COS DCE BOOT FSW v1.09 Component Test Results
Requirement 5.2.2.1a Command Rate: One Per Second

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THE UNIVERSITY OF COLORADO
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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 5.2.2.1 — Command Rate: One Per Second.

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 test sends all non-hazardous commands sequentially separated by 0.9 seconds each. It then verifies that Commands Received and Commands Executed counters agree, and are equal to the number of commands sent.

1.6 TEST SCRIPT IMPLEMENTATION

1.6.1 Test Script Arguments

The script is parameterized as shown in the following Table:

Table 1-1: Parameters/Arguments for stp5_2_2_1a.tst

Parameter	Meaning	Correct Argument for Version 1.09
#0	Absolute hex storage address of 8051 "scratch" area	C000

These parameters must be encoded into the shell script **u** (see Appendix A).

1.6.2 Test Script Coding

The script uses standard **UniScript** commands and directives.

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 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
\disks\galex\users\galex\tcs\uniscript	**UniScript.pl**	**UniScript** interpreter
\disks\galex\users\galex\tcs\uniscript\stp5_2_2_1a	**u**	Shell script for this procedure
Ditto	**stp5_2_2_1.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)	*NASA Basic Safety Manual*
2	COS-03-0024	*DCE FSW Test Procedure 5.2.2.1* (this document)
3	UCB-COS-008	*COS FUV Detector Software Test Plan*
4	UCB-COS-DOC-1118	*COS EGSE Startup Procedure*

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].

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: **tcs** 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: ***(get from SSL personnel)*** 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_2_2_1a** eagcos:shorty% **pwd** /disks/galex/users/galex/tcs/uniscript/stp5_2_2_1a	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_2_2_1a.tst -rw-r--r-- 1 tcs eag 62 Oct 9 17:44 u eagcos@shorty% **more < u** #!/bin/sh perl ../UniScript.pl stp5_2_2_1a "0,0,0,0,0,0,0,0"	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		eagcos:shorty% sh u $pstring=C000,C100,0330,0,0,0,0,0 Parameters are: Script File: stp5_2_2_1a #0: C000 #1: C100 #2: 0330 #3: 0 #4: 0	Shell to **u**. You should see the accompanying output as **UniScript** executes

Step	QA	Operator Entry/System Response	Description
		#5: 0 #6: 0 #7: 0 Report file >/disks/galex/users/galex/tcs/uniscript/stp5_2_2_1a /stp5_2_2_1a.rp1 successfully opened. Report file >/disks/galex/users/galex/tcs/uniscript/stp5_2_2_1a /stp5_2_2_1a.rp2 successfully opened. Script file /disks/galex/users/galex/tcs/uniscript/stp5_2_2_1a/s tp5_2_2_1a.tst successfully opened at level 0. "Press Y when ready to conduct test 5.2.2.1a" y Continuing. "Sending two PORs, WAITS, collecting initial HK" LFDNOOP WAIT 0: HKV0=1; HKV1=0; wc=5 WAIT 1: HKV1=0; wc=4 WAIT 1: HKV1=1; wc=3 LFDNOOP "Sending LFDCOPY" LFDCOPY SOURCE,DEST,NBYTES,BANK "Sending LFMCRC" LFDCRC SOURCE,NBYTES,CODE	

Step	QA	Operator Entry/System Response	Description
		"Sending LFDDIAGC" LFDDIAGC "Sending LFDDNLOD" LFDDNLOD SOURCE,NBYTES "Sending LFDGOTO" LFDGOTO NOOP "Sending LFDHKREQ" LFDHKREQ "Sending LFDMADDR" LFDMADDR 0,SOURCE,DATA "Sending LFDUPLOD" LFDUPLOD DEST,NBYTES,0 "Sending LFDWDOG" LFDWDOG 1 WAIT 0: HKV0=13; HKV1=11; wc=5 WAIT 1: HKV1=12; wc=4 WAIT 1: HKV1=13; wc=3 "Test stp5.2.2.1a completed successfully"	

