<table>
<tr><td colspan="2" align="center">University of Michigan
Space Physics Research Laboratory</td></tr>
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		CAGE No.	0TK63
TIDI OPERATIONS		Drawing No.	055-3886N
CHECKLISTS		Project	TIDI
		Contract No.	NASW-5-5049
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REVISION RECORD

Rev	Description	Date	Approval
N	Added resendCM procedure for recovery from lost command messages to section 23.5 The flight software load procedure is updated to include advanced staging of the command messages and selection of the target bank. Added instructions for maintaining the tcmd files. Added instructions for compiling a daily command message load. Added selection of telemetry server to OASIS startup procedure.	11 Sep 2002	
M1	Editorial improvements	7 Aug 2001	
M	Correct typos and use consistent convention for display of user inputs and computer outputs. Corrected command used at UNIX prompt for safing, it required quotation marks around the file name. Added check for instrument operating mode in telescope interference test. Added further detail to the telescope alignment test configuration instructions Noted that group id when using sendCM must be tidi. The group id required to view ARR and CRR files is now tidi. Corrected the spectra display setup for the telescope throughput test. Added a procedure for re-booting the instrument processor. A utility procedure for processing return receipts and displaying the message log is pending.	1 July 2001	

APPROVAL RECORD

Function	Name	Signature	Date
Originator	D. Gell		

REVISION RECORD

Rev	Description	Date	Approval
L	Add procedure for telescope validation Add procedure for telescope interference check Add procedure for flight software load Add procedure for telescope alignment Correct name of control program in recovery from safing Removes references to gse data collection from telescope throughput procedure Remove procedure for abbreviated functional test Correct program IDs of day driver control programs Add description of FindEntry utility procedure. Editorial corrections	1 Jun 2001	
K	Add procedure for Instrument Safing Add procedure for starting ppp Add procedures for loading and starting control programs Replace day_driver with dNomBeta_nBaseline in orbit simulation. Correct name of procedure to use in mechanism test.	22 Nov 2000	
J	Add procedure for activation mechanical test Add procedure for activation optical test Add dHighBeta_nBaseline to control programs used during orbit simulations. Created tables for strip chart definitions that include data type and expected value. Add a note regarding correct group privilege when issuing the sendCM command Add note to warn SEE when starting large command load	26 Sept 2000	
I	Correct typographical error in telescope though-put test. Add instructions for cover release, aliveness check and computer self-test.	4 Aug 2000	
H	Add protocol for completing TIDI Operations Log Add additional recovery step when error occurs establishing communications. Add option to functional test for extended epet or standard epet.	2 Jun 2000	

G	Completed section for special telescope throughput test
	Update Orbit simulation section for 96 hour test
	   Changed strip chart assignments to diagnose safe
	    mode entries
	   Added Alternate control programs
		1 Mar 2000	

F	Clarified the number of command messages expected to be received during the Orbit simulation. Specified the value of the sun vector component for night and day. Add section for special telescope throughput test	8 Feb 2000	

REVISION RECORD

Rev	Description	Date	Approval
E	Removed IEM Side Change procedure from EPET to its own section Removed IEM side change and second instance of test from TIDI Functional Test (EPET). Removed IEM side change and second instance of test from TIDI Abbreviated Functional Test. Clarified setting the enable time for the command messages sent as part of the Orbit Simulation. Added option to stop control program at the end of the orbit simulation. Sending noisy and quiet modes requires execution queue manipulation. Added explanatory note to compatibility test currents.	15 Jan 2000	
D1	Correct names of heater duty cycle telemetry points Correct IEM Side switch procedure Add notation regarding repeated EPET runs		
D	Updates for thermal vacuum cycling test Changed procedure to start EPET Added detail on events to observe during EPET Noted that power is not removed at the end of the EPET Added procedure for Low Voltage Shutdown recovery. Added procedure for instrument compatibility test. Added procedure for spacecraft survival test. Added procedure for printing any OASIS window. Changed Thermal Balance Test Procedure section to Thermal Setpoint Control	11 Dec 1999	
C	Update start and stop procedures to include manual control of tmLogger (auto control removed to permit multiple OASIS) sessions Correct location of tmLogger semaphore files in error recovery sections. Correct tm variable names for thermal balance strip chart setup Added items to observe during the thermal vacuum test Add another error recovery method	16 Dec 1999	
B	Add procedures for thermal balance test Added OASIS error recovery section Remove OASIS startup /shutdown procedure to a separate section	13 Dec 1999	
A	Add procedures for "Event Driven" Orbit simulation Quit OASIS button now terminates TM Logger, §10.3 Abbreviated Functional changed, run_epet_tel procedure installed in OASIS tables Add section for utilities	3 Dec 1999	
	Initial Release	27 Oct 1999	

Contents

1. Introduction

The following sections contain checklists for TIDI operations during spacecraft I&T. It is assumed that the instrument will be operated from the TIDI Flight Payload Operations Center (POC) located at the Space Physics Research Laboratory in Ann Arbor, MI. Each of the following sections contains a checklist for a particular operation. Each of the operations are briefly described below, and a complete checklist for each is supplied in a subsequent section.

1.1 OASIS Startup And Shutdown

The OASIS startup procedure describes the steps required to start and stop the TIDI Real Time Command and Display System. The startup procedure must be completed prior to any operations. This section includes starting and stopping the tmLogger task from within the OASIS task.

(section 3, page 13)

1.2 Instrument Safing

The instrument safing procedure describes the steps required to place the instrument in a safe configuration without switching the instrument off. The procedure stops the execution of control programs and scan tables, then configures the telescopes in a safe state, fully depressed with the shutters closed. This procedure will not interrupt the execution of a command by the flight software, so an extended period may pass between executing this procedure and the achievement of a safe state. In the event of an urgent condition, the TIMED MOC can be instructed to remove power from the instrument at any time without risk to TIDI.

Two versions of the procedure exist. One can be performed from the TIDI RCDS OASIS application and the other from the UNIX command prompt. When executed from the command prompt, telemetry confirmation cannot be viewed.

Recovery from safe mode consists of restarting the control program in the control program holding buffer. The buffer may be reloaded if necessary with a revised control program.

(section 4, page 16)

1.3 Integrated Electronics Module (IEM) Side Change

The TIMED spacecraft flight computer, attitude control computer, guidance and navigation system (GNS) and telemetry system are integrated into a redundant subsystem called the IEM. Each unit is refereed to as an IEM side. When switching from one IEM to the other, certain telemetry packets change identity. This procedure configures the TIDI Real-time Command and Display system to match the spacecraft configuration.

(section 5, page 18)

1.4 Thermal-Vacuum Test

The Thermal-Vacuum Test consists of exposing the spacecraft to a series of temperature environments. After the spacecraft is stabilized at each environment, one or more spacecraft level tests may be performed. At the appropriate point in a spacecraft functional test, the TIDI EPET will be performed. Other tests that may be performed during the Thermal-Vacuum test include orbital simulations of various durations, spacecraft survival tests and instrument compatibility tests. Each of the tests is described in one of the procedure sections. While the thermal vacuum test is underway, a series of routine monitoring activities, described in this section must be maintained.

In addition to the specific tests, the instruments thermal control system must be configured, which is described in Section 7.

The overall schedule of activities for the Thermal-Vacuum Test is contained in the master schedule posted in the operations room.

1.5   Thermal Setpoint Control

The thermal setpoint control procedure describes the method required to change the telescope, profiler, and CCD heater setpoints. These procedures are used periodically during thermal vacuum testing.

1.6   Engineering Performance Evaluation Test (EPET)

The EPET (Engineering Performance Evaluation Test tests the optical and mechanical performance of the instrument. The EPET succeeds if command messages are acknowledged, the instrument cycles through the data collection states specified for the optical test, and the telescopes move without triggering an over-current condition during the mechanical test. Two versions of the EPET exist, the standard version and the extended version. The extended version includes additional tests of the CCD that are most appropriate when the CCD is at its operation temperature, -80 °C.

1.7   Telescope Validation

This procedure is intended to confirm that the TIDI telescopes function correctly after being electronically balanced. The balance procedure requires that two connectors be de-mated prior to the balance procedure and re-mated thereafter. The connectors that are affected by this carry power for the telescope motors, shutter motors and operational heaters. They also carry telescope position information from the LVDT and telescope barrel and pedestal temperatures.

The data sheet for this test is located in the latest version of SPRL document 055-4014.

1.8   Telescope Interference Test

This procedure exercises each telescope in turn over the full range of motion. It is intended to be executed at the completion of the flight blanket installation and dressing to insure that there are no interferences between the telescope and any obstructions. It is executed in coordination with spacecraft personnel who observe each telescope as it moves.

