COS DCE BOOT FSW v1.09 Component Test Results
Requirement 5.1.1.5c Code in PROM

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Prepared By: Tim Swanson, Software Test Engineer, Design_Net Eng.  Date

Reviewed By: K. Brownsberger, COS Sr. Software Scientist, CU/CASA  Date

Reviewed By: Grant Blue, COS Software & Operations Manager, BATC  Date

Approved By: Barry Welsh, FUV Detector Program Manager, UCB  Date

Approved By: John Andrews, COS Experiment Manager, CU/CASA  Date

Center for Astrophysics & Space Astronomy
University of Colorado
Campus Box 593
Boulder, Colorado 80309
<table>
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</table>

Original Release

THE UNIVERSITY OF COLORADO
At Boulder
The Center for Astrophysics and Space Astronomy

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Requirement 5.1.1.5c Code in PROM

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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 — Code in PROM: Verify that [Boot State code] transfers control to the Operate State code area.

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 relies on two quantifiable factors to verify that the FSW is in Operate State: first, that the **LFDOPERT** bit will be 1; second, that the transition from Boot State to Operate State resets the timer. The script forces Boot State by emitting a **POR** packet (0x80000000). It then assures a timer value of nine (9) seconds (or greater) by executing a nine-second **WAIT**. Following this interval the script issues an **LFDJMPCS** command, which should force Operate State. This is followed by a request for HK data, from which both **LFDOPERT** and **LFCTIME** can be determined. The former should be 1 and the latter should have a value (substantially) less than 9.

1.6 TEST SCRIPT IMPLEMENTATION

The test implements the operations described in Section 1.5 by means of standard UniScript directives and commands.

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:

<table>
<thead>
<tr>
<th>EGSE</th>
<th>DCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>taiyo</td>
<td>ETU</td>
</tr>
<tr>
<td>shorty</td>
<td>X</td>
</tr>
<tr>
<td>ginger</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

COS DCE BOOT FSW v1.09 Component Test Results
Requirement 5.1.1.5c Code in PROM
3.3 DATA/SOFTWARE

The following files must be present:

<table>
<thead>
<tr>
<th>EGSE (shorty) Directory</th>
<th>File</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>\disks\galex\users\galex\tcs\uniscript\</td>
<td>UniScript.pl</td>
<td>UniScript interpreter</td>
</tr>
<tr>
<td>\disks\galex\users\galex\tcs\uniscript\stp5_1_1_5c\</td>
<td>u</td>
<td>Shell script for this procedure</td>
</tr>
<tr>
<td>Ditto</td>
<td>stp5_1_1_5c.tst</td>
<td>Test script for this procedure (Appendix B)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Reference</th>
<th>Document Number</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NHB 1700.1(V1-A)</td>
<td>NASA Basic Safety Manual</td>
</tr>
<tr>
<td>2</td>
<td>COS-03-0015</td>
<td>DCE FSW Test Procedure 5.1.1.5c (this document)</td>
</tr>
<tr>
<td>3</td>
<td>UCB-COS-008</td>
<td>COS FUV Detector Software Test Plan</td>
</tr>
<tr>
<td>4</td>
<td>UCB-COS-DOC-1118</td>
<td>COS EGSE Startup Procedure</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Step</th>
<th>QA</th>
<th>Operator Entry/System Response</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>C:\tcs\us&gt; telnet shorty.ssl.berkely.edu</td>
<td>Establish connection to shorty via Telnet client program</td>
</tr>
</tbody>
</table>
| 2    |    | Login: tcs  
    Password: | Using telnet window, login as user tcs |

### 4.1.4 Set Current Directory

<table>
<thead>
<tr>
<th>Step</th>
<th>QA</th>
<th>Operator Entry/System Response</th>
<th>Description</th>
</tr>
</thead>
</table>
| 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

<table>
<thead>
<tr>
<th>Step</th>
<th>QA</th>
<th>Operator Entry/System Response</th>
<th>Description</th>
</tr>
</thead>
</table>
| 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

<table>
<thead>
<tr>
<th>Step</th>
<th>QA</th>
<th>Operator Entry/System Response</th>
<th>Description</th>
</tr>
</thead>
</table>
| 5    |    | eagcos:shorty% cd  
    /disks/galex/users/galex/tcs/uniscript/stp5_1_1_5c  
    eagcos:shorty% pwd  
    /disks/galex/users/galex/tcs/uniscript/stp5_1_1_5c | Change current directory as shown |
### 4.1.7 Ensure that Proper Files are Present