4.3 POST-OPERATION ACTIVITIES

4.3.1 Copy Reports to PC Files and Print Them

Using an FTP client, copy the **u**, **stp5_2_2_1a.tst**, **stp5_2_2_1a.rp1**, and **stp5_2_2_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_2_2_1a "C000,C100,0330,0,0,0,0,0"
cosnoopy&
```

Appendix B. Test Script stp5_2_2_1a.tst

```
; ********************************************************************
; ********************************************************************
; **                                                                **
; **  BBBB    OOO    OOO   TTTTT          OOO   N   N  L      Y   Y  **
; **  B   B  O   O  O   O    T           O   O  N   N  L      Y   Y  **
; **  B   B  O   O  O   O    T           O   O  NN  N  L       Y Y   **
; **  BBBB   O   O  O   O    T           O   O  N N N  L        Y    **
; **  B   B  O   O  O   O    T           O   O  N  NN  L        Y    **
; **  B   B  O   O  O   O    T           O   O  N   N  L        Y    **
; **  BBBB    OOO    OOO     T            OOO   N   N  LLLLL    Y    **
; **                                                                **
; ********************************************************************
; ********************************************************************
; ***************************************************************************************
; * STP 5.2.2.1a                                                                        *
; * ----------------------------------------------------------------------------------- *
; * Send all non-hazardous commands sequentially separated by 0.9 seconds each.         *
; * Verify that Commands Received and Commands Executed counters agree, and are         *
; * equal to the number of commands sent.                                               *
; * ----------------------------------------------------------------------------------- *
; * NOTE: This test requirement cannot be met literally as stated for the follow-       *
; * ing reasons:                                                                        *
; *                                                                                     *
; * 1. Not all commands are accepted/executed in Boot State                             *
; *                                                                                     *
; * 2. The "reset" commands LFDRSTP and LFDRSTW demolish the ongoing packet counts      *
; *    since they reset FSW variables.                                                  *
; *                                                                                     *
; * 3. The LFDJMPCS command takes FSW out of Boot State, hence leaves FSW in no         *
; *    condition to report success of the test in Boot State.                           *
; *                                                                                     *
; * 4. The LFDNOOP command is not counted as "executed" per software design.            *
; * ----------------------------------------------------------------------------------- *
; * Parameters:                                                                         *
; * Parameters:                                                                         *
; * #0 SOURCE ("scratch area")                                                          *
; * #1 DEST   ("scratch area + 256")                                                    *
; * #2 NOOP   (address of LFDNOOP command routine)                                      *
; ***************************************************************************************
;
SYM      SOURCE  =0x#0
SYM      DEST    =0x#1
SYM      NOOP    =0x#2
SYM      NBYTES  =16
SYM      CODE    =0
SYM      ID      =0
SYM      SETTING =0
SYM      BANK    =0
SYM      RATE    =0
SYM      SEGMENT =0
SYM      DIR     =0
SYM      POWER   =0
SYM      STATE   =0
SYM      HIVOLT  =0
SYM      LIMIT   =0
SYM      VOLTAGE =0
SYM      ACTUATOR=0
SYM      ABORT   =0
SYM      OVERRIDE=0
SYM      DOOR    =0
SYM      MOVE    =0
SYM      BANK    =0
SYM      DATA    =0
SYM      DELTA   =25
SYM      NSEC    =5
;
; ****************************************
```

