

**COS DCE BOOT FSW v1.13 Component Test Results
Requirement 5.1.1.5a Code in PROM**

Date:	February 13, 2001
Document Number:	COS-03-0045
Revision:	Initial Release
Contract No.:	NAS5-98043
CDRL No.:	N/A

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REVISIONS

Letter	ECO No.	Description	Check	Approved	Date	
-		Initial Release				
Original Release Name		Date	THE UNIVERSITY OF COLORADO At Boulder The Center for Astrophysics and Space Astronomy COS DCE BOOT FSW v1.13 Component Test Results Requirement 5.1.1.5a Code in PROM			
Drawn: K. Brownsberger		2-13-01				
Reviewed:						
Approved:						
			Size	Code Indent No.	Document No.	Rev
			A		COS-03-0045	-
			Scale: N/A			

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1. INTRODUCTION

1.1 PURPOSE

This document presents the Cosmic Origins Spectrograph (COS) Device Control Electronics (DCE) Flight Software (FSW) certification procedure. The purpose of this procedure is to verify that the FSW satisfies Software Requirements according to the method specified in the DCE FSW Test Plan (STP).

1.2 SCOPE

This test procedure comprises the steps necessary to verify that the FSW satisfies Software Requirements Document (SRD) paragraph 5.1.1.5 — Initialize to Boot State after Reset: Verify that it performs requisite initializations.

1.3 LIMITATIONS AND CONSTRAINTS

This test cannot be run in parallel with any other commanding activity directed at the DCE FSW (such as, for example, the periodic transmission of NOOP commands). Test hardware shall be visually inspected, and its configuration noted, prior to conducting this test.

1.4 PROCEDURE OVERVIEW

The procedure requires the `hks` tools running on the Sun SparcStation Electronic Ground Support Equipment (EGSE) whose network IP address is one of

shorty.ssl.berkeley.edu
taiyo.ssl.berkeley.edu
ginger.ssl.berkeley.edu.

Test time shall be scheduled in advance. The Test Conductor must be logged into the Unix system as user `eagcos`, and be commanding from the appropriate directory. This directory contains both the test script file and the shell script file; these two files control test execution. The test is conducted by invoking the shell script. This shell script in turn invokes the Perl 5 program `UniScript.pl`, which resides in its own distinct directory. The test procedure steps have been pre-recorded in the test script file, and are executed interpretively by the `UniScript` program. The shell script and test script are attached to this document as appendices. As `UniScript` executes the test script it sends results to the operator console and to two report files, which are also placed in the current directory. After completion of the test script, the Test Conductor can certify successful test

execution by examining the contents of the report files and determining that required outputs are present in them. Printed copies of the report files are attached to the manually completed checklist (Paragraph 4 below) as documentation of the test.

1.5 THEORY OF TEST

The following HK variables are identified as being initialized (to 0) by DCE FSW Boot State code:

**LFGPHA, LFGPHB, LFCDECA, LFCDECB, RFXSVD2, LFCSDC1, LFCSDC2
LFCFECA, LFCFECB, RFVP21D, RFRESER0, RFRLATCH, RFD1HZ, RFDPROJT
LFMRAM, LFHSTATE, LFRILIM, LFHVILIM, LFPCNTA, LFPINTA, LFPCNTB
LFHVLOA, LFHVLOB, LFHVNOMA, LFHVNOMB, LFPINTB, LFGSTIMA, LFGSTIMB
RFDPEEK, LFRPOS, LFRTIMER, RFXSVD1, LFHRAMPT, LFHVTGTA, LFHVTGTB**

The script transmits the **POR** packet (0x80000000) to the DCE in order to force a power-on reset. The resulting HK data are then examined to ensure that the variables named above have value 0.

1.6 TEST SCRIPT IMPLEMENTATION

The script employs the **CHECK** directive to inspect the HK values. In the three cases of bit-valued variables (**RFRLATCH**, **RFD1HZ**, **RFDPROJT**) the bit mask for these variables is logically ANDed with the value for the containing variable (**LFSBITS2** and **LFSBITS1**, respectively); the result should be 0 (eight or 16 bits).

