410.4-PROC-253
Revision -1.0

UVOT ICU Flight Software Upload Procedure

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Prepared by: Peter Gorog / Code 568

Goddard Space Flight Center Greenbelt, Maryland

UVOT Instrument Flight Software Upload Procedure

Rev. – 2.0

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, Swift Observatory Integration and Test Quality Engineer

____
Carl Powell / Code 303, 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
-1.0	Initial Release	02/13/2003	
-2.0	Updates for combined DPU/ICU software upload	05/06/2003	

1. OVERVIEW

This document describes the UVOT Instrument Flight Software Upload Procedure that will provide necessary hardware configuration as well as the instructions for uploading a new version of the flight software and tables.

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 Comprehensive Functional Test Procedure (410.4-PROC-246 ver. 1.0). This document will be referenced as UCFTP.
- UVOT Electronics Boxes Functional Test Procedure (410.4-PROC-0240 ver. 1.0 December 19, 2002)

The purpose of the UVOT Instrument Flight Software Upload is to accommodate the installation and testing of new UVOT flight software releases to the electronic boxes connected to the SWIFT spacecraft bus. The UVOT Instrument Flight Software Upload Procedure would take approximately TBD hours to execute and verify.

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

2. TEST CONFIGURATION

The UVOT Spacecraft Flight Software Upload Configuration is described in the UVOT Electronics Boxes Electrical Integration Procedure.

3. INITIAL CONDITIONS

Before commencing the UVOT Instrument Flight Software upload 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 procedure 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)
- ACS 1000 workstation (AWS)

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 ACS will provide the proper spacecraft parameters (no constraint).

The telemetry data will be archived on the SCWS.

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.

<u>ROLE</u> <u>INDIVIDUAL</u>

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):_______________________________________
h) Operator At The AWS Console (OAWS): ___________________________________

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:

- No commands have been identified

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: ____

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: __________________________________

XRT Instrument Software Version Number and Revision: ____________________________

UVOT Primary DEM Serial Number: ____

UVOT Redundant DEM Serial Number: ____

TC_________________

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 and the UVOT.

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.

TC_________
QA_________

5. WORKSTATIONS

5.1. Start Spacecraft workstation (SCWS)

If this procedure is executed immediately following a UVOT DPU Flight Software Upload Procedure (410.4-PROC-0284) go to section 7 Step 11.

DPU software upload performed (yes/no): ___________________

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.

Power ON the spacecraft in idle mode.

If the S/C is not powered on prior to this procedure use the Swift Spacecraft Power ON/OFF procedure, 1143-EP-W27641. Spacecraft Power is supplied via Solar Array Simulator.

Record :

- Bus Voltage: _____________V
- Current: _________________A

This will automatically start the S/C ITOS system. No valid telemetry is expected during warm-up and no commanding is allowed.

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
        2. ./uvot_cp_prime
    - for the Redundant channel
        1. ./iredundant
        2. ./uvot_cp_redundant

Record the channel selected: ________________________

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.proc

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

Configure the Solid State Recorder (SSR) in ITOS STOL window

If the SSR is needed for this procedure perform the following steps:

5.1.3.1. start sc_config_ssr
This procedure runs for approximately 20 minutes if the "test" option is used.
5.1.3.2. Write Enable SSR for UVOT, S/C and HIPRI telemetry
5.1.3.3. Verify that the SSR is receiving data: on page scdownlink

Enable archiving all virtual channels
5.1.4.1. start masterarchive

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.

UWS power on
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): _______________
- If Primary channel: ./iprime
- If 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.