```
; * Wait until setup (if any) is complete *
; ****************************************
;
WTOR          "Press Y when ready to conduct test 5.2.2.1a"
;
; ********************
; * Force Boot State *
; ********************
;
DTG           3,"(0) Sending two PORs, WAITs, collecting initial HK"
WTO           "Sending two PORs, WAITS, collecting initial HK"
POR
WAIT          1
POR
WAIT          1
;
LFDNOOP
WAIT          NSEC,HK
LOG           1,LFCTIME,LFDCMDX,LFDCMDR
LFDNOOP
;
DELAY         DELTA
DTG           3,"(1) Sending LFDCOPY"
WTO           "Sending LFDCOPY"
LFDCOPY       SOURCE,DEST,NBYTES,BANK
;
DELAY         DELTA
DTG           3,"(2) Sending LFMCRC"
WTO           "Sending LFMCRC"
LFDCRC        SOURCE,NBYTES,CODE
;
DELAY         DELTA
DTG           3,"(3) Sending LFDDIAGC"
WTO           "Sending LFDDIAGC"
LFDDIAGC
;
DELAY         DELTA
DTG           3,"(4) Sending LFDDNLOD"
WTO           "Sending LFDDNLOD"
LFDDNLOD      SOURCE,NBYTES
;
; ************************************************************
; * This GOTO NOOP will NOT get counted in LFDCMDX or LFDCMDR! *
; ************************************************************
;
DELAY         DELTA
DTG           3,"(5) Sending LFDGOTO"
WTO           "Sending LFDGOTO"
LFDGOTO       NOOP
;
DELAY         DELTA
DTG           3,"(6) Sending LFDHKREQ"
WTO           "Sending LFDHKREQ"
LFDHKREQ
;
DELAY         DELTA
DTG           3,"(7) Sending LFDMADDR"
WTO           "Sending LFDMADDR"
LFDMADDR      0,SOURCE,DATA
;
DELAY         DELTA
DTG           3,"(8) Sending LFDUPLOD"
WTO           "Sending LFDUPLOD"
LFDUPLOD      DEST,NBYTES,0
;
DELAY         DELTA
DTG           3,"(9) Sending LFDWDOG"
WTO           "Sending LFDWDOG"
LFDWDOG       1
;
```

```
;DELAY        DELTA
;DTG          3,"(10) Sending LFDJMPCS"
;WTO          "Sending LFDJMPCS"
;LFDJMPCS     0
; ------------------------------------------------------------------------
;LFGBWK       SETTING,SEGMENT,0
;LFGEWK       SETTING,SEGMENT,0
;LFGLQT       SETTING,SEGMENT
;LFGSHFT      SETTING,SEGMENT,0
;LFGSTIM      RATE,SEGMENT
;LFGSTR       SETTING,SEGMENT,0
;LFGTT        SETTING,SEGMENT,DIR
;LFGUQT       SETTING,SEGMENT
;LFHQPWR      0
;LFHRAMPT     RATE
;LFHSTATE     STATE
;LFHVENA      HIVOLT
;LFHVILIM     LIMIT
;LFHVLOW      VOLTAGE,SEGMENT
;LFHVMAX      VOLTAGE,SEGMENT
;LFHVNOM      VOLTAGE,SEGMENT
;LFHVPWR      POWER
;LFHVSET      VOLTAGE,0
;LFPCRP       INTERVAL,SEGMENT,COUNT
;LFRACT1      POWER
;LFRACT2      POWER
;LFRACTEN     ACTUATOR
;LFRACTRS     0
;LFRAXPWR     POWER
;LFRILIM      LIMIT
;LFRSOVD      OVERRIDE
;LFRMDIR      DIR
;LFRMENA      DOOR
;LFRMPWR      MOVE
;
WAIT         NSEC,HK
LOG          1,LFCTIME,LFDCMDX,LFDCMDR,LFDDIAGS
CHECK        1,($LFDCMDR==$LFDCMDX && $LFDCMDX==8)
;
DTG          1, "(10) Test stp5.2.2.1a completed successfully"
WTO          "Test stp5.2.2.1a completed successfully"
```

Appendix C. Test Report stp5_2_2_1a.rp1

```
                                    55555          222          222           1
                                    5             2   2        2   2         11
                     ssss  ttttt  pppp   555              2            2          1
aaa
                    s        t    p   p     5             2            2          1
a   a
                    sssss    t    pppp       5           2            2          1
aaaaa
                        s    t    p      5   5          2            2          1
a   a
                    ssss     t    p       555   _____  22222  _____  22222  _____   111
a   a

