 0 product GLA00 APID1984	/home/utcsr/prap	GLA0PRAP
Level 1A product GLA04	/home/utcsr/gla04	GLA04

When files are pushed to the I-SIPS, the XFR is removed from the output cache, but the PDR and data files remain. Sometime later, the ISF should pull a PAN into the input cache. A script checks the PAN for the keyword "Successful" and if present, removes the PAN from the input cache and the corresponding PDR and all of the files listed in it from the output cache. Therefore, if the files and PDR are gone from the output cache, it can be assumed that the data transfer to the I-SIPS was successful.

The run_scripts.ksh script invoked by the cron job appends or overwrites a file, /home/utcsr/cron.log.### where ### is 001 to 010, every time it runs. Starting with cron.log.001, the file is appended until it reaches a certain size, then the next file, cron.log.002, is written. If the file does not exist it is created, otherwise it is overwritten. In this way, there is no need for cleanup since the log files just overwrite themselves and since there are ten files, error messages are kept for a while in case problem troubleshooting is necessary. The number of log files and max size of each file may be modified as necessary in the run_scripts.ksh script.

SECTION 9: TROUBLESHOOTING GUIDE

If an error occurs during a data transfer, the PAN will indicate a problem, but an email will be sent explaining the problem in further detail. The cron.log.### file may also show a problem. Use the error description in the email to troubleshoot the problem. Once the problem has been solved, all the files must be put into the output cache again so that they will be transferred when the cron job invokes. Since the scripts reference the complete PDR, it is important that all of the files listed in the PDR are available to be transferred again, even if some of them were already transferred before the transfer was interrupted. In most cases, the XFR file may have been removed, since this is the first thing that most of the scripts do. The scripts read the PDR or PAN only if the XFR is also present, and therefore remove the XFR first so that another cron job does not try to access the same PDR or PAN at the same time. Therefore, if a transfer has to be run again, if the XFR is missing, it needs to be recreated. This can be accomplished simply by using the "touch" command since the XFR only needs to exist, not necessarily contain anything. The XFR file name is simply the PDR or PAN file name with the extension ".XFR" added at the end. For example: "touch filename.PDR.XFR".

When files are moved from the input cache to the subdirectory, they are actually first copied to a .tmp directory under the subdirectory. The .tmp directory has the request ID or distribution ID appended to the name to ensure a unique directory name. When the file sizes have been verified against the PDR they are then moved to the subdirectory. This is to ensure that the files are not accessed before the move is complete. If a problem occurs during the copy (i.e. the subdirectory runs out of space), the files and PDR still reside in the input cache. Once the problem is resolved, just "touch" the XFR to attempt the move again. Sometimes this subsequent attempt will fail if the permissions of the files in the .tmp directory do not allow the files to be overwritten. This may happen when a copy is abruptly cut off. If need be, go to the subdirectory listed in the PDR and type "ls -la .tmp*" to see the directories listed. Type "rm -rf .tmp*" to remove them. Retouch the XFR in the input cache and the move should work.

Below are common error messages generated by the Perl scripts and a general outline of troubleshooting techniques if an error occurs. Refer to the *SCF Interface Software Detailed Design Document* for detailed descriptions of the PDR, XFR, and PAN files.

Error Type	Check that:
Error creating file	<ul style="list-style-type: none"> - Disk space is available * - Permissions allow write access **
File does not exist	<ul style="list-style-type: none"> - Full file name is correct - Permissions allow read access **
Error opening file	<ul style="list-style-type: none"> - Permissions allow read access ** - Full file name is correct
Cannot create directory	<ul style="list-style-type: none"> - Disk space is available * - Permissions allow write access **
Number of files has not been read from PDR	<ul style="list-style-type: none"> - PDR follows correct format
Number of files does not match number in PDR	<ul style="list-style-type: none"> - PDR follows correct format - Disk space is available * - All files listed in PDR exist in the directory - File transfer was complete
PDR is for a subscription and number of files is 0	<ul style="list-style-type: none"> - PDR follows correct format - PDR is really for a subscription
Checksum for file does not match checksum in PDR	<ul style="list-style-type: none"> - PDR follows correct format - File checksum is accurate - File transfer was complete

PDR verification did not pass all tests	<ul style="list-style-type: none"> - PDR follows correct format - All files listed in PDR exist in the directory - File checksums are accurate - File transfer was complete
PAN file does not indicate successful transfer	- Look for accompanying email for error details
Expected data can not be found	- Cron job ran

* **If disk space is not available:** Have system administrator create more disk space on system

** **If file has restrictive permissions:** Have system administrator change permissions on file

SECTION 10: ERROR EMAIL RECIPIENTS

If an error occurs during a data transfer an email is sent explaining the problem. The email address of the designated UTCSR person is in the following routine:

```
/home/utcsr/src/perl/ops/send_mail_local.pm
```

Edit this file to change the recipients of these emails. Be sure to notify I-SIPS personnel of any changes, so that modifications are not overwritten by a new version of the software.

Emails are also sent to designated I-SIPS personnel. A system alias has been created to direct email to I-SIPS personnel:

send_mail_isips@icesat0.gsfc.nasa.gov

This alias is used in the following routine:

```
/home/utcsr/src/perl/ops/send_mail_isips.pm
```

APPENDIX A: ABBREVIATIONS & ACRONYMS

GLAS	Geoscience Laser Altimeter System
GSFC	Goddard Space Flight Center
ICESat	Ice, Cloud, and land Elevation Satellite
ISF	Instrument Support Facility
I-SIPS	ICESat Science Investigator-led Processing System
LIDAR	LIght Detection And Ranging
MIT	Massachusetts Institute of Technology
mSCF	Main Science Computing Facility
NASA	National Aeronautics and Space Administration
OSU	Ohio State University
rSCF	Remote Science Computing Facility
UCSD	University of California at San Diego
UTCSR	University of Texas Center for Space Research
UW	University of Washington
WFF	Wallops Flight Facility