<table>
<thead>
<tr>
<th>Step</th>
<th>QA</th>
<th>Operator Entry/System Response</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td></td>
<td>eagcos@shorty% ls -l</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total 12</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-rw-r--r-- 1 tcs eag 1398 Oct 8 18:03</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>stp5_1_1_5c.tst</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-rw-r--r-- 1 tcs eag 62 Oct 9 17:44</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>eagcos@shorty% more &lt; u</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>#!/bin/sh</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>perl ../UniScript.pl stp5_1_1_5c &quot;0,0,0,0,0,0,0,0&quot;</td>
<td>List files; the .tst file and the shell script u should be present</td>
</tr>
</tbody>
</table>

### 4.2 OPERATION EXECUTION

#### 4.2.1 Establish Initial Test Conditions

<table>
<thead>
<tr>
<th>Step</th>
<th>QA</th>
<th>Operator Entry/System Response</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td></td>
<td>eagcos:shorty% set path=(Path ~dbb/scripts/bin)</td>
<td>Set path as shown to enable access to hks tools</td>
</tr>
</tbody>
</table>

#### 4.2.2 Execute the Script

<table>
<thead>
<tr>
<th>Step</th>
<th>QA</th>
<th>Operator Entry/System Response</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td></td>
<td>eagcos:shorty% sh u</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$pstring=0,0,0,0,0,0,0,0</td>
<td>Shell to u. You should see the accompanying output as UniScript executes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Parameters are: Script File: stp5_1_1_5c</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>#0: 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>#1: 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>#2: 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>#3: 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>#4: 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>#5: 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>#6: 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>#7: 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Report file</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;/disks/galex/users/galex/tcs/uniscript/stp5_1_1_5c</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>/stp5_1_1_5c.rp1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>successfully opened. Report file</td>
<td></td>
</tr>
</tbody>
</table>
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_5c.tst, stp5_1_1_5c.rp1, and stp5_1_1_5c.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.  hell Script u

#!/bin/sh
pkill noopy
perl ../UniScript.pl stp5_1_1_5c "0,0,0,0,0,0,0,0"
cosnoopy&
Appendix B. Test Script stp5_1_1_5c.tst

; ***********************************************************
; * DCE FSW Requirement 5.1.1.5c -- Code in PROM *
; * Verify ... [that Boot State code] transfers control to *
; * the lower code image. *
; ***********************************************************

SYM NSEC=5
ECNO 2

;****************************************************
* Make sure we are in Boot State -- issue POR *
;****************************************************

WAIT 1
DTG 3,"(0) Issuing POR"
WTO "Issuing POR"
POR
WAIT NSEC,HK
LOG 1,LFSBITS1,LFDOPERT
CHECK 1,((LFSBITS1 & LFDOPERT) == 0)
DTG 3,"DCE is in Boot State"

;****************************************************
* Jump to Code in External Memory. Verify this by *
* checking LFDOPERT and the timer LFCTIME *
;****************************************************

;*********************************
* Some tester entertainment ... *
;*********************************

