

**COS DCE BOOT FSW v1.09 Component Test Results
Requirement 5.1.2.3 Capability to Log Diagnostics**

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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 5.1.2.3 — Capability to Log Diagnostics.

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

When the **REPORT_DIAGNOSTIC** routine executes it places its diagnostic code parameter in the **LFDDIAGS** array along with an ordinal number associated with the parameter. The codes are placed in position 0 of the array, and all existing contents of the array are shifted "forward" toward the high-index end of the array. A code in the 31st element of the array is "shifted off the end" — i.e., erased. This script generates diagnostics in the order 01, 02,..., 33, 34, 35. Hence these codes should appear in **LFDDIAGS**[0..31] in the order 35, 34, 33,..., 05, 04.

The script forces FSW to log the diagnostics by means of a chunk of 8051 binary code generated into Buffer 1 and uploaded to a "scratch area" of 8051 external memory starting at C000.

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_1_2_3.tst

Parameter	Meaning	Correct Argument for Version 1.09
#0	Absolute hex storage address of 8051 "scratch" area	C000
#1	Absolute hex storage address of REPORT_DIAGNOSTIC	0A40

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. The special 8051 code generated by the script has the following form:

```
C000 7401 MOV A,#01h ; generate  
C002 1209D0 LCALL REPORT_DIAGNOSTIC ; DIAG0001
```

```
C005 7402  MOV  A,#02h      ; generate
C007 1209D0 LCALL REPORT_DIAGNOSTIC ; DIAG0002
C00A 7403  MOV  A,#03h      ; generate
C00C 1209D0 LCALL REPORT_DIAGNOSTIC ; DIAG0003
... ..
C0AA 7423  MOV  A,#23h      ; generate
C0AC 1209D0 LCALL REPORT_DIAGNOSTIC ; DIAG0023
C0AF 22    RET              ; return
```

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\uniscrpt\	UniScript.pl	UniScript interpreter
\disks\galex\users\galex\tcs\uniscrpt\stp5_1_2_3\	u	Shell script for this procedure
Ditto	stp5_1_2_3.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-03-0021	<i>DCE FSW Test Procedure 5.1.2.3 (this document)</i>
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].

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		<pre>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</pre>	slogin as eagcos ; get password from SSL personnel

4.1.6 Set Current Directory

Step	QA	Operator Entry/System Response	Description
5		<pre>eagcos:shorty% cd /disks/galex/users/galex/tcs/uniscript/stp5_1_2_3 eagcos:shorty% pwd /disks/galex/users/galex/tcs/uniscript/stp5_1_2_3</pre>	Change current directory as shown

4.1.7 Ensure that Proper Files are Present

Step	QA	Operator Entry/System Response	Description
6		<pre>eagcos@shorty% ls -l Total 12 -rw-r--r-- 1 tcs eag 1398 Oct 8 18:03 stp5_1_2_3.tst -rw-r--r-- 1 tcs eag 62 Oct 9 17:44 u</pre>	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		<pre>eagcos:shorty% set path=(\$path ~dbb/scripts/bin)</pre>	Set path as shown to enable access to hks tools

4.2.2 Execute the Script

Step	QA	Operator Entry/System Response	Description
8		<pre>eagcos:shorty% sh u \$psstring=C000,0A40,0,0,0,0,0,0 Parameters are: Script File: stp5_1_2_3 #0: C000 #1: 0A40 #2: 0 #3: 0 #4: 0 #5: 0 #6: 0 #7: 0 Report file >/disks/galex/users/galex/tcs/uniscript/stp5_1_2_3/ stp5_1_2_3.rp1 successfully opened. Report file >/disks/galex/users/galex/tcs/uniscript/stp5_1_2_3/ stp5_1_2_3.rp2 successfully opened. Script file /disks/galex/users/galex/tcs/uniscript/stp5_1_2_3/st p5_1_2_3.tst successfully opened at level 0. "Sending two PORs, followed by one-second WAITs" "Uploading special code" "Sending LFDUPL0D" LFDUPL0D SCRATCH,NBYTES,CRC1 gnxtser 0: NEXTSEQ=1 "Sending LFDGOTO" LFDGOTO SCRATCH</pre>	<p>Shell to u. You should see the accompanying output as UniScript executes</p>