1.9   Telescope Alignment Measurement

This procedure supports the theodolite measurement of the telescope alignments relative to the spacecraft reference frame. The telescope thermal-mechanical elevation compensation is enabled. In coordination with the personnel making the theodolite measurements, the telescope under test is moved to the travel midpoint and 5 degrees on either side.

1.10   Flight Software Load

The procedure for flight software loads describes the method for loading a complete image of the flight software into the instrument processor and confirm that it correctly loaded. This procedure may be executed when either boot code or instrument code is running.

(section 9, page 23)

1.11   Initial Operations

Initial operations are defined in "Instrument Activation Scenario", SPRL File 055-3757 and include both real-time and stored program operations. Real time operations are required when power switching must be coordinated with instrument commanding. The checklists for performing the initial operations that require real time contacts are included in this document.

1.11.1   Aliveness Test

The aliveness test is intended to check for gross electrical faults. The instrument is switched on, the state of the instrument is checked in the health and safety telemetry and a no-op command message is sent.

(section 13, page 30)

1.11.2   Computer Self Test

The computer self test confirms that the computer can perform normal data collection. It is similar to the aliveness test, but commands to the computer replace the no-op command.

(section 14, page 31)

1.11.3   Mechanism Test

The mechanism test switches on the instrument and exercises the telescopes, filter wheels and shutters. In flight, the instrument remains powered at the conclusion of this test.

(section 15, page 32)

1.11.4   Optical Test

The activation optics test confirms that the alignment and performance of the optical elements within the profiler have not been adversely affected by launch and deployment.

(section 16, page 33)

1.11.5   Telescope Cover Deployment

The procedure places the telescopes in the configuration for the deployment of the telescope covers. Once the configuration is confirmed by the TIDI operator, the spacecraft operators are directed to release the covers.

(section 17, page 34)

1.12   Orbit Simulation

The orbit simulation, is intended to simulate actual on orbit operations. Included in the test are preflight actions to load the Spacecraft Mission Operations Center (MOC) with command messages to be transmitted during the simulated ground stations contacts, initialization activities to activate the instrument and begin measurements, and observations of the response of the instrument to various events.

The orbit simulation may be followed by a low voltage sense shutdown test, if it is not, the control program must be manually stopped. This section also includes the procedure for stopping the control program.

(section 18, page 35)

1.13   Instrument Compatibility Test

The instrument compatibility test is a spacecraft level test intended to detect interference between spacecraft subsystems and instruments. In this test, each instrument is placed in a "listening" or quiet mode, in turn. All other instruments and spacecraft subsystems are placed in the noisy mode. Real-time evaluation of the performance of TIDI is made by observing the pseudo-tm point "counts sigma" on a strip chart. If the value exceeds 1.5, a possible compatibility problem exists.

1.14   Spacecraft Survival Test

The spacecraft survival test is a spacecraft level test intended to confirm that the instruments and spacecraft subsystems will operated correctly over the full main bus voltage range. The test consists of operating all instruments in their noisy modes while the spacecraft main bus voltage is increased from the nominal value up to 35 V and then decreased to 24 V. At 24 V power is removed and then reapplied to each instrument in turn.

1.15   Telescope Throughput Special Test

This section, page 41, provides the procedure used to determine optical continuity from the telescope through the interferometer to the CCD. It requires an external calibration source that is controlled by a PC and an HP data acquisition switch. The PC and the data acquisition switch form another source of telemetry and a command distributor that OASIS interacts with. The procedure is performed once for each telescope.

1.16   OASIS Error Recovery

This section provides procedure checklists for recovery from common OASIS mis-configurations. These include missing CSTOL procedures, temporary file deletions, data server problems, and resource limitations on the workstation.

1.17   Utility Procedures

This section documents the use of a number of supporting programs. These include a program to print a copy of any OASIS window to the TIDI color printer, a TIMED mission clock, and a utility to find and display the description of scanning and binning tables. Procedures to control the telemetry logging process from the command prompt are included. The procedures to maintain the command block files, to construct a daily control program load and to transmit command block files with OASIS commands and with UNIX commands are included. The procedure to post an OASIS page on a remote computer is shown. The procedure to reboot the TIDI instrument processor using the OASIS interface is included. The UNIX commands to establish and terminate a PPP connection to the TIMED MOC is also included.

2.   Completion of the TIDI Operations Log

Maintaining complete and accurate records of the operation of the TIDI instrument is fundamental to the successful outcome of the TIDI project. A major component of the record keeping is the Operations Log. A sample page is shown in Figure 1, on page 12. This log is completed during the test and is used to record the commands issued to the instrument, the operation of the ground station and to note any significant events or discrepancies. The instrument log shall be transcribed into a shared data base that any team member can view.

The top section of the log sheet identifies the operation being performed and is completed at the start of a test or operation. The test name as specified in the day's schedule of events is recorded in the first line. The intent of the test is recorded in the second field. This should be complete enough that an informed outsider can understand the goal of the operation. The individual issuing commands to the ground system is recorded as the Operator and the engineer or scientist who requested that the operation be performed is recorded as the Conductor. Routine tests may have only an Operator and not a Conductor.

The second section of the log sheet summarizes the configuration of the operation. The start time is recorded both in universal time (UTC) and mission time if available. At the conclusion of the test, the ending time is recorded where indicated on the form. The class of the test is recorded by marking one of the circular buttons. The classes are defined in Table 1.

Table 1 Operations Classes	
class	description
epet	routine collection of instrument performance trend data
cal	detailed collection data from which the instrument transfer function may be obtained
special	operation of the instrument to support a special objective
orbit	simulation of orbital operations

The location of the test is recorded by checking the appropriate boxes in the field labeled Location. The vacuum chamber box may be selected along with either the SPRL or APL box when that is appropriate. The environmental conditions at the start of the test are recorded by noting the CCD temperature and the barometric pressure. The barometric pressure is recorded by marking either ambient or vacuum in the Pressure field.

This section is completed by noting the name of the Level 0 file created for the calibration or epet data after the stop_logger command is executed. The file name is determined by checking in the directory /data/tidi/level0/inbox for the file created. If a problem report or test report is subsequently produced, the document number and name is recorded when available.

The third and forth sections of the log used to record the sequence of events as they occur. Events to be recorded include the ground system start up, instrument activation and deactivation, commands transmitted by selecting options under the "Commands" menu , commands issued from the CSTOL_PROMPT window, and the start or end of a CSTOL procedure. The mission time, date and time of each event is to be noted. Should additional amplification about an event be required the notes section of the log is used. The number of the event requiring further amplification is recorded in the column labeled event and the additional narrative is recorded in the remaining column.

An operations log sheet is closed, recording the end time and level 0 file name, when a calibration or epet CSTOL procedure completes, when a spacecraft test procedure is completed, when the space on the sheet for events is exhausted or when a change of operator occurs.

TIDI OPERATIONS LOG

Test Name _____ page

Test Intent _____

Operator _____ Conductor _____

Summary

	mission time	utc date	time		Class	○ epet ○ cal ○ special ○ orbit
Start					Location	☐ sprl ☐ vacuum chamber
End						☐ apl ☐ launch site
					Press	○ ambient ○ vacuum
					CCD Temp	

Level 0 File _____

Problem Report _____

Test Report _____

Chronological Test Log

event	mission time	utc date	time	Event Description / Command
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Notes

event

created   updated

Figure 1, TIDI Operations Log

3. OASIS Startup and Instrument Activation

1   Confirm that tmLogger is shut down

1.1   At the UNIX prompt type
```
checkLogger O
```

1.2   If checkLogger reports that there are missing processes , reset the tmLogger stream by typing:
```
resetLogger O
```
Reply "Y" to the confirmation request.

1.3   If checkLogger reports that tmLogger is running, stop it by typing
```
abortLogger O
```
Confirm that tmLogger has terminated by repeating item 1.1 and if indicated, item 1.2

2   Start OASIS

2.1   At the UNIX prompt, type:
```
go_rcds
```
followed by:
```
oasis
```

2.2   Once the program starts, click in the CSTOL_PROMPT window and type:
```
start init_session
```

2.3   Configure OASIS pages and graphical displays as needed.

2.3.1   Display the OASIS main title bar in each workspace. Right click on the title bar and select the workspaces to contain the title bar.

3   Establish communications with the MOC

3.1   When the init_session procedure completes, click the "Link Control" button.

3.2   Select the IEM side appropriate to the test

3.3   Select the telemetry server to use, tdmc-ts4.

3.4   Click the "Connect to MOC" button

3.5   If an error establishing the socket connection is reported by OASIS:

3.5.1   Click in the CSTOL_PROMPT window and type:
```
return all
```
3.5.2   Click in a terminal window and repeat item 1.