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)

BWS power on
Log onto BWS
Run bustools

5.4. Start AC 1000 workstation (AWS)

AWS is used (yes/no):____________

If the response is NO continue at Section 6 Step 1

AWS power on
Log onto AWS
Get S/C into mission mode

5.4.3.1. at the ITOS prompt type:

- start scacs_require_error_trap
- start scacs_powerup_nebs("AB")
- wait until the proc completes
- start scacs_end_grb. Follow prompts in script when to place AC 1000 into open or closed loop mode
- Record the proc name, date and version #: ________________________________
- When the proc prompts: Perform Slews select OK button.
- When the proc prompts "Shutdown ACS?" select CANCEL button.
- start scacs_rwbias_ac1000
- start scacs_sc3arcmin

1.1.1.1. Verify ACS Mode on the SCWS. Expected Mode: inertial point
page scstartup.
Actual Mode = ___________

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.	☐ ☐ TC:______ QA:______	
2	Check S/C Power	Power line	Both power lines are turned off. Record from the EGSE computer: BUSVOLT:_________V	☐ ☐	
3	Verify UVOT Power OFF page shw_NEB4_switches Follow the instructions on the page.	Record Switch positions. All must be OFF!	NEB4A Current:_______ NEB4B Current:_______ NEB4A:____________ NEB4B:_____________ UVOT Elec DEMA :____ UVOT Elec DEMB :____ UVOT TelescopA :_____ UVOT TelescopB :_____	☐ ☐	
4	Verify : Survival Heaters=OFF page shw_NEB3_switches	Record Currents and Switch positions. All but NB3A and IPCU TLM Conv A must be OFF!	NEB3A Curr:_________ NEB3B Curr:_________ NEB3A:_____________ NEB3B:_____________ UVOT:______________ IPCU TLM Conv A:____	☐ ☐	
5	Check: Survival Heaters on page scace_sf2	Record temperatures. UVOT = Temp CH 11-15	Temp CH 11 :________ Temp CH 12 :________ Temp CH 13 :________ Temp CH 14 :________ Temp CH 15 :________	☐ ☐	

7. UVOT Instrument Flight Software Upload Procedure

The Steps 2 to 10 described in this section are performed by the uvot_power_on.proc. The UTC shall record the values every time the proc halts.

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:_________________		
	2.	Run Power On proc	start uvot_power_on (“PRIME”) or start uvot_power_on (“REDUNDANT”)	Verify the proc started in the PROC window Proc started: _________________		
	3.	Select NEB4 A or B		NEB4 (A or B):_________________ UVOT_ICU "ENA":________ UVOT_DPU "ENA":________ UVOT_ICU BUS_ (A or B) :____________ UVOT_DPU BUS_(A or B) :____________		
	4.	check ICU housekeeping and limits before power ON		Record: NEB4A Current:__________ A NEB4B Current:__________ A		
	5.	check ICU housekeeping and limits after DEM power ON		Check “boot” sequential print for “Power ON Reset” message. Record: NEB4A Current:__________ A NEB4B Current:__________ A		
	6.	check ICU housekeeping and limits after TM power ON		Record: NEB4A Current:__________ A NEB4B Current:__________ A		
	7.	check ICU housekeeping and limits after switch to safe state		Record: NEB4A Current:__________ A NEB4B Current:__________ A		
	8.	check ICU housekeeping and limits after watchdog test		Record: NEB4A Current:__________ A NEB4B Current:__________ A		
	9.	check ICU housekeeping and limits after switch to safe state		Record: NEB4A Current:__________ A NEB4B Current:__________ A		
	10.	check DPU housekeeping and limits after DPU reboot		Record: NEB4A Current:__________ A NEB4B Current:__________ A		

Time	Step	Action	ITOS Command, or other action	ITOS display	Remarks	P/F
	11.	ICU EEPROM checksum tests	start ICUeeprom	Confirm correct checksums for the current version	Attach checksum printout "*.crc.log"	
	12.	Set timeout	timeout 60		ITOS requires longer timeout for the LOAD commands	
	13.	Load ICU code and tables	start iloads			
	13.1			tc good: ___________________		
	13.2			tc good: ___________________		
	13.3			tc good: ___________________		
	13.4			tc good: ___________________		
	13.5			tc good: ___________________		
	13.6			tc good: ___________________		
	13.7			tc good: ___________________		
	13.8			tc good: ___________________		
	13.9			tc good: ___________________		
	13.10			tc good: ___________________		
	13.11			tc good: ___________________		
	13.12			tc good: ___________________		
	13.13			tc good: ___________________		
	13.14			tc good: ___________________		
	13.15			tc good: ___________________		
	13.16			tc good: ___________________		
	13.17			tc good: ___________________		
	13.18			tc good: ___________________		
	13.19			tc good: ___________________		
	13.20			tc good: ___________________		