2. SPECIAL INSTRUCTIONS

2.1 QUALITY ASSURANCE

QA support is required to verify the configuration and setup environment as well as monitoring test steps and verifying results.

2.2 SAFETY

2.2.1 Personal Safety

To ensure the safety of the test personnel during test execution the guidelines contained in Paragraph 3.4, Reference [1] will be adhered to.

2.2.2 Test Article and Equipment Safety

- If access within one (1) meter of COS bench electronics is necessary, wrist straps attached to technical ground shall be used by all personnel involved in handling of any COS test article. Overcurrent and overvoltage shall be set to remove power if nominal limits are exceeded.
- Emergency Power Shutdown — If, during the COS DCE FSW test, power is ON and a severe test equipment failure results in the power system exceeding specified limits, the Test Conductor shall direct or perform shutdown of power.

2.3 CONTAMINATION

All flight hardware shall be handled with clean latex gloves; it shall be covered with clean ESD material and/or stored in a clean flow-bench.

3. SUPPORT REQUIREMENTS

3.1 PERSONNEL

Execution of the COS DCE FSW certification procedure requires the following personnel (to be completed at the Test Readiness Review (TRR)):

Test Director: _____

Test Conductor: _____

Test Technician: _____

QA: _____

3.2 TOOLS, EQUIPMENT, AND MATERIALS

The following is a list of tools, equipment, or materials required in this test. Record manufacturer and model, metrology, or property numbers of equipment used, where appropriate. Record calibration due dates where appropriate.

Boot Mode ROM: schematic **27C256**

Engineering Ground Support Equipment (see paragraph Section 1.4). Indicate specific configuration:

EGSE			DCE		
taiyo	shorty	Ginger	ETU	DCE #1	DCE #2
X				X	

3.3 DATA/SOFTWARE

The following files must be present:

Table 3-1: Required Program and Data Files

EGSE (shorty) Directory	File	Description
<code>\disks\galex\users\galex\tcs\uniscrpt\</code>	UniScript.pl	UniScript interpreter
<code>\disks\galex\users\galex\tcs\uniscrpt\stp5_1_1_5a\</code>	u	Shell script for this procedure
Ditto	stp5_1_1_5a.tst	Test script for this procedure (Appendix B)

In addition, the **hks** tools must be active. Directions for activating **hks** are given in UCB-COS-DOC-1118 (Paragraph 3.4, Reference [4]).

3.4 REQUIRED DOCUMENTATION

Reference	Document Number	Title
1	NHB 1700.1(V1-A)	<i>NASA Basic Safety Manual</i>
2	COS-03-0045	<i>DCE FSW Test Procedure 5.1.1.1a</i> (this document)
3	UCB-COS-008	<i>COS FUV Detector Software Test Plan</i>
4	UCB-COS-DOC-1118	<i>COS EGSE Startup Procedure</i>

4. PROCEDURE/TASK STEPS

4.1 PRE-OPERATION ACTIVITIES

4.1.1 Make Sure that **hks** Tools Are Active

Follow the procedure given in Paragraph 3.4, Reference [4].

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4.1.2 Make Sure that the Proper ROM Is Installed

Visually verify that the ROM under test is installed: if EEPROM, in U18; if PROM, in U2 and U7.

4.1.3 Log In to the EGSE

Step	QA	Operator Entry/System Response	Description
1		C:\tcs\us> telnet shorty.ssl.berkely.edu	Establish connection to shorty via Telnet client program
2		Login: xxx Password: -----	Using telnet window, login as user tcs

4.1.4 Set Current Directory

Step	QA	Operator Entry/System Response	Description
3		tcs@shorty% cd ~galex/tcs tcs@shorty% pwd /disks/galex/users/galex/tcs	Change current directory as shown

