Swift Catching gamma ray bursts on the fly . . .

UVOT Aliveness Functional Test Procedure

410.4-PROC-0173

Version: 1.0

Date: May 29, 2003

Revision Date: June 12, 2003

Prepared by: Peter Gorog / Code 568

Goddard Space Flight Center Greenbelt, Maryland

UVOT Aliveness Functional Test Procedure

Rev. – 1

PREPARED BY:

____
Peter Gorog Raytheon ITSS, Chief Systems Engineer

REVIEWED BY:

____
Mark Edison/Spectrum Astro Swift Observatory Integration and Test Manager

____
Terry Fletcher SPECTRUM ASTRO, Quality Assurance

____
Phil Smith, MSSL, Software engineer

____
Barry Hancock, MSSL, UVOT Electrical Lead

APPROVED BY:

____
Joanne Baker/568
Swift Instrument Module Integration and Test Manager

DOCUMENT CHANGE RECORD

(Explicitly note if changes have safety implications)

Revision	Description	Date	Approval
-	Initial Release	05/29/2003	
- 1	Update	06/12/2003	

1. OVERVIEW

This document describes the UVOT Aliveness Functional Test Procedure that will provide the functional verification of the overall health and the general interfaces of the UVOT (power, 1553 bus, 1PPS line, etc.). It is designed to provide a simple, rapid test that demonstrates that the instrument possesses at least minimal functionality.

The test procedure described in this document is based on the

- UVOT Short/Long Functional Test Procedure (SWIFT-UVOT-112-R00, Rev. 1.3, 12, December, 2002).
- UVOT Electronics Boxes Functional Test Procedure (410.4-PROC-0240 ver. 1.0 December 19, 2002)
- UVOT Comprehensive Functional Test Procedure (410.4-PROC-0246 ver 1.0 rev 5, 05/28/2003)

The purpose of the UVOT Aliveness Functional Test is to demonstrate the basic functionality of the UVOT DEM and TM after integration to the SWIFT spacecraft.

This procedure requires that the DEM and the TM be connected to the SWIFT Spacecraft Power Bus, to the 1553 Bus as well as to the Thermal Connector. These connections assumed to be verified according to UVOT Electronics Boxes Electrical Integration Procedure.
/

2. TEST CONFIGURATION

The UVOT Spacecraft Functional Test Configuration is described in the UVOT Electronics Boxes Electrical Integration Procedure.

3. INITIAL CONDITIONS

Before commencing the UVOT Aliveness Functional Test all setups and verifications described in the UVOT Electronics Boxes Electrical Integration Procedure must have been successfully completed. It is also assumed that all power lines to the UVOT are disabled and turned off.

This telescope has image intensifiers and is damaged or aged by any light. Any light visible to the human eye can damage this detector! When powered, a telescope door or cover is not sufficient protection from light. At the correct darkness, the instrument can operate at atmospheric pressure and high vacuum. Intermediate pressures can however allow electric discharges that will damage the instrument! MSSL
hardware and/or software personnel must be present for operation!

This test may be performed in ambient light condition.

The UVOT test conductor must visually verify that the "SAFE PLUG" is installed (par. 3.4 Step 1).

The test conductor must verify that no inappropriate ICU or DPU error codes have been issued before checking pass box after each step.

This test procedure requires the following ITOS workstations:

- Spacecraft workstation (SCWS)
- UVOT workstation (UWS)
- 1553 Bus monitoring workstation (BWS)

AC 1000 workstation (AWS) is not required for this test but this would result in error messages once/minute when the spacecraft is in constraint (sun, earth, etc.)

All commanding will be executed from the SCWS and the results will be simultaneously observed on both the SWCS and the UWS. The BWS will monitor all activities and errors, if any, on the 1553 bus.

The telemetry data will be archived on the SCWS only and the archive files will be copied over to UWS after the test is completed.

Before issuing any command the test conductor at the SCWS console shall confirm it with personnel at the UWS. The test conductor at the UWS is responsible for verifying the status of the UVOT both before and after the execution of a command.

4. TEST CONDUCTORS & COMMANDING

The following roles have been established to clarify responsibility during the execution of this test procedure. Please record the names of the individuals who are performing these roles.

ROLE	INDIVIDUAL

a) Test & Integration Manager (TIM):____
b) Designee of Test & Integration Manager (DTIM):______________________________
c) UVOT Instrument Test Conductor (UTC): ___________________________________
d) Quality Assurance Personnel (QA): _______________________________________

e) Operator At The SCWS Console (OSC): _______________________________
f) Operator At The 1553WS Console (O1553):_________________________________
g) Operator At The UWS Console (OUVOT):_________________________________

It is Spectrum Astro's responsibility to assign a person as the Test & Integration Manager (TIM).

The UVOT Instrument Test Conductor (UTC) has the full responsibility for the proper execution of this procedure. The UTC has to confirm visually and verbally every command sent to the spacecraft. When a proc is executed and it stops waiting for operator input the TCS must wait for the UTC's instruction before responding to a prompt or clicking on the GO button on the upper left corner of the proc window.