Time	Step	Action	ITOS Command, or other action	ITOS display	Remarks	P/F
	14.	Set timeout back to default	timeout 15			
	15.	Dump checksums	start icrc_tables			
	16.	ICU EEPROM checksum tests	start ICUeeprom	Confirm correct checksums for the new version.	Attach checksum printout "*.crc.log"	
	17.	Verify if DPU software upload is executed at this time	If this procedure was called from the UVOT DPU Flight Software Upload Procedure (410.4-PROC-0284) return to that procedure (Section 7 Step 51.)	Return to DPU software upload procedure Y-Yes/No: ___________________	.	
	18.	Perform functional test according to UVOT Comprehensive Functional Test Procedure (410.4-PROC-0246)	Execute the UVOT Comprehensive Functional Test Procedure (410.4-PROC-0246) starting at section 7 Step 1.	Verify Channel Selection in par. 5.1.2. Primary/Redundant:________________ Verify the procedure started at : Date: _____________ Time: _____________ Verify that the UVOT Comprehensive Functional Test Procedure (410.4-PROC-0246) executed properly:(yes/no): ____________________	The current version of the uvot_functional_test.proc would turn ON the UVOT without verifying first that the DPU power is already on (see Section 7 Step 2!). The proc would also turn OFF the UVOT before the exposure test. The proc should ask the operator before starting the uvot_power_on.proc or the uvot_power_off.proc.	
	19.	Configure the UVOT to take an exposure. BPE setup and verify centroid LUT and camera bit map loaded	start bpesetup	Set up BPE and run camera Check nhk messages "table load ok" and window table load ok" Camera started=1 Camera integration=0 Acq mode=3 Event Threshold=15	Load tables etc.	
	20.	Reconfigure polling rate to shorten the image taking time. Verify the highest available polling rate.	/sbcsetpollrate bat=9, icu=1, dpu=25, xrt=10 page scbci1553	Verify 25Hz polling for DPU, 1Hz polling for ICU.	Once BAT is mounted on the spacecraft, this only can be done with prior permission from BAT!	
	21.	Run a high-rate noise exposure (ImageEvent Mode with Finding Chart) in which the TMALI queue fills:	start dpu_fill_tmali			
	22.	Check for 1553 errors	Check for error messages related to 1553 communications.			
	23.	Turn the UVOT power off.	start uvot_power_off(side) where side= "PRIME" if channel selected is "PRIMARY" or side= "REDUNDANT" if channel selected is " REDUNDANT "	Verify Channel Selection selected in par. 5.1.2. Primary/Redundant:________________ Verify the proc started in the PROC window Proc started: ________________		
	24.	Before the S/C is powered down the data stored on the SSR must be downloaded		Check archive directory for files: uvot_functest_mm_dd_ yyyy_VC6 uvot_functest_mm_dd_ yyyy_VC6	page scdownlink Enable Downlk Stat for UVOT, S/C and HIPRI	
	25.	Stop Archiving	archive stop all			
	26.	In order to retrieve data from the S/C workstation execute the three functions	1. Disable TLM 2. Enable TLM 3. acquire scptp_gn			
	27.	Copy archive files and seq. logs to a backup medium				

8. DATA ANALYSIS

8.1. Test Acceptance

We verify that the tests listed in section 7 were performed correctly and produced the expected results.

ENGINEER DATE

QUALITY ASSURANCE DATE

8.2. Certification

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

ENGINEER DATE

QUALITY ASSURANCE DATE