3.5.3   Repeat items 3.2 and 3.4.

3.5.4   If error persists, click in a terminal window and use the command:
```
ps –flea | grep ogger
```
to identify any "rogue" tmLogger processes. Use the UNIX `kill` command to abort them.

3.6   Telemetry is flowing if the mission time is incrementing.

4   Start telemetry logging
Telemetry logging is not required if previously started or when starting a second, concurrent OASIS session.

4.1   Click in the CSTOL_PROMPT window and type:
```
start_logger 10000 01:00:00 O
```

4.2   Confirm that the tmLogger is running.
        Click in a terminal window and type:
                `checkLogger 0`

5   Instrument Activation

5.1   Inform test conductor the TIDI may be powered up.

5.2   Request that the TIDI execution queue be enabled.

5.3   When powered up, boot instrument software if needed. The instrument software will start after a delay of 5 minutes. You can check if the instrument software is running on the health and safety page. If software mode is reported as **BOOTING,** the flight software must be booted. If it is reported as **RUNNING**, the flight software has booted up. This indication is only valid after TIDI power has been applied.

5.3.1   To boot instrument software, select "Boot Code Commands" from the Commands menu.

5.3.2   Send Boot Now.

6   Shut down OASIS

6.1   Stop tmLogger if required

6.1.1   Click in the CSTOL_PROMPT window

6.1.2   Type the command:
```
stop_logger 0
```

6.2   Exit from OASIS

6.2.1   Select the QUIT button

6.2.2   Reply to the confirmation query with Y.

6.3   Confirm that the tmLogger stream has stopped, repeating item 1, page 13

4.   Instrument Safing Procedure

4.1   Real-Time Command And Display Procedure

This procedure may be used while running the TIDI OASIS application. It can take several minutes for the instrument to achieve the safe state. If the instrument health is in immediate danger, the TIMED MOC can switch of TIDI at any time without danger to the instrument.

1   Join the TIMED Voice Network

1.1   Use the instructions in the procedures Notebook

2   Start OASIS using the procedure in Section 3, page 13.

2.1   Insure that the Health and Safety panel is displayed

3   Transmit safing commands

3.1   Select the "Control Program Status" panel from the "PANELS" menu.

3.2   Transmit the safing command sequence

3.2.1   Request that the test conductor disable the TIDI execution queue.

3.2.2   Select the "Stored Commands" item from the "COMMANDS" menu.

3.2.3   Select "!safeTIDI" from the list of command block files.

3.2.4   Click Send.

3.2.5   When prompted by the blue screen, request that the test conductor enable the execution queue.

4   Confirm safe mode entry

4.1   Confirm that the control program run state on the "Control Program Status" panel is HALTED

4.2   Examine the Health and Safety Page

4.2.1   Confirm that the instrument is not scanning.

4.2.2   Confirm that all telescopes are at or near 30.3° elevation

4.2.3   Confirm that all shutters are closed..

5   Shutdown Oasis using the procedure in Section 3, item 6, page 15.

4.2   UNIX Procedure

This procedure may be during any time. However, if the MOC is not in communications with the TIMED satellite, there will be no effect until communications is established.

1   Log into the TIDI POC workstation as OASIS1 or OASIS2

2   Transmit safing commands

2.1   At the UNIX prompt type the command
```
sendCM /tidi/flt_ticl/tcmd/"!safeTIDI.tcmd"
```

4.3 Recovery Procedure

The recovery procedure may be used at any time. The command messages issued during the procedure will be held in the MOC queues until communications with the spacecraft is established.

1   Join the TIMED Voice Network

  1.1   Use the instructions in the procedures Notebook

2   Start OASIS using the procedure in Section 3, page 13.

  2.1   Insure that the Health and Safety panel is displayed

3   Load a revised control program if necessary
If resolution of the anomaly that required the safe mode entry includes a new or modified control program , it must be transmitted to the instrument. Once that control program is identified or constructed, perform this step.

  3.1   Request that the test conductor disable the TIDI execution queue.

  3.2   Select the "Stored Commands" item from the "COMMANDS" menu.

  3.3   Select the appropriate command block file from the list.

  3.4   Click Send.

  3.5   When prompted by the blue screen, request that the test conductor enable the execution queue.

4   Start the control program

  4.1   Check the validation status of the control program on the control program status page. If the control program is reported as **INVALID**, the control program must be retransmitted. If it is reported as **VALID**, it may be started.

  4.2   To retransmit the control program if the holding buffer is invalid, repeat item 3, above.

  4.3   To start the control program
      4.3.1   Select "Control Program Commands" from the Commands menu.
      4.3.2   Send Start Control Program.

5   Confirm control program operation

  5.1   Check the control program run state on the control program status panel. It should be running.

  5.2   Check the control program ID on the control program status panel. It should contain the value specified in the program statement in the selected control program.

  5.3   Confirm that the instrument is scanning.

5. Integrated Electronics Module (IEM) Side Change

1   **Shut down the tmLogger**

   1.1   Click in the CSTOL_PROMPT window.

   1.2   Type the command
   ```
   stop_logger O
   ```

2   **Disconnect oasis from the tm server.**

   2.1   Click the "Link Control" button

   2.2   Click "Disconnect"

3   **Establish communications with the MOC**

   3.1   When the init_session procedure completes, click the "Link Control" button.

   3.2   Select the IEM side appropriate to the test

   3.3   Click the "Connect to MOC" button

   3.4   If an error establishing the socket connection is reported by OASIS:
      3.4.1   Click in the CSTOL_PROMPT window and type:
      ```
      return all
      ```
      3.4.2   Click in a terminal window and repeat item 1.
      3.4.3   Repeat items 3.2 and 3.4.

   3.5   Telemetry is flowing if the mission time is incrementing.

4   **Start telemetry logging**

   4.1   Click in the CSTOL_PROMPT window and type:
   ```
   start_logger 10000 01:00:00 O
   ```

   4.2   Confirm that the tmLogger is running.
   Click in a terminal window and type:
   ```
   checkLogger O
   ```

6. TIMED Thermal Vacuum Test

1   Monitor the TIMED Voice Network for announcements

1.1   Join the TIMED Voice Network at 25 and 55 minutes past the hour

1.2   Announcements are made on the half hour and on the hour.

1.3   Note any announcements that affect TIDI

2   Monitor the TIDI Thermal Control System.

2.1   Observe the thermal control system events as described in Section 7, page 20.

2.2   Change the thermal control system setpoints according to the master schedule using the procedure of Section 7, page 20.

2.2.1   Setpoint changes are made at the start of transitions from one spacecraft thermal environment to another.

2.2.2   Setpoints may need to be re-established anytime power is cycled on the instrument.

3   Monitor the TIDI Telemetry Logger

3.1   Click in a terminal window.

3.2   At the UNIX prompt type
```
checkLogger O
```

3.3   If checkLogger reports that there are missing processes, reset and restart the tmLogger stream.

3.3.1   Reset the stream by typing in the terminal window at the UNIX prompt:
```
resetLogger O
```
Reply "Y" to the confirmation request.

3.3.2   Restart telemetry logging.
3.3.2.1   Click in the CSTOL_PROMPT window and type
```
start_logger 10000 01:00:00 O
```
3.3.2.2   Repeat items 3.1 and 3.2 above, to confirm that the telemetry logging stream has restarted.

7.   Thermal Setpoint Control

1   Configure Thermal Control Setpoints

1.1   Click in the CSTOL_PROMPT window

1.2   Load and start the thermal control configuration program by typing the command:

   start tv_setpoints *n*

where "n" is the case number selected from the following table.

1.3   Confirm that the temperature setpoints have changed by examining the TIDI Temperatures panel

Case	Telescope Setpoint	Profiler Setpoint	CCD Housing Setpoint	CCD Setpoint
1	-20. °C	25.°C	-60.°C	-80.°C
2	40.	25.	-60.	-80.
3	40.	20.	-60.	-80.
4	-20.	20.	-40.	-80.
5	-20.	15.	-50.	-80.
6	40.	15.	-50.	-80.

2   Observe Events

2.1   Confirm that the TIDI survival heaters are off. The indicator is on the TIDI Health and Safety page. The tell-tale to the right of the survival heater current display should be black when the heaters are off and white when they are on.

2.2   Confirm that the TIDI operational heaters are on. The indicator is on the TIDI Health and Safety page. The tell-tale to the right of the operational heater current display should be white when they are on and black when the heaters are off.

2.3   Monitor the thermal control duty cycles shown on the TIDI Temperatures page or on the strip charts. Notify David Gell or Jon Harvey if they decrease to zero.

2.4   Confirm the TIDI operational heaters are in the automatic mode. The mode for each heater is reported on the TIDI Temperature panel. If any of the heaters are reported as **MANUAL** repeat item 1, page 20.