If an incorrect command is sent to the spacecraft the UTC has the authority to take whatever corrective action is necessary depending of the classification of the command. The commands used in this procedure are classified as follows:

- Hazardous (H)
- Critical (R)
- Conditionally Critical (C)
- Not critical (N)

The ITOS currently does not distinguish among Hazardous, Critical and Conditionally Critical therefore we reference these three categories in the rest of this document as Critical.

4.1. Critical Commands.

This procedure assumes that the proper designations (H, R, C or N) are entered into the ITOS database (Command Record: Field 11). ITOS will prompt for permission to send the command whenever a Critical command is entered by the operator.

The following commands used in this procedure are in this category:

- See attached list

If a Critical command is sent inadvertently or with the wrong parameter(s) the UTC shall immediately notify the Test & Integration Manager (TIM) or its designee (DTIM). No further action/function shall be performed without the explicit written approval of the TIM. The TIM will open a QAR and will decide the corrective action after consultation with the UTC, the QA and if necessary with other instrument managers.

All actions and decisions must be properly documented and attached to the QAR and the "As Run" test procedure.

4.2. Non-Critical Commands.

ITOS will NOT prompt for permission to send these commands.

All commands that are not listed in par. 4.1 are Non-Critical.

If these commands are sent inadvertently or with the wrong parameter(s) the UTC shall immediately notify the Test & Integration Manager (TIM) or its designee (DTIM).

No further action/function shall be performed without the explicit written approval of the TIM. The TIM will decide if a QAR shall be opened and the corrective action to be taken.

All actions and decisions must be properly documented and attached to the "As Run" test procedure and the QAR if one was opened.

4.3. Configuration Management

The UTC shall record and verify the software versions used to conduct this procedure.

The Integrated Test Operating System (ITOS) version number is displayed above the Spacecraft Telecommunications Operating Language (STOL) prompt.

If used, the AC-1000 version number can be found on its main screen, and the AstroRT version is found on its main screen.

The instrument software version number and revision shall be proved by the applicable instrument software manager.

This procedure can be executed in the following two S/C power configurations:

1. Battery
2. SAS

It is the responsibility of the UTC to request and verify the actual S/C power configuration.

S/C power configuration (battery or SAS): ____

EGSE Software Version Number and Revision: ____

ITOS Software Version Number and Revision: ____

S/C ITOS Pages, Procs and DBX Version Number and Revision: _______________________________

Flight Software Version Number and Revision:____

AC-1000 Software Version Number and Revision:____

Astro RT Software Version Number and Revision: ____

BAT Instrument Software Version Number and Revision: ____________________________________

UVOT ICU Software Version Number and Revision: ____

UVOT DPU Software Version Number and Revision: ____

UVOT ITOS Pages, Procs and DBX Version Number and Revision: ______________________________

XRT Instrument Software Version Number and Revision: ___________________________________

UVOT Primary DEM Serial Number: ____

UVOT Redundant DEM Serial Number: ____

UTC_________________
QA_________________

4.4. Quality Assurance Report (QAR) and Non-conformance Report (NCR) List

Table 4-1 lists the current QARs and NCRs that are outstanding against the S/C.

Table 4-1. Non-Conformance Items and QARs/NCR

Document Number	Summary/Comments
	See attached list of the current QARs and NCRs.
	See VDD for details
	Indicate here and attach continuation page if necessary.

This list has been reviewed as to the effect these items may have on execution of this procedure.

UTC:__________

QA:___________

5. WORKSTATIONS

5.1. Start Spacecraft workstation (SCWS)

If the S/C ITOS system must be aborted for any reason during this procedure the operator at the UWS console has to be notified. The ITOS on the UWS also has to be stopped and it shall be restarted after the S/C ITOS is up and running again. Failing to follow this procedure will disconnect the UWS from the SCWS and UWS will not receive telemetry.

The SCWS will always be powered on by the time this procedure is executed.

5.1.1. Run shell script in a terminal window to configure ITOS symbolic links.

- Set directory
    1. cd /swift-sc/swift-itos
- Channel selected (prime, redundant): _______________
    - For Primary channel
        1. ./iprime
    - for the Redundant channel
        1. ./iredundant

This proc can be run even after the ITOS had been started. The steps in this procedure designed for testing the PRIMARY side are marked with P and for the REDUNDANT side with R in the Steps column. The REDUNDANT side steps can only be executed if the operator runs the "iredundant"

DO NOT EXECUTE STEPS THAT ARE NOT CONSISTENT WITH THE SIDE SELECTION!

5.1.2. Configure the SSR in ITOS STOL window

The SSR will always be powered on and configured by the time this procedure is executed.

At this point we expect that the "telemetry relay" is turned on, so SCWS will relay telemetry to UWS when the UVOT power is turned on.