Ver 01.09  Fri Nov 17 04:30:46 2000    "(0) Sending two PORs, WAITs, collecting initial
HK"

LFDNOOP

Addr Addr HK-Name        Value
---- ---- -------------- -----
1680-1683 LFCTIME        00000000
170C-170D LFDCMDX        0000
1718-1719 LFDCMDR        0000

LFDNOOP

Ver 01.09  Fri Nov 17 04:30:51 2000    "(1) Sending LFDCOPY"

LFDCOPY      SOURCE,DEST,NBYTES,BANK

Ver 01.09  Fri Nov 17 04:30:52 2000    "(2) Sending LFMCRC"

LFDCRC       SOURCE,NBYTES,CODE

Ver 01.09  Fri Nov 17 04:30:52 2000    "(3) Sending LFDDIAGC"

LFDDIAGC

Ver 01.09  Fri Nov 17 04:30:53 2000    "(4) Sending LFDDNLOD"

LFDDNLOD     SOURCE,NBYTES

Ver 01.09  Fri Nov 17 04:30:53 2000    "(5) Sending LFDGOTO"

LFDGOTO      NOOP

Ver 01.09  Fri Nov 17 04:30:53 2000    "(6) Sending LFDHKREQ"

LFDHKREQ

Ver 01.09  Fri Nov 17 04:30:54 2000    "(7) Sending LFDMADDR"

LFDMADDR     0,SOURCE,DATA

Ver 01.09  Fri Nov 17 04:30:54 2000    "(8) Sending LFDUPLOD"

LFDUPLOD     DEST,NBYTES,0

Ver 01.09  Fri Nov 17 04:30:55 2000    "(9) Sending LFDWDOG"

LFDWDOG      1

Addr Addr HK-Name        Value
---- ---- -------------- -----
1680-1683 LFCTIME        00000008
170C-170D LFDCMDX        0008
1718-1719 LFDCMDR        0008
```

```
1780-179F LFDDIAGS       0000  0000  0000  0000  0000  0000  0000  0000  0000  0000  0000
0000  0000  0000  0000  0000
17A0-17BF                0000  0000  0000  0000  0000  0000  0000  0000  0000  0000  0000
0000  0000  0000  0000  0000

CHECK:   ($LFDCMDR==$LFDCMDX && $LFDCMDX==8)
eval:    (0008==0008 && 0008==8)

S U C C E S S

Ver 01.09  Fri Nov 17 04:30:57 2000    "(10) Test stp5.2.2.1a completed successfully"
```

Appendix D. Test Report stp5_2_2_1a.rp2

```
                                    55555          222           222           1
                                    5             2   2         2   2         11
                     ssss  ttttt  pppp   555              2             2          1
aaa
                    s        t    p   p     5            2             2          1
a   a
                    sssss    t    pppp       5          2             2          1
aaaaa
                        s    t    p      5   5         2             2          1
a   a
                    ssss     t    p       555   _____  22222  _____  22222  _____   111
a   a

Ver 01.09  Fri Nov 17 04:30:46 2000    "(0) Sending two PORs, WAITs, collecting initial
HK"

Ver 01.09  Fri Nov 17 04:30:51 2000    "(1) Sending LFDCOPY"

Ver 01.09  Fri Nov 17 04:30:52 2000    "(2) Sending LFMCRC"

Ver 01.09  Fri Nov 17 04:30:52 2000    "(3) Sending LFDDIAGC"

Ver 01.09  Fri Nov 17 04:30:53 2000    "(4) Sending LFDDNLOD"

Ver 01.09  Fri Nov 17 04:30:53 2000    "(5) Sending LFDGOTO"

Ver 01.09  Fri Nov 17 04:30:53 2000    "(6) Sending LFDHKREQ"

Ver 01.09  Fri Nov 17 04:30:54 2000    "(7) Sending LFDMADDR"

Ver 01.09  Fri Nov 17 04:30:54 2000    "(8) Sending LFDUPLOD"

Ver 01.09  Fri Nov 17 04:30:55 2000    "(9) Sending LFDWDOG"
```