8. TIDI Functional Test (EPET)

1   Join the TIMED Voice Network

1.1   Use the instructions in the procedures Notebook

2   Start OASIS using the procedure in Section 3, page 13.

2.1   Configure panels.

2.1.1   Select the Panels workspace

2.1.2   Display the TIDI Temperatures panel
2.1.2.1   Click the "Panels" button
2.1.2.2   Click the "TIDI Temps" button

2.1.3   Display the Profiler Status
2.1.3.1   Click the "Panels" button
2.1.3.2   Click the "Profiler Status" button

2.1.4   Display the Telescope Status
2.1.4.1   Click the "Panels" button
2.1.4.2   Click the "Telescope Status" button

2.1.5   Display the Power Status
2.1.5.1   Click the "Panels" button
2.1.5.2   Click the "Power Status" button

2.2   Configure Spectra Displays

2.2.1   Select the Spectra workspace
2.2.1.1   Click the "Graphics" button
2.2.1.2   Click the "Spectra 1" button
2.2.1.3   Click the "Graphics" button
2.2.1.4   Click the "Spectra 2" button
2.2.1.5   Click the "Graphics" button
2.2.1.6   Click the "Spectra 3" button

3   Execute the functional test (EPET)

3.1   Click in the CSTOL_PROMPT window.

3.2   Start the EPET

3.2.1   For the extended EPET, type the command:
```
start run_tv_epet load, n
```
where "n" is the number of epets scheduled for the functional test. A value of zero performs continuous epets.

3.2.2   For the standard EPET, type the command:
```
start run_epet n
```
where "n" is the number of epets scheduled for the functional test. A value of zero performs continuous epets.

3.3   When prompted by the script, request that the test conductor disable the TIDI execution queue.

3.4   When prompted by the blue screen, request that the test conductor enable the execution queue.

3.5   The test is complete when the message
```
run_tv_epet procedure completed
```
appears in the OASIS message window.

4   Observe Events

4.1   Observe that the instrument is in operating mode.

4.2 Periodically check that tmLogger stream E is running.

    4.2.1 Click in a terminal window and type:

```
checkLogger E
```

    4.2.2 If checkLogger reports that there are missing processes, contact David Gell.

4.3 Periodically check that the thermal control system is operating correctly. See Section 7, page 20.

5 Power down TIDI (Not required during thermal vacuum testing).

5.1 Inform the test conductor that TIDI may be shut down.

6 Shutdown Oasis using the procedure in Section 3, item 6, page 15 (Not required during thermal vacuum testing).

9. Telescope Validation

1 Obtain the Validation data sheet and checklist in document 055-4014 (latest revision)

1.1   Join the TIMED Voice Network

1.2   Use the instructions in the procedures Notebook

2 Start OASIS using the procedure in Section 3, page 13.

2.1   Insure that the Health and Safety panel is displayed

2.2   Insure that the Telescope Status panel is displayed

3 Execute the procedure specified in 055-4014, "Telescope Validation Procedure".

3.1   Check mark each step in the procedure as it completed.

3.2   Record the specified information on the check list

3.3   When the procedure is finished, file the completed checklist and data sheet in the operations logbook.

4 Power down TIDI if no additional tests are required

4.1   Inform the test conductor that TIDI may be shut down

4.2   Confirm that power has been removed from the instrument.

5 Shutdown Oasis using the procedure in Section 3, item 6, page 15.

10.   Telescope Interference Test

1   Join the TIMED Voice Network

1.1   Use the instructions in the procedures Notebook

2   Start OASIS using the procedure in Section 3, page 13.

2.1   Insure that the Health and Safety panel is displayed

2.2   Insure that the Telescope Status panel is displayed

3   Configure the instrument for the test

3.1   Request that the test conductor enable the TIDI execution queue.

3.2   Disable all telescope elevation compensation adjustments.
    3.2.1   Select "Stored Commands" from the "COMMANDS" menu.
    3.2.2   Select the noCompConfig.tcmd command block file and click send.
    3.2.3   Confirm that compensations are disabled on the Telescope Status panel
    3.2.4   Confirm that the instrument is in operating mode on the Health and
                Safety panel

4   Exercise each telescope in coordination with the clean room staff

4.1   Load the telescope scan table for the telescope of interest
    4.1.1   Select the "Scanning Binning" item from the "COMMANDS" menu.
    4.1.2   Type the full path of scan table file into the "Load Scan Table" text box.
                The path is
                        `/tidi/flt_ticl/scans/exerciseTelN.scan`
                where "*N*" is the telescope number.
    4.1.3   Click send

4.2   Start the scan table
    4.2.1   Click the "Start Scanning" send button
    4.2.2   Check the scan step number on the health and safety panel. It should be
                incrementing.
    4.2.3   Check that the correct telescope is moving.

4.3   Inform the clean room personnel that the telescope is in motion

4.4   Stop telescope motion when requested by clean room personnel.
    4.4.1   Select the "Scanning Binning" item from the "COMMANDS" menu.
    4.4.2   Click the "now" option in the "Stop Scanning" item.
    4.4.3   Click the "Stop Scanning" send button.
    4.4.4   Check that the scan step number on the health and safety page. It should
                remain constant.

**5   Record any observations reported by the clean room personnel in the operations
        log.**

6   When the test is complete, remove power from TIDI.

    6.1   Inform the test conductor that TIDI may be shut down

    6.2   Confirm that power has been removed from the instrument.

7   Shutdown Oasis using the procedure in Section 3, item 6, page 15.

11. Telescope Alignment Measurement

1   **Join the TIMED Voice Network**

     1.1   Use the instructions in the procedures Notebook

2   **Start OASIS using the procedure in Section 3, page 13.**

     2.1   Insure that the Health and Safety panel is displayed

     2.2   Insure that the Telescope Status panel is displayed

3   **Configure the instrument for the test**

     3.1   Request that the test conductor enable the TIDI execution queue.

     3.2   Enable telescope thermal-mechanical compensation.
         3.2.1   Select "Stored Commands" from the "COMMANDS" menu.
         3.2.2   Select the tele_align_setup.tcmd command block file and click send.
         3.2.3   Confirm that the attitude and oblateness compensations are disabled on the Telescope Status panel

4   **Position telescopes as requested by the theodolite operator.**

     4.1   Select the "Mechanism Control" item from the Commands menu.

     4.2   Select the telescope of interest with the telescope position radio buttons.

     4.3   Type the requested angle into the telescope position text box and click send.

     4.4   Inform the clean room personnel that the telescope is in motion.

     4.5   Inform the clean room when the telescope position is achieved.

null relative positions	command angle
minimum	10.8
maximum	29.8
-5.0	15.3
-2.5	17.8
0.0	20.3
+2.5	22.8
+5.0	25.3
Note: The encoder limits are 10.305° and 30.295°	

5   **Snap the Telescope Status panel using the utility procedure of section ¡23.1 page 45**

     5.1   Snap the panel.

     5.2   Annotate snap shot with the telescope of interest and the commanded angle.

6   **Record any observations reported by the clean room personnel in the operations log.**

7   **When the test is complete, remove power from TIDI.**

     7.1   Inform the test conductor that TIDI may be shut down.

     7.2   Confirm that power has been removed from the instrument.

8   **Shutdown Oasis using the procedure in Section 3, item 6, page 15.**

12. Flight Software Load

1   **Obtain the release notes from the flight software developer and note the length and crc for the version of the software to be loaded. The cumulative release note document for TIDI flight software is 055-4032.**

2   **Select the bank to be loaded**

    2.1   For bank one the software load will be contained in a file named
        `/homes/musko/iswload1_ver_xx.hex`
        where "*xx*" is the version number.

    2.2   For bank two the software load will be contained in a file named
        `/homes/musko/iswload2_ver_xx.hex`
        where "*xx*" is the version number.

    2.3   Update the file /tidi/flt_ticl/load_fs.ticl to specify the selected file.
        2.3.1   Check out the load_fs.ticl from the configuration management system.
        2.3.2   Change the file name in the .purpose statement to the selected file.
        2.3.3   Change the file name in the load_mem command to the selected file.
        2.3.4   Check in the load_fs.ticl file to the configuration management system.

3   **Build the command block file and stage it.**

    3.1   Use the ticlBuilder command to compile the control program.
        3.1.1   At the unix prompt make your current group the tidi group
                `newgrp tidi`
        3.1.2   Make the current working directory the ticl source directory
                `cd /tidi/flt_ticl/ticl`
        3.1.3   Recompile the load_fs.ticl program using the ticlBuilder script
                ticlBuiler –r

    3.2   Stage the command messages .
        3.2.1   Select an up-link enable time prior to the contacts selected for the upload.
        3.2.2   Stage the command block file using the "UNIX Prompt Procedure" of section 23.5, page 46.