5.2. Start UVOT workstation (UWS)

If the S/C ITOS system must be aborted for any reason during this procedure the operator at the UWS console has to be notified. The ITOS on the UWS also has to be stopped and it shall be restarted after the S/C ITOS is up and running again. Failing to follow this procedure will disconnect the UWS from the SCWS and UWS will not receive telemetry.

5.2.1. UWS power on

5.2.2. Log onto UWS

5.2.2.1. Type: cd itos_groupdir,

5.2.2.2. Run shell script to configure ITOS symbolic links. Start procs according to the Selected Channel (prime, redundant): ________________

- For Primary channel: ./iprime
- for the Redundant channel: ./iredundant

5.2.2.3. Start ITOS: itos

At this point we expect that the "telemetry relay" is turned on, so UWS will receive telemetry when the UVOT power is turned on.

5.3. Start 1553 bus monitoring workstation (BWS)

If the BWS is not already powered on perform the following steps:

5.3.1.1. BWS power on

5.3.1.2. Log onto BWS

5.3.1.3. Run bustools

6. POWER SUPPLY VERIFICATION PROCEDURE:

Step	Action / ITOS	Monitor	Verification	Pass / Fail Signature	Date & Time
1	Verify that the "SAFE PLUG" is installed. QA must verify and sign this step!	Spacecraft, UVOT	The UVOT test conductor must visually verify that the "SAFE PLUG" is installed.	☐ ☐ UTC:___ QA:______	
2	The procedure calling the Aliveness Test will perform the following tasks automatically: - Check S/C Power - Record Switch positions - Record Currents - Record temperatures.		The following values will be recorded by the proc: BUSVOLT:__________ NEB4A Current:_______ NEB4B Current:_______ NEB4A:_____________ NEB4B:______________ UVOT Elec DEMA :____ UVOT Elec DEMB :____ UVOT TelescopA :_____ UVOT TelescopB :_____ UVOT Elec DEMA :____ UVOT Elec DEMB :____ UVOT TelescopA :_____ UVOT TelescopB :_____ NEB3A Curr:_________ NEB3B Curr:_________ NEB3A:_____________ NEB3B:_____________ UVOT:______________ IPCU TLM Conv A:____ Temp CH 11 :________ Temp CH 12 :________ Temp CH 13 :________ Temp CH 14 :________ Temp CH 15 :________	☐ ☐	

7. UVOT SPACECRAFT FUNCTIONAL TEST

Time	Step	Action	ITOS Command, or other action	ITOS display	Remarks	P/F
	1.	Verify Channel Selection	Verify the TM channel (prime or redundant) selected in par. 5.1.2. Record the configuration.	Primary:__________________ Redundant:________________	IF this procedure is performed as part of the ICU/DPU software upload procedures the side selection shall be confirmed using the relevant paragraph of those procedures	
	2.	Run Functional Test	**start uvot_aliveness_test ("PRIME") or start uvot_aliveness_test ("REDUNDANT")**	Verify the proc started in the PROC window Procedure started at : Date: _____________ Time: _____________		
	3.	Select NEB4 A or B		NEB4 (A or B):_________________		
	4.	Record 1553 errors	On the1553 bus monitor record the initial error numbers related to 1553 communications.	DPU Errors: No Resp.: __________________ ME/Illegal: _________________ ICU Errors: No Resp.: __________________ ME/Illegal: _________________		
	5.	End of Aliveness Test. Check for 1553 errors	On the1553 bus monitor record the current error numbers related to 1553 communications.	DPU Errors: No Resp.: __________________ ME/Illegal: _________________ ICU Errors: No Resp.: __________________ ME/Illegal: _________________	Compare the numbers with the ones recorded in Step 6.	

8. DATA ANALYSIS

8.1. Test Acceptance

Verify that the following tests were performed correctly and produced the expected results. Use the attached log file to verify the results.

8.1.1. Verify UVOT DEM Power-on

Pass/Fail: _________

8.1.1.1. Verify ICU housekeeping and limits

Pass/Fail: _________

8.1.2. Verify UVOT TM Power-on

Pass/Fail: _________

8.1.2.1. Verify ICU housekeeping and limits

Pass/Fail: _________

8.1.3. Verify ICU housekeeping after switching to safe

Pass/Fail: _________

8.1.4. Verify DPU housekeeping and limits after DPU boot

Pass/Fail: _________

8.1.5. Verify ICU EEPROM test

Pass/Fail: _________

8.1.6. Verify DPU EEPROM test

Pass/Fail: _________

8.1.7. Verify ICU housekeeping and limits
Pass/Fail: _________

8.1.8. Verify count rate
Pass/Fail: _________

8.1.9. Verify TM power-off
Pass/Fail: _________

8.1.10. Verify DEM power-off
Pass/Fail: _________

THIS IS TO CERTIFY THAT THE UNIT HAS MET THE ACCEPTANCE STANDARDS OF THIS PROCEDURE.

ENGINEER DATE

QUALITY ASSURANCE DATE