4.1.5 Slogin as eagcos

Step	QA	Operator Entry/System Response	Description
4		tcs@shorty% slogin -l eagcos shorty.ssl.berkeley.edu eagcos@shorty.ssl.berkeley.edu's password: (<i>get from SSL personnel</i>) Last login: Sat Oct 7 10:41:05 2000 from auntem.ssl.berke Sun Microsystems Inc. SunOS 5.8 Generic February 2000 You have mail. COS EGSE software version: devel	slogin as eagcos ; get password from SSL personnel

4.1.6 Set Current Directory

Step	QA	Operator Entry/System Response	Description
5		eagcos:shorty% cd /disks/galex/users/galex/tcs/uniscript/stp5_1_1_1 eagcos:shorty% pwd /disks/galex/users/galex/tcs/uniscript/stp5_1_1_1	Change current directory as shown

4.1.7 Ensure that Proper Files are Present

Step	QA	Operator Entry/System Response	Description
6		eagcos@shorty% ls -l Total 12 -rw-r--r-- 1 tcs eag 1398 Oct 8 18:03 stp5_1_1_1a.tst -rw-r--r-- 1 tcs eag 62 Oct 9 17:44 u eagcos@shorty% more < u #!/bin/sh perl ../UniScript.pl stp5_1_1_1a "0,0,0,0,0,0,0"	List files; the .tst file and the shell script u should be present

4.2 OPERATION EXECUTION

4.2.1 Establish Initial Test Conditions

Step	QA	Operator Entry/System Response	Description
7		eagcos:shorty% set path=(\$path ~dbb/scripts/bin)	Set path as shown to enable access to hks tools

4.2.2 Execute the Script

Step	QA	Operator Entry/System Response	Description
8		sh u \$pstring=0,0,0,0,0,0,0 Parameters are: Script File: stp5_1_1_5a #0: 0 #1: 0 #2: 0 #3: 0 #4: 0	Shell to u . You should see the accompanying output as UniScript executes

	<pre> #5: 0 #6: 0 #7: 0 Report file >/disks/galex/users/galex/tcs/ver_1_13/stp5_1_1_5 a/stp5_1_1_5a.rp1 successfully opened. Report file >/disks/galex/users/galex/tcs/ver_1_13/stp5_1_1_5 a/stp5_1_1_5a.rp2 successfully opened. Script file /disks/galex/users/galex/tcs/ver_1_13/stp5_1_1_5a/ stp5_1_1_5a.tst successfully opened at level 0. "Sending POR" WAIT 0: HKV0=316; HKV1=316; wc=5 "Testing HK variables" "Test 5.1.1.5a completed successfully" eagcos:taiyo% </pre>	
--	---	--

4.3 POST-OPERATION ACTIVITIES

4.3.1 Copy Reports to PC Files and Print Them

Using an FTP client, copy the **u, stp5_1_1_1a.tst, stp5_1_1_1a.rp1, and stp5_1_1_1a.rp2** files to appropriate PC files. Include these files as Appendices A, B, C, and D with this completed form.

4.3.2 Complete The Test Procedure Form

Ensure that all blank fields in this report are completed correctly and submit the completed report to QA.

SUMMARY SHEET

OPERATION TITLE: _____ WOA# _____

TEST ARTICLES IDENTIFICATION (including serial and/or part numbers):

TASKS/STEPS COMPLETED: _____

LOCATION: _____

TEST STARTED:

TEST TERMINATED

TIME: _____ Hr/Min

TIME: _____ Hr/Min

DATE: _____

DATE: _____

LOGS USED: _____

ANOMALY REPORTS GENERATED: _____

COMMENTS: _____

TEST CONDUCTOR: _____

Signature/Date

QA REPRESENTATIVE: _____

Signature/Date

Appendix A. Shell Script u

```
#!/bin/sh  
pkill cosnoopy  
perl ../UniScript.pl stp5_1_1_5a "0,0,0,0,0,0,0,0"  
cosnoopy&
```