4   **Verify the flight software load**

    4.1   Join the TIMED Voice Network
        4.1.1   Use the instructions in the procedures Notebook

    4.2   Start OASIS using the procedure in Section 3, page 13.
        4.2.1   Insure that the Health and Safety panel is displayed

    4.3   Confirm that the flight software was loaded correctly.
        4.3.1   Check the length of the software received.
             4.3.1.1   Select the "Memory Commands" item from the "COMMANDS" menu.
             4.3.1.2   Type `30000` into the dump memory address field.
             4.3.1.3   Type 2 into the dump memory length field.
             4.3.1.4   click send.
             4.3.1.5   The memory dump display page will appear. Confirm that the bytes at 030000H and 030002H contain the length as specified in the release notes.
        4.3.2   Confirm that the CRC validates.

4.3.2.1   Select the "Memory Commands" item from the "COMMANDS" menu.

4.3.2.2   Type `30002` into the calculate crc address field.

4.3.2.3   Type the length from the release notes into the calculate crc length field. Note that the length is a hexadecimal number.

4.3.2.4   Click send.

4.3.2.5   The crc report will appear in the message window. Confirm that the calculated crc is zero.

4.4   The software loaded correctly if the length reported in item 5.1 matches the length recorded in the release notes and the crc reported in item 5.2 is zero.

5   Shutdown Oasis using the procedure in Section 3, item 6, page 15.

6   Record the flight software upload in the TIDI document "9999—TIDI! Activities! Plan.xls"

13. Initial Operations – Aliveness Test

1 Join the TIMED Voice Network

1.1 Use the instructions in the procedures Notebook

2 Start OASIS using the procedure in Section 3, page 13.

2.1 Insure that the Health and Safety panel is displayed

3 Execute the Aliveness Test

3.1 Click in the CSTOL_PROMPT Window

3.2 Type the command:
  start aliveness

3.3 When prompted by the script, request that the test conductor enable the TIDI execution queue.

3.4 When prompted by the script, request that the test conductor apply power to the instrument.

3.5 When the prompt
  "Confirm telescope, shutter, and filter wheel positions OK [y|n]"
  appears confirm the following conditions on the health and safety page:
  3.5.1 Heartbeat indicator blinking
  3.5.2 Software Mode: BOOTING
  3.5.3 Safe Mode: SAFE_MODE
  3.5.4 Auto Safe Mode: SM_ENABLED
  3.5.5 Telescope Positions: Approximately 29.0
  3.5.6 Telescope Position Error Telltales: GREEN
  3.5.7 Shutter Position Telltales: BLACK (closed)
  3.5.8 Filter Wheel Positions: 1
  3.5.9 Filter Wheel Position Error Telltales: GREEN
  3.5.10 Instrument Current: Approximately 0.64 A

3.6 Reply "Y" to the confirmation request

3.7 When prompted by the script, request that the test conductor remove power from the instrument

3.8 Confirm that the test succeeded by checking the message log page
  3.8.1 If the message "**Aliveness–Test succeeded**" is shown, the test succeeded
  3.8.2 If the message "**Aliveness–Test failed**" is shown, the test failed.

4 Shutdown Oasis using the procedure in Section 3, item 6, page 15.

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14.   Initial Operations – Computer Self-Test

1   Join the TIMED Voice Network

    1.1   Use the instructions in the procedures Notebook

2   Start OASIS using the procedure in Section 3, page 13.

    2.1   Insure that the Health and Safety panel is displayed

3   Execute the Computer Self-Test

    3.1   Click in the CSTOL_PROMPT Window

    3.2   Type the command:

```
start computer_test
```

    3.3   When prompted by the script, request that the test conductor enable the TIDI execution queue.

    3.4   When prompted by the script, request that the test conductor apply power to the instrument.

    3.5   Observe the results of the CRC computations in the OASIS message window.

    3.6   When prompted by the script, request that the test conductor remove power from the instrument

    3.7   Confirm that the test succeeded by checking the message log page

        1.1.1   If the message "**ComputerTest-Test succeeded**" is shown, the test succeeded

        1.1.2   If the message "**ComputerTest–Test failed**" is shown, the test failed.

4   Shutdown Oasis using the procedure in Section 3, item 6, page 15.

15. Initial Operations – Mechanism Test

1   Join the TIMED Voice Network

1.1   Use the instructions in the procedures Notebook

2   Start OASIS using the procedure in Section 3, page 13.

2.1   Insure that the Health and Safety panel is displayed

3   Execute the Aliveness Test

3.1   Click in the CSTOL_PROMPT Window

3.2   Type the command:
         start activate_mech

3.3   When prompted by the script, request that the test conductor enable the TIDI execution queue.

3.4   When prompted by the script, request that the test conductor apply power to the instrument.

3.5   When prompted by the script, request that the test conductor disable the TIDI execution queue.

3.6   When prompted by the blue screen, request that the test conductor enable the execution queue.

3.7   Inform test conductor that instrument power will remain on.

4   Verify results

4.1   Procedure Pending

5   Shutdown Oasis using the procedure in Section 3, item 6, page 15.

16.   Initial Operations – Optical Test

1   Join the TIMED Voice Network

1.1   Use the instructions in the procedures Notebook

2   Start OASIS using the procedure in Section 3, page 13.

2.1   Insure that the Health and Safety panel is displayed

3   Load the control program

3.1   Select the "Control Program Status" panel from the "PANELS" menu.

3.2   Transmit the activationOptics control program
        3.2.1   Request that the test conductor disable the TIDI execution queue.
        3.2.2   Select the "Stored Commands" item from the "COMMANDS" menu.
        3.2.3   Select "activationOptics.tcmd" from the list of command block files.
        3.2.4   Click Send.
        3.2.5   When prompted by the blue screen, request that the test conductor enable the execution queue.

4   Start the control program

4.1   Check the validation status of the control program on the control program status page. If the control program is reported as INVALID, the control program must be retransmitted. If it is reported as VALID, it may be started.

4.2   To retransmit the control program if the holding buffer is invalid, repeat item 3

4.3   To start the control program
        4.3.1   Select "Control Program Commands" from the Commands menu.
        4.3.2   Send Start Control Program.

5   Confirm control program operation

5.1   Check the control program run state on the control program status panel. It should be running.

5.2   Check the control program ID on the control program status panel. It should be 5030.

5.3   Confirm that the instrument is scanning.

6   Verify results

6.1   Procedure Pending

7   Shutdown Oasis using the procedure in Section 3, item 6, page 15.

17. Initial Operations – Telescope Cover Deployment

1   Join the TIMED Voice Network

    1.1   Use the instructions in the procedures Notebook

2   Start OASIS using the procedure in Section 3, page 13.

    2.1   Insure that the Health and Safety panel is displayed

    2.2   Insure that the TIMED status panel is displayed.

3   Execute the Cover Deployment Configuration Procedure

    3.1   Request that the test conductor enable the TIDI execution queue.

    3.2   Click in the CSTOL_PROMPT Window

    3.3   Type the command:
```
start cover_release
```
        If required, the procedure will boot the instrument software, abort a running control program, and stop scan table execution.

    3.4   When the prompt
            "Confirm telescopes fully depressed and shutters closed [y|n]"
        appears confirm the following conditions on the health and safety page:

        3.4.1   Heartbeat indicator blinking

        3.4.2   Telescope Positions: Approximately 29.0

        3.4.3   Telescope Position Error Telltales: GREEN

        3.4.4   Shutter Position Telltales: BLACK (closed)

    3.5   Reply "Y" to the confirmation request

    3.6   When prompted by the script, inform the test conductor that TIDI is configured for cover release.

    3.7   Observe the pyro firing commands on the TIMED status page

4   Shutdown Oasis using the procedure in Section 3, item 6, page 15.

18.   Orbit Simulation

1   Initialize Simulation

1.1   Start OASIS using the procedure in Section 3, page 13.
Configure the strip charts as shown in Table 2

Table 2
Orbit Simulation Strip Chart Configuration

Strip Chart		variable 1	variable 2	variable 3	variable 4
1	data item	sci_state tel1_elev	sci_state tel2_elev	sci_state tel3_elev	sci_state tel4_elev
	data type	EV§	EV§	EV§	EV§
	nominal value	scanning	scanning	scanning	scanning
2	data item	spacecraft warn_1_val_stat	spacecraft warn_2_val_stat	spacecraft pos_valid_stat	spacecraft att_valid_stat
	data type	DN§	DN§	DN§	DN§
	nominal value	1	1	1	1
3	data item	spacecraft low_volt_stat	spacecraft tidi_pwr_stat	spacecraft yaw_stat	spacecraft sun_safe_att
	data type	DN§	DN§	DN§	DN§
	nominal value	0	0	0	0
4	data item	sys safe_mode_state	spacecraft sun_v_valid_stat	spacecraft stat_age	spacecraft panel_rot_stat
	data type	DN§	DN§	DN§	DN
	nominal value	0	1	< 3	0
5	data item	spacecraft sun_vector_x	spacecraft sun_vector_y	spacecraft sun_vector_z	unused
	data type	EV§	EV§	EV§	
	nominal value				
§ DN is Data Number EV is Engineering Value					

1.2   Load and start the initial ticl control program

1.2.1   Select the "Control Program Status" panel from the "PANELS" menu.

1.2.2   Transmit the science data collection control program

1.2.2.1 Inform the SEE POC that a large command load is pending. If requested, wait until SEE commanding has a lull.

1.2.2.2 Request that the test conductor disable the TIDI execution queue

1.2.2.3 Select the "Stored Commands" item from the commands menu.

1.2.2.4 Select "dNomBeta_nBaseline.tcmd" from the list of command block files.

1.2.2.5 Click Send

1.2.2.6 When prompted by the blue screen, request that the test conductor enable the execution queue.

   1.2.3 Start the control program

     1.2.3.1 Check the validation status of the control program on the control program status page. If the control program is reported as INVALID, the control program must be retransmitted. If it is reported as VALID, it may be started.