Step	QA	Operator Entry/System Response	Description
		gnxtser 0: NEXTSEQ=2 WAIT 0: HKV0=2; HKV1=0; wc=5 gnxtser 0: NEXTSEQ=3 WAIT 1: HKV1=1; wc=4 gnxtser 0: NEXTSEQ=4 WAIT 1: HKV1=3; wc=3 "Test 5.1.2.3 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_1_2_3.tst**, **stp5_1_2_3.rp1**, and **stp5_1_2_3.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  
kill cosnoopy  
perl ../UniScript.pl stp5_1_2_3 "C000,0A40,0,0,0,0,0,0"  
cosnoopy&
```

Appendix B. Test Script `stp5_1_2_3.tst`

```
; *****  
; *****  
; **  
; ** BBBB   OOO   OOO   TTTT           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   **  
; **  
; *****  
; *****  
; *****  
; * DCE FSW Requirement 5.1.2.3 -- Capability to log diagnostics *  
; * ----- *  
; * Generate a known pattern of 33+ diagnostics. Verify that the *  
; * 32 most recent diagnostics appear in diagnostic stack code *  
; * in proper order. *  
; * ----- *  
; * Parameters (v1.07) #0 = C000 address of scratch area *  
; * #1 = 0A40 address of REPORT_DIAGNOSTIC *  
; *****  
; *****  
; * When the REPORT_DIAGNOSTIC routine executes it places the *  
; * LSB of its diagnostic code parameter in the LFDDIAGS array *  
; * along with an ordinal number associated with the parameter. *  
; * The codes are placed in position 0 of the array, and all *  
; * existing contents of the array are shifted "forward" toward *  
; * the high-index end of the array. A code in the 31st element *  
; * of the array is "shifted off the end" -- i.e., erased. This *  
; * script generates diagnostics in the order *  
; * 01,02,...,33,34,35. Hence these codes should appear in *  
; * LFDDIAGS[0..31] in the order 35,34,33,...,05,04. *  
; * *  
; * The script forces FSW to log the diagnostics by means of a *  
; * chunk of 8051 binary code generated into Buffer 1 and *  
; * uploaded to a "scratch area" of 8051 external memory *  
; * starting at C000. This code has the following form: *  
; * *  
; * C000 7401   MOV     A,#01h       ; generate *  
; * C002 1209D0  LCALL  REPORT_DIAGNOSTIC ; DIAG0001 *  
; * C005 7402   MOV     A,#02h       ; generate *  
; * C007 1209D0  LCALL  REPORT_DIAGNOSTIC ; DIAG0002 *  
; * C00A 7403   MOV     A,#03h       ; generate *  
; * C00C 1209D0  LCALL  REPORT_DIAGNOSTIC ; DIAG0003 *  
; * ..... *  
; * C0AA 7423   MOV     A,#23h       ; generate *  
; * C0AC 1209D0  LCALL  REPORT_DIAGNOSTIC ; DIAG0023 *  
; * C0AF 22     RET                    ; return *  
; *****  
; *****  
ECHO      2  
; *****  
SYM       SCRATCH=0x#0  
SYM       NBYTES =176  
; *****  
; * Generate the special program *  
; *****  
; *****  
DATA      1,  0,5,CONST=0x7401_12#1  
DATA      1,  5,5,CONST=0x7402_12#1  
DATA      1, 10,5,CONST=0x7403_12#1  
DATA      1, 15,5,CONST=0x7404_12#1
```

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```
DATA      1, 20,5,CONST=0x7405_12#1
DATA      1, 25,5,CONST=0x7406_12#1
DATA      1, 30,5,CONST=0x7407_12#1
DATA      1, 35,5,CONST=0x7408_12#1
DATA      1, 40,5,CONST=0x7409_12#1
DATA      1, 45,5,CONST=0x740A_12#1
DATA      1, 50,5,CONST=0x740B_12#1
DATA      1, 55,5,CONST=0x740C_12#1
DATA      1, 60,5,CONST=0x740D_12#1
DATA      1, 65,5,CONST=0x740E_12#1
DATA      1, 70,5,CONST=0x740F_12#1
DATA      1, 75,5,CONST=0x7410_12#1
DATA      1, 80,5,CONST=0x7411_12#1
DATA      1, 85,5,CONST=0x7412_12#1
DATA      1, 90,5,CONST=0x7413_12#1
DATA      1, 95,5,CONST=0x7414_12#1
DATA      1,100,5,CONST=0x7415_12#1
DATA      1,105,5,CONST=0x7416_12#1
DATA      1,110,5,CONST=0x7417_12#1
DATA      1,115,5,CONST=0x7418_12#1
DATA      1,120,5,CONST=0x7419_12#1
DATA      1,125,5,CONST=0x741A_12#1
DATA      1,130,5,CONST=0x741B_12#1
DATA      1,135,5,CONST=0x741C_12#1
DATA      1,140,5,CONST=0x741D_12#1
DATA      1,145,5,CONST=0x741E_12#1
DATA      1,150,5,CONST=0x741F_12#1
DATA      1,155,5,CONST=0x7420_12#1
DATA      1,160,5,CONST=0x7421_12#1
DATA      1,165,5,CONST=0x7422_12#1
DATA      1,170,5,CONST=0x7423_12#1
DATA      1,175,1,CONST=0x22_
;
LOG      1,1
;
; *****
; * Ensure Boot State and upload special program *
; *****
;
DTG      3,"(0) Sending two PORs, followed by one-second WAITs"
WTO      "Sending two PORs, followed by one-second WAITs"
;
POR
WAIT     1
POR
WAIT     1
;
DTG      3,"(1) Uploading special code"
WTO      "Uploading special code"
;
XMIT     1,L1
;
DTG      3,"(2) Sending LFDUPL0D"
WTO      "Sending LFDUPL0D"
;
LFDUPL0D SCRATCH,NBYTES,CRC1
WAIT     1
;
; *****
; * Execute the diagnostic-generation program and download HK *
; *****
;
DTG      3,"(3) Sending LFDGOTO"
WTO      "Sending LFDGOTO"
;
LFDGOTO  SCRATCH
;DELAY   26
;LFDNOOP
WAIT     5,HK
LOG      1,LFDIAGS,LFDERR,LFSBITS1,LFDOPERT
```