Appendix B. Test Script stp5_1_1_5a.tst

```
; *****  
; * DCE FSW Requirement 5.1.1.5a -- Performs requisite initializations *  
; *****  
;  
SYM      DELTA=5  
;  
ECHO     2  
DTG      3," (0) Sending POR"  
WTO      "Sending POR"  
WAIT     1  
POR  
;  
WAIT     DELTA,HK  
LOG      1,LFGPHA,LFGPHB,LFCDECA,LFCDECB,RFXSVD2,LFCSDC1,LFCSDC2  
LOG      1,LFCFECA,LFCFECB,RFVP21D,RFRESERO,RFRLATCH,RFD1HZ,RFDPROJT  
LOG      1,LFMRAM,LFHSTATE,LFRILIM,LFHVILIM,LFPCNTA,LFPINTA,LFPNTB  
LOG      1,LFHVLOA,LFHVLOB,LFHVNOMA,LFHVNOMB,LFPINTB,LFGSTIMA,LFGSTIMB  
LOG      1,RFDPEEK,LFRPOS,LFRTIMER,RFXSVD1,LFHRAMPT,LFHVTGTA,LFHVTGTB  
LOG      1,LFSBITS2  
;  
DTG      3," (1) Testing HK variables"  
WTO      "Testing HK variables"  
;  
; *****  
; * list of variables tested *  
; * ----- *  
; * LFGPHA      array word      *  
; * LFGPHB      array word      *  
; * LFCDECA      dword          *  
; * LFCDECB      dword          *  
; * RFXSVD2      word           *  
; * LFCSDC1      dword          *  
; * LFCSDC2      dword          *  
; * LFCFECA      dword          *  
; * LFCFECB      dword          *  
; * RFVP21D      byte           *  
; * RFRESERO     byte           *  
; * RFRLATCH     bit            *  
; * RFD1HZ       bit            *  
; * LFDPROJT     bit            *  
; * LFMRAM       word           *  
; * LFHSTATE     byte           *  
; * LFRILIM      byte           *  
; * LFHVILIM     byte           *  
; * LFPCNTA      word           *  
; * LFPINTA      word           *  
; * LFPNTB       word           *  
; * LFHVLOA      byte           *  
; * LFHVLOB      byte           *  
; * LFHVNOMA     byte           *  
; * LFHVNOMB     byte           *  
; * LFPINTB      word           *  
; * LFGSTIMA     byte           *  
; * LFGSTIMB     byte           *  
; * RFDPEEK      byte           *  
; * LFRPOS       byte           *  
; * LFRTIMER     byte           *  
; * RFXSVD1      word           *  
; * LFHRAMPT     byte           *  
; * LFHVTGTA     byte           *  
; * LFHVTGTB     byte           *  
; *****  
;  
; *****  
; * Test PH counter arrays *  
; *****  
;
```