     1.2.3.2 To retransmit the control program if the holding buffer is invalid, repeat item 1.2.2.

     1.2.3.3 To start the control program

       1.2.3.3.1 Select "Control Program Commands" from the Commands menu.

       1.2.3.3.2 Send Start Control Program.

   1.2.4 Confirm control program operation

     1.2.4.1 Check the control program run state on the control program status panel. It should be EXECUTING.

     1.2.4.2 Check the control program ID on the control program status panel. It should be 10010.

     1.2.4.3 Confirm that the instrument is in operating mode.

     1.2.4.4 Confirm that the instrument is scanning.

2 Observe Events

2.1 Observe that the instrument is in operating mode

2.2 Observe that automatic safe mode entry is enabled (reported on the health and safety panel)

2.3 Observe the transitions between day and night science modes as reflected in the telescope elevation profiles and the scan table identifiers.

2.4 Observe the transition between ticl programs at the change of the day. The control program ID shown on the control program status will have value 10010 during simulation days 182 and 183, 10030 during day 184, 10020 during day 185.

2.5 Observe that the data displayed on the strip charts remains at the nominal value.

   2.5.1 Report off-nominal values, the ground time and the mission time to the test conductor.

   2.5.2 Log all occurrences of tidi entering safe mode.

2.6 Observe that the day to night transitions occur when the z component of the sun vector is 0. The z-component is less than zero during the day and greater than zero during the night.

2.7 Monitor for sun avoidance on the telescope panel at terminator crossings.

2.8 Observe that TIDI enters safe mode at the YAW maneuver

2.9 Observe that the value of the SAA flag on any spectra panel changes at the South Atlantic Anomaly entries and exits.

2.10 Observe that the solar array status on the health and safety panel changes from NOT_ROTATING to ROTATING at the SA rotation event.

2.11 Observe that command messages are received during the first contact after the enable time specified in item 3.1.1. Observe that the total number is the same as the number queued.

2.12 Monitor the instrument for anomalous behavior.

3 Package and Transmit Daily Driver
Completion required before the start of each simulation day

3.1   Transmit command messages to the MOC

      3.1.1   Ensure that the effective group id is tidi by typing the following command at the UNIX prompt:

```
newgrp tidi
```

      3.1.2   At the UNIX prompt type on one line:

```
sendCM –e YYYYdoyhh0000 –d 23:59:59 –i 2
        /tidi/flt_ticl/tcmd/driver.tcmd
```

YYYY is the current year
doy is the day of the year (1-366), and
*hh*0000 is the command message enable time.

 driver.tcmd is the control program for the following day. It should be selected from Table 3.

Table 3 Day Driver Control Programs			
Upload	Control Program	Program ID	cmd message count
1	dOptCont_nAlignConf.tcmd	10030	42
2	lineSurveyDriver.tcmd	10020	53
3	dHighBeta_nBaseline.tcmd	10040	29
4	dNomBeta_nBaseline.tcmd	10010	29

      3.1.3   Confirm that each ftp session is successful
           3.1.3.1   No time outs
           3.1.3.2   No ftp errors

      3.1.4   Note the command message sequence numbers. The file names are of the form **TI*nnnnn*** where "***nnnnn***" is the sequence number.

      3.1.5   Note the total number of command messages queued in the log. The sendCM script reports the total number of command message sent. The number of command messages for each control program as of the date of this issue is noted in Table 3.

3.2   Confirm that the command messages were received

      3.2.1   At the UNIX prompt type:
```
cd /homes/timed
```
to change the default directory to that containing the authentication return receipts.

      3.2.2   At the Unix prompt type:
```
newgrp tidi
```
to set the correct permission to read the files.

3.2.3 At the UNIX prompt type:

```
find . –name "*.ARR" –mtime –1 –print
```

to list the latest authentication return receipts. Insure that each of the command messages is acknowledged.

3.2.4 Inspect the contents of the authentication files to confirm that the command messages were authenticated successfully. Each file should contain a return code of zero in the second line.

4   Confirm Low Voltage Shutdown

4.1 Check state of spacecraft upon announcement of low voltage shutdown.

4.1.1 Observe the powering down flag on the health and safety page.

4.1.2 Observe that the instrument enters safe mode.

4.1.3 Observe that the telescopes are positioned to about 29 degrees.

4.1.4 Observe that the scanning flag is still set.

4.2 Check that the instrument heartbeat has stopped.

5   Low Voltage Shutdown Recovery

5.1 Repeat Instrument Activation following the procedure of Section 2, Item 5, page!15.

5.2 Reconfigure TIDI thermal control following the procedure of Section 7, page!20

6   Stop Instrument Control Program
Required if the Low Voltage Shutdown test is not performed.

6.1 Stop the control program

6.1.1 Select "Control Program" from the "Commands" menu.

6.1.2 Click on stop control program send.

6.2 Stop scanning

6.2.1 Select "Scanning and Binning" from the "Commands" menu.

6.2.2 Select stop scanning now.

6.2.3 Click send.

7   Shutdown Oasis using the procedure in Section 3, item 6, page 15
(Not required during thermal vacuum testing).

19.   Spacecraft Compatibility Test

1   Start OASIS using the procedure in Section 3, page 13, if not previously completed.

2   Configure the following display pages

<table>
<tr><td colspan="6">Table 4
Spacecraft Compatibility Test Strip Chart Configuration</td></tr>
<tr><td>Strip Chart</td><td></td><td>variable 1</td><td>variable 2</td><td>variable 3</td><td>variable 4</td></tr>
<tr><td rowspan="3">1</td><td>data item</td><td>counts sigma</td><td>unused</td><td>unused</td><td>unused</td></tr>
<tr><td>data type</td><td>EV§</td><td></td><td></td><td></td></tr>
<tr><td>nominal value</td><td>1.5 or less</td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">2</td><td>data item</td><td>tel_1 position_error</td><td>tel_2 position_error</td><td>tel_3 position_error</td><td>tel_4 position_error</td></tr>
<tr><td>data type</td><td>EV§</td><td>EV§</td><td>EV§</td><td>EV§</td></tr>
<tr><td>nominal value</td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="6">§   DN is Data Number
    EV is Engineering Value</td></tr>
</table>

3   Place TIDI in the appropriate mode as requested by the test conductor.

3.1   Noisy Mode
      3.1.1   Request that the test conductor disable the TIDI execution queue.
      3.1.2   Select "Stored Commands" from the "Commands" menu
      3.1.3   Select noisy.tcmd from the list presented.
      3.1.4   Click Send
      3.1.5   When prompted by the blue screen, request that the test conductor enable the execution queue.

3.2   Quiet Mode
      3.2.1   Request that the test conductor disable the TIDI execution queue.
      3.2.2   Select "Stored Commands" from the "Commands" menu
      3.2.3   Select quiet.tcmd from the list presented.
      3.2.4   Click Send
      3.2.5   When prompted by the blue screen, request that the test conductor enable the execution queue.