DTG 3,"(1) Beginning 9-second wait..."
WTO "Beginning 9-second wait..."
WAIT 1
WTO "9 seconds to go: > "
WAIT 1
WTO "8 seconds to go: -- > "
WAIT 1
WTO "7 seconds to go: ---> "
WAIT 1
WTO "6 seconds to go: ---- > "
WAIT 1
WTO "5 seconds to go: ------ > "
WAIT 1
WTO "4 seconds to go: ------- > "
WAIT 1
WTO "3 seconds to go: -------- > "
WAIT 1
WTO "2 seconds to go: --------- > "
WAIT 1
WTO "1 second to go: ---------- > "
WAIT 1
WTO "Ka-boom!! ... "
LOG 1,LFCTIME,LFDOPERT
LFDJMPCS 0
WAIT 10,HK
LOG 1,LFCTIME,LFDOPERT
CHECK 1,((LFSBITS1 & LFDOPERT) != 0)
CHECK 1,(LFCTIME < 9)
DTG 1,"(2) Test stp5_1_1_5c completed successfully"
WTO "Test stp5_1_1_5c completed successfully"
### Appendix C. Test Report stp5_1_1_5c.rp1

```
<table>
<thead>
<tr>
<th>55555</th>
<th>1</th>
<th>1</th>
<th>55555</th>
<th>5</th>
<th>1</th>
<th>1</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>sss</td>
<td>ttt</td>
<td>ppp</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>c</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>sssss</td>
<td>t</td>
<td>pppp</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>c</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>sss</td>
<td>t</td>
<td>p</td>
<td>555</td>
<td>111</td>
<td>111</td>
<td>111</td>
</tr>
<tr>
<td></td>
<td>c</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ver 17200 Thu Nov 16 19:20:25 2000  "(0) Issuing two PORs"

LFDNOOP

Addr    Addr    HK-Name    Value
-----    -----    -------------- -----
16F4-16F5 LFSBITS1  0000

Addr    Mask    HK-Bit-Name   Value
-----    ----     -------------- -----
16F4 0008 LFDOPERT  0

CHECK: (($LFSBITS1 & $LFDOPERT) == 0)
eval:  ((0000 & 0008) == 0)
SUCCESS

Ver 01.09 Thu Nov 16 19:20:30 2000  "(1) DCE is in Boot State"

Ver 01.09 Thu Nov 16 19:20:30 2000  "(2) Beginning 9-second wait..."

Addr    Addr    HK-Name    Value
-----    -----    -------------- -----
1680-1683 LFCTIME 00000000

Addr    Mask    HK-Bit-Name   Value
-----    ----     -------------- -----
16F4 0008 LFDOPERT  0

LFDJMPCS

Addr    Addr    HK-Name    Value
-----    -----    -------------- -----
1680-1683 LFCTIME 00000002

Addr    Mask    HK-Bit-Name   Value
-----    ----     -------------- -----
16F4 0008 LFDOPERT  1

CHECK: (($LFSBITS1 & $LFDOPERT) != 0)
eval:  ((4008 & 0008) != 0)
SUCCESS

CHECK: ($LFCTIME < 9)
eval:  (0002 < 9)
SUCCESS

Ver 17200 Thu Nov 16 19:20:44 2000  "(3) Test stp5_1_1_5c completed successfully"
```
Appendix D.  Test Report stp5_1_1_5c.rp2

Ver 17200  Thu Nov 16 19:20:25 2000  "(0) Issuing two PORs"

------------------------------------------------- POR PACKET -------------------------------------------------
80000000

------------------------------------------------- POR PACKET -------------------------------------------------
80000000

------------------------------------------------- COMMAND PACKET -------------------------------------------------
PARM4 PARM3 PARM2 PARM1 PARM0
045AFFFE 04580000 0456FFFF 04540000 0452FFFF 04500000 044EFFFF 044C0000 044AFFFF 04480000
SN OPCODE
0446FFFE 04440001 04427F7F 04408080

------------------------------------------------- COMMAND PACKET -------------------------------------------------
PARM4 PARM3 PARM2 PARM1 PARM0
045AFFFE 04580000 0456FFFF 04540000 0452FFFF 04500000 044EFFFF 044C0000 044AFFFF 04480000
SN OPCODE
0446FFFFD 04440002 04427F7F 04408080

------------------------------------------------- COMMAND PACKET -------------------------------------------------
PARM4 PARM3 PARM2 PARM1 PARM0
045AFFFE 04580000 0456FFFF 04540000 0452FFFF 04500000 044EFFFF 044C0000 044AFFFF 04480000
SN OPCODE
0446FFFC 04440003 04427F7F 04408080

Ver 01.09  Thu Nov 16 19:20:30 2000  "(1) DCE is in Boot State"
Ver 01.09  Thu Nov 16 19:20:30 2000  "(2) Beginning 9-second wait..."
<table>
<thead>
<tr>
<th>COMMAND PACKET</th>
</tr>
</thead>
<tbody>
<tr>
<td>SN</td>
</tr>
<tr>
<td>0446FFFB</td>
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<th>COMMAND PACKET</th>
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<tr>
<td>SN</td>
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<tr>
<td>0446FFFA</td>
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<th>COMMAND PACKET</th>
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<tbody>
<tr>
<td>SN</td>
</tr>
<tr>
<td>0446FFFA</td>
</tr>
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<thead>
<tr>
<th>COMMAND PACKET</th>
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