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```

CHECK      1, ($LFGPHB[100]==0 && $LFGPHB[101]==0 && $LFGPHB[102]==0 && $LFGPHB[103]==0 &&
$LFGPHB[104]==0 && $LFGPHB[105]==0 && $LFGPHB[106]==0 && $LFGPHB[107]==0 &&
$LFGPHB[108]==0 && $LFGPHB[109]==0)
CHECK      1, ($LFGPHB[110]==0 && $LFGPHB[111]==0 && $LFGPHB[112]==0 && $LFGPHB[113]==0 &&
$LFGPHB[114]==0 && $LFGPHB[115]==0 && $LFGPHB[116]==0 && $LFGPHB[117]==0 &&
$LFGPHB[118]==0 && $LFGPHB[119]==0)
CHECK      1, ($LFGPHB[120]==0 && $LFGPHB[121]==0 && $LFGPHB[122]==0 && $LFGPHB[123]==0 &&
$LFGPHB[124]==0 && $LFGPHB[125]==0 && $LFGPHB[126]==0 && $LFGPHB[127]==0)
;
; *****
; * Check scalars *
; *****
;
CHECK      1, ($LFCDECA == 0)
CHECK      1, ($LFCDECB == 0)
CHECK      1, ($RFXSVD2 == 0)
CHECK      1, ($LFCSDC1 == 0)
CHECK      1, ($LFCSDC2 == 0)
CHECK      1, ($LFCFECA == 0)
CHECK      1, ($LFCFECB == 0)
CHECK      1, ($RFVP21D == 0)
CHECK      1, ($RFRESERO == 0)
CHECK      1, ($LFMRAM == 0)
CHECK      1, ($LFHSTATE == 0)
CHECK      1, ($LFRILIM == 0)
CHECK      1, ($LFHVILIM == 0)
CHECK      1, ($LFCNTA == 0)
CHECK      1, ($LFPINTA == 0)
CHECK      1, ($LFCNTB == 0)
CHECK      1, ($LFHVLOA == 0)
CHECK      1, ($LFHVLOB == 0)
CHECK      1, ($LFHVNOMA == 0)
CHECK      1, ($LFHVNOMB == 0)
CHECK      1, ($LFPINTB == 0)
CHECK      1, ($LFGSTIMA == 0)
CHECK      1, ($LFGSTIMB == 0)
CHECK      1, ($RFDPEEK == 0)
CHECK      1, ($LFRPOS == 0)
CHECK      1, ($LFRTIMER == 0)
CHECK      1, ($RFXSVD1 == 0)
CHECK      1, ($LFHRAMPT == 0)
CHECK      1, ($LFHVTGTA == 0)
CHECK      1, ($LFHVTGTB == 0)
;
; *****
; * Check bits *
; *****
;
CHECK      1, (($LFSBITS2 & $RFRLATCH) == 0)
CHECK      1, (($LFSBITS1 & $RFD1HZ) == 0)
CHECK      1, (($LFSBITS1 & $RFDPROJT) == 0)
;
DTG        3, "(2) Test 5.1.1.5a completed successfully"
WTO        "Test 5.1.1.5a completed successfully"

```

Appendix C. Test Report stp5_1_1_5a.rp1

```

                    55555      1      1      55555
                    5      11      11      5
                    555      1      1      555
aaa                ssss  ttttt  pppp
a  a                s      t    p  p    5      1      1      5
aaaaa              sssss  t    pppp    5      1      1      5
a  a                s      t    p    5  5      1      1      5  5
a  a                ssss  t    p    555      111      111      555

```

Ver 01.13 Tue Jan 16 14:13:26 2001 "(0) Sending POR"

Addr	Addr	HK-Name	Value
1440-145F	LFGPHA	0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000	0000	0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
1460-147F		0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000	0000	0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
1480-149F		0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000	0000	0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
14A0-14BF		0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000	0000	0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
14C0-14DF		0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000	0000	0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
14E0-14FF		0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000	0000	0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
1500-151F		0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000	0000	0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
1520-153F		0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000	0000	0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
1540-155F	LFGPHB	0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000	0000	0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
1560-157F		0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000	0000	0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
1580-159F		0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000	0000	0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
15A0-15BF		0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000	0000	0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
15C0-15DF		0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000	0000	0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
15E0-15FF		0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000	0000	0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
1600-161F		0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000	0000	0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
1620-163F		0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000	0000	0000	0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
1694-1697	LFCDECA	00000000	
1698-169B	LFCDECB	00000000	
169C-169D	RFXSVD2	0000	
16A4-16A7	LFCSDC1	00000000	
16A8-16AB	LFCSDC2	00000000	

Appendix D. Test Report stp5_1_1_5a.rp2

```

                    55555      1      1      55555
                    5      11      11      5
aaa      ssss  ttttt  pppp  555      1      1      555
a  a      s      t  p  p      5      1      1      5
aaaaa      ssss  t  pppp      5      1      1      5
a  a      s      t  p      5  5      1      1      5  5
a  a      ssss  t  p      555  _____  111  _____  111  _____  555

```

Ver 01.13 Tue Jan 16 14:13:26 2001 "(0) Sending POR"

```

-----
P O R   P A C K E T
-----
80000000
-----

```

Ver 01.13 Tue Jan 16 14:13:27 2001 "(1) Testing HK variables"

Ver 01.13 Tue Jan 16 14:13:27 2001 "(2) Test 5.1.1.5a completed successfully"