4   Observe events

4.1   Confirm that the COUNTS SIGMA telemetry point value remains below 1.5

4.2   Confirm that the telescope position errors remain well behaved.

4.3   Snap representative strip charts.

20. Spacecraft Survival Test

1   Start OASIS using the procedure in Section 3, page 13, if not previously completed.

2   Configure the following display pages

2.1   Strip Charts

<table>
<tr><td colspan="6">Table 5
Survival Test Strip Chart Configuration</td></tr>
<tr><td>Strip Chart</td><td></td><td>variable 1</td><td>variable 2</td><td>variable 3</td><td>variable 4</td></tr>
<tr><td rowspan="3">1</td><td>data item</td><td>counts sigma</td><td>unused</td><td>unused</td><td>unused</td></tr>
<tr><td>data type</td><td>EV§</td><td></td><td></td><td></td></tr>
<tr><td>nominal value</td><td>1.5 or less</td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">2</td><td>data item</td><td>tel_1 position_error</td><td>tel_2 position_error</td><td>tel_3 position_error</td><td>tel_4 position_error</td></tr>
<tr><td>data type</td><td>EV§</td><td>EV§</td><td>EV§</td><td>EV§</td></tr>
<tr><td>nominal value</td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="6">§   DN is Data Number
     EV is Engineering Value</td></tr>
</table>

2.2   Panels
2.2.1   Power Status

3   Place TIDI in the noisy mode when requested by the test conductor.

3.1   Select "Stored Commands" from the "Commands" menu

3.2   Select noisy.tcmd from the list presented.

3.3   Click Send

4   Observe normal operation

4.1   Confirm that the instrument current, shown on the Power Status panel, is correct.
   4.1.1   Main Bus Voltage 22V Instrument Current 0.73 A (Cal lamps off)
   4.1.2   Main Bus Voltage 26V Instrument Current 0.63A (Cal lamps off)
   4.1.3   Main Bus Voltage 35V Instrument Current 0.50 A (Cal lamps off)

4.2   Confirm that the COUNTS SIGMA telemetry point value remains below 1.5

4.3   Confirm that the telescope position errors remain well behaved.

4.4   Snap representative strip charts and Power Status panels

21.   Telescope Throughput Special Test

1   Start OASIS using the procedure in Section 3, page 13, if not previously completed.

2   Configure Displays

2.1   Select the Spectra workspace

2.2   Click the "Graphics" button

2.3   Click the "Spectra1" button
Set the starting channel with the value from the following table for the telescope
of interest. The number of bins is set to 30 for each telescope.

Telescope	start bin
1	90
2	60
3	30
4	0

2.4   Select the Panels workspace

2.5   Display the telescope reference channel counts

2.5.1   Click the "Wildcard" button

2.5.2   Type I4 in the format field. Fill in the row, external element and item
names for each telescope from the following table. Click "Update" after
each set is entered.

Table 6, Reference Channels			
Telescope	Row	External Element	Item Name
1	1	counts	bin_091
	2	counts	bin_092
2	1	counts	bin_062
	2	counts	bin_063
3	1	counts	bin_031
	2	counts	bin_032
4	1	counts	bin_001
	2	counts	bin_002

3   Execute test for each telescope in coordination with staff in clean room.

3.1   Start the data collection program, typing the command
```
start thruput_special
```

3.2   Respond to prompts

3.2.1   Enter the optical power meter gain settings in response to the prompt
"Enter the OPM gain switch setting"

3.2.2   When prompted by the script request that the test conductor disable the
TIDI execution queue. Respond to the prompt with "Y" when the test
conductor confirms that the queue is disabled.

3.2.3 When prompted by the blue screen, request that the test conductor enable the execution queue. Click in the blue screen and press return when the test conductor confirms that the queue is enabled.

3.2.4 When prompted by the script, specify the telescope number, 1, 2,3, or 4, that is being tested.

3.2.5 Request that the external shutter be closed or opened by the personnel in the clean room in response to prompts from the script. When the shutter has been configured response to the prompt with "Y".

3.3 Record count levels in reference channels at end of dark signal collection and end of illuminated data collection. Record corresponding optical power meter readings.

4   Power down TIDI if no additional tests are required.

4.1 Inform the test conductor that TIDI may be shut down.

4.2 Confirm that power has been removed from the instrument.

5   Clear the telescope over current protection if additional tests are to be run.

5.1 Select "Boot Code Commands" from the Commands Menu.

5.2 Click the "Allow WD Expiration" button.

5.3 Observe the software mode on the Health and Safety panel. The instrument is executing boot code when the status changes from **RUNNING** to **BOOTING**.

5.4 Click the "Boot Now" Button

5.5 Observe the software mode on the Health and Safety panel. The instrument software is running when the status changes from **BOOTING** to **RUNNING**. Additional instrument operations may now be performed.

22. Error Recovery

22.1 Procedure Missing from Table

CSTOL procedures must be installed in the OASIS procedures table before they may be executed. Normally, all the required procedures are configured in the procedures table that is loaded when OASIS starts. Occasionally, a new procedure , not yet configured in the OASIS database is invoked, which results in the following message:

Cannot find *proc* in procedures table

Recovery from this condition requires the installation of the procedure in the OASIS memory resident procedures table.

1   **Confirm that the procedure name is spelled correctly
re-issue command with correct procedure name if incorrectly spelled.**

2   **Install the procedure**

2.1   Click in the CSTOL_PROC window

2.2   Type of the command:
    new_proc *proc_name*
where *proc_name* is the name of the CSTOL procedure to be installed.

3   **Start the installed procedure.**

22.2 Temporary Source File Deleted

Occasionally, a TIDI RCDS action will fail, with the message

Temporary source file for procedure *proc_name* has been deleted.

Recovery from this condition requires that the current action be stopped, the procedure listed in the error message be decompiled and the action restarted.

1   **Terminate current action**

1.1   Click in the CSTOL_PROMPT window

1.2   Type the command
    return all

2   **Decompile the procedure**

2.1   Click in the CSTOL_PROMPT window

2.2   Type the command
    decompile *proc_name*
where *proc_name* is the procedure named in the error message.

3   **Repeat the action that was interrupted by the error message**

22.3 Data Server Problems

Occasionally an attempt to connect to the TIMED MOC for data will fail. Generally, this is because the server has been tied up by a failed tmLogger session. To recover, the tmLogger session must be identified and reset. Once this is done, the connection to the MOC can be made.

If the procedure outlined in the OASIS startup procedure, section 2, page 11 fails, one should check for additional tmLogger streams, confirm that they have failed jobs and reset if needed.

1   Identify additional tmLogger streams

    1.1   Click in a xterm window

    1.2   Type the following command at a UNIX prompt:
                    `ls /tidi/tidi_config/tmLoggerPID`

    1.3   For each file listed, note the final character of the name. This is the stream identifier.

2   Reset any failed streams

    2.1   For each stream identifier type the command
                    `checkLogger S`
               where S is the stream identifier

    2.2   If checkLogger reports that there are missing processes, reset the tmLogger stream by typing:
                    `resetLogger S`
               reply "Y" to the confirmation request.

3   Return to the OASIS startup procedure.

22.4 OASIS Fails To Spawn a Process

In times of high resource usage on the TIDI POC workstations a situation can arise where OASIS cannot spawn one of the shell scripts required to encrypt and transmit command messages. When this occurs, an alert will be posted by OASIS containing the following message:

                    unable to spawn process name.

The recover from this condition requires that the load on the workstations be reduced and OASIS be restarted. The load on both workstations is pertinent and must be reduced. Unnecessary sessions on TIDI01 and TIDI02 should be closed. Once this is done, OASIS can be exited and restarted according to the procedures elsewhere in this document.

23.   Utility Procedures

23.1   *Printing Copies Of OASIS Displays.*

OASIS panels, windows and graphic displays may be printed to the color printer by the following procedure. First, bring the window of interest to the front by clicking on its border. Next, click on the print window icon (Figure 2, below) in the control panel at the bottom of the workspace. Finally click in the window of interest. The window will be copied to the color printer.

Figure 2, Print Window Icon

23.2   *Start TIMED Mission Clock*

The TIMED mission clock displays the current UT and the seconds since the mission epoch. To start the mission clock type the following command from the UNIX prompt:

```
tidiClockStart.sh
```

23.3   *Controlling the tmLogger Program*

The telemetry logging program may be started from the UNIX prompt. This might be done to even the load between the workstations. To start the logger, type the following command all on one line, from the UNIX prompt.

```
nohup runLogger —c n —d hh:mm:ss —s S —f
    /tidi/tidi_config/tmLogger_config/MOC_Config.txt &
```

where "*n*" is the number of cycles of duration "*hh:mm:ss*" in hours, minutes and seconds. The stream identifier, usually "O" replaces the "*S*" in the template above. The telemetry logger program collects "n" files then halts.

To stop telemetry logging sooner, type the following command from the UNIX prompt:

```
abortLogger S
```

in this case, "S" refers to the stream to halt. The status of a telemetry logging stream may be displayed by typing the command:

```
checkLogger S
```

23.4   *Compiling a Daily Control Program*

The daily control program load is built using the ticlBuilder script. This script compiles the control program and creates a directory in an archive area containing the control program source, each included ticl file, scan table and binning table. It also places a copy of the source code listing file and command block file with the source files.

To build the control program, you must be a member of the tidi group. To set your group membership issue the following command from the UNIX prompt:

```
newgrp  tidi
```

Next set the working directory to the ticl source area by typing

```
cd /tidi/flt_ticl/ticl
```

Next compile the control program and archive the sources and results. Issue the command

```
ticlBuilder —d edate —s ticlFile.ticl
```

where *edate* is the execution date in the YYYYdoy format and *ticlFile*.ticl is the control program to be built. You can add the —v switch to the command to display additional diagnostic information as the control program is being built.

23.5   Transmitting A Precompiled Sequence Of Commands Or Control Program

All compiled control programs and immediate command sequences appear in the "Stored Commands" panel of the "Commands" menu. These commands can be send from within OASIS or from the UNIX prompt. The procedures are provided below:

1   OASIS Procedure

1.1   Request that the test conductor disable the TIDI execution queue.

1.2   Select "Stored Commands" from the "Commands" menu

1.3   Select the desired command block (tcmd) file.

1.4   Click Send

1.5   When prompted by the blue screen, request that the test conductor enable the execution queue.

2   UNIX Prompt Procedure

2.1   Determine the enable time and transmission window duration desired.

Note that the enable time should not be within a planned uplink window, if it is there is a possibility that the command messages will be received out of order. The enable time should be in the day prior to the day on which the control program is run. The uplink window duration should extend from the enable time though the end of the day. For example, a control program to be run on 2002195 is to be staged. The enable time should be on 2002194 at a time at least 30 minutes prior to any contact on that day. If 03:00:00 is selected as the enable time a duration of 21:00:00 would be appropriate.

2.2   Log into the OASIS1 or OASIS2 accounts.

2.3   Type the following command on one line at the UNIX prompt

```
sendCM —e YYYYdoyhhmmss —d hh:mm:ss
     /tidi/flt_ticl/tcmd/commandFile.tcmd
```

YYYYdoyhhmmss is the uplink enable time in day-of-year format.
hh:mm:ss is the duration of the uplink window, which may be as long as 24 hours.
commandFile.tcmd is the name of the file to transmit.

2.4   Confirm that each command message has been received and authenticated at the TIMED MOC by examining the command message log. Type the following commands:

```
updMsgDrv.sh
reportMsg —c —m  todays_date | more
```

Todays_date is the date in YYYYdoy format specifying a time of midnight, *YYYYdoy*000000. A command message log of all command messages produced since the start of the day will be produced. Check the column labeled "Auth Status / Time". Each command message should have a status of zero and a time specified. Note the sequence number contained in the first column for any messages with either a non-zero status or a missing authorization time. These command messages may be resent using the resendCM command, as follows:

```
resendCM seqNum
```

where *seqNum* is the sequence number identified in the message log.

2.5   Confirm that the retransmissions succeeded by examining the authentication return receipt. These files are found in the ~timed directory. Make sure that your group id is tidi, then open the file using the following commands:

```
newgrp tidi
cd ~timed
more TIseqnum.ARR
```

where *seqNum* is the sequence number of the command message you retransmitted. The second line of the file contains the authentication status. If zero the retransmission succeeded, otherwise it failed.

2.6   Maintaining the Control Block Files

The directory /tidi/flt_ticl/tcmd contains the control block files that are shown in the "Stored Commands" item of the "Commands" menu. The source code for these files is contained in the /tidi/flt_ticl/ticl, /tidi/flt_ticl/ticl_subs, /tidi/flt_ticl/ticl_inc, /tidi/flt_ticl/scans and /tidi/flt_ticl/bins directories, which contain the ticl programs, subroutines, included code fragments, scan tables and binning tables respectively. Each of these directories is under configuration control. Modifications are made by checking the file out, making the modifications, the checking them back in. Once the modifications are made, the tcmd directory is updated using the ticlBuilder command as follows:

```
cd /tidi/flt_ticl/ticl
ticlBuilder —a
```

This command rebuilds the make file for the tcmd directory then executes it to update any tcmd files made obsolete by the modifications to the source code files. A complete rebuild may be forced by issuing the command with the rebuild option as follows:

```
cd /tidi/flt_ticl/ticl
ticlBuilder —ar
```

The ticlBuilder script may also be used to clean the directories by removing editor back-up files or to index scan table files or bin table files. To clean the directories use the –c option as follows:

```
cd /tidi/flt_ticl/ticl
ticlBuilder —c
```

To index the scan directory or the bin directory issue the command

```
cd /tidi/flt_ticl/ticl
ticlBuilder —i directory
```

where *directory* is a directory containing the tables to be indexed.

23.6   Starting a Control Program

When a control program is transmitted to the TIDI instrument, it is placed in an area called the control program holding buffer. Execution of the control program does not begin until a start_cp command is received by the flight software. This command can be transmitted from the OASIS system or from the UNIX command prompt.

1   OASIS Procedure

   1.1   Check the validation status of the control program on the control program status page. If the control program is reported as INVALID, the control program must be retransmitted. If it is reported as VALID, it may be started.

   1.2   To retransmit the control program if the holding buffer is invalid, repeat the procedure of section 23.5

   1.3   To start the control program

            1.3.1   Select "Control Program Commands" from the Commands menu.

            1.3.2   Send Start Control Program.

2   UNIX Prompt Procedure

   1.1   Transmit the command block file startCntlProgram.tcmd using the procedure of section 23.5

23.7   Rebooting the TIDI Instrument Processor

You can reboot the instrument processor by sending the command that causes the instrument watchdog timer to expire. At this point the instrument software relinquishes control to the boot code in PROM. The instrument software can be reloaded and restarted.

1   Terminate Instrument Software Execution

   1.1   Start OASIS using the procedure in section 3 page 13.

   1.2   Request that the test conductor enable the TIDI execution queue.

   1.3   Select "Boot Code commands" from the Commands Menu.

   1.4   Click the "Allow WD Expiration" Button

   1.5   Observe the software mode on the Health and Safety panel. The instrument is executing boot code when the status changes from **RUNNING** to **BOOTING**.

2   Resuming Instrument Software Execution

   2.1   Start OASIS using the procedure in section 3 page 13.

   2.2   Request that the test conductor enable the TIDI execution queue.

   2.3   Select "Boot Code commands" from the Commands Menu.

   2.4   Click the "Boot Now" Button

   2.5   Observe the software mode on the Health and Safety panel. The instrument software is running when the status changes from **BOOTING** to **RUNNING**.

23.8   Posting OASIS Pages To Remote Clients

OASIS displays can be posted to remote X servers. The remote system must have an X server running and the server must be configured to accept connections from the machine on which

OASIS is running. For remote UNIX systems, the native window manager must be running. To configure the remote UNIX system to accept connections from the OASIS host, type the following command at the remote system's UNIX prompt:

```
xhost +tidi0n.engin.umich.edu
```

Where tid0n is the name of the host from which the page will be sent and may be `tidi01` or `tidi02`.

To configure OASIS to post the page on the remote server click in the CSTOL_PROMPT window and type the oasis command:

```
remote_display nickname "ip_address"
```

`nickname` is the name by which the remote machine will be known to OASIS. It may be any alphanumeric string, beginning with a letter, of up to 16 characters. The IP address may be either symbolic (e.g. sprlmac-gell.sprl.umich.edu) or numeric (e.g. 141.212.111.123) and may include a display and window suffix (141.212.111.123:0.0). The IP address must be enclosed in quotation marks.

23.9   Identifying Binning and Scan Tables

The binning and scanning tables active in the instrument are identified by table identifiers included in the telemetry. The source file for the table can be identified using the findEntry command. To determine the source of a binning table, type the following command at the UNIX prompt:

```
findEntry bin nnnnn
```

where "nnnnn" is the binning table id from the telemetry. Similarly, the source file for a scan table can be determined using the command:

```
findEntry scan nnnnn
```

where "nnnnn" is the scan table id from the telemetry.

23.10   Establishing A Modem Connection To The MOC

The MOC provides a point-to-point protocol (ppp) server to provide a backup communications channel between the POCs and the MOC. The TIDI POC includes client software for this protocol. If the internet connection becomes unreliable, the ppp connection can be established.

The connection must be established prior to starting the OASIS application. To start the ppp client type the following command at the UNIX prompt.

```
ppp_sw start
```

The modem will dial the TIMED ppp server and establish a connection. This can take up to about one minute. When established, the transmit and receive data lights on the mode will be active. At this point OASIS can be started and normal operations resumed.

Once the need for the backup connection has passed and the OASIS session is completed, the following command halts the ppp client software and returns the workstation to normal internet routing:

```
ppp_sw stop
```

You may monitor the status of the ppp connection by displaying the ppp daemon log file using the following command:

```
tail /var/adm/pppd.log
```