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```
i
CHECK 1, (($LFDDIAGS[ 0] & hex("FF"))==hex("23"))
CHECK 1, (($LFDDIAGS[ 1] & hex("FF"))==hex("22"))
CHECK 1, (($LFDDIAGS[ 2] & hex("FF"))==hex("21"))
CHECK 1, (($LFDDIAGS[ 3] & hex("FF"))==hex("20"))
CHECK 1, (($LFDDIAGS[ 4] & hex("FF"))==hex("1F"))
CHECK 1, (($LFDDIAGS[ 5] & hex("FF"))==hex("1E"))
CHECK 1, (($LFDDIAGS[ 6] & hex("FF"))==hex("1D"))
CHECK 1, (($LFDDIAGS[ 7] & hex("FF"))==hex("1C"))
CHECK 1, (($LFDDIAGS[ 8] & hex("FF"))==hex("1B"))
CHECK 1, (($LFDDIAGS[ 9] & hex("FF"))==hex("1A"))
CHECK 1, (($LFDDIAGS[10] & hex("FF"))==hex("19"))
CHECK 1, (($LFDDIAGS[11] & hex("FF"))==hex("18"))
CHECK 1, (($LFDDIAGS[12] & hex("FF"))==hex("17"))
CHECK 1, (($LFDDIAGS[13] & hex("FF"))==hex("16"))
CHECK 1, (($LFDDIAGS[14] & hex("FF"))==hex("15"))
CHECK 1, (($LFDDIAGS[15] & hex("FF"))==hex("14"))
CHECK 1, (($LFDDIAGS[16] & hex("FF"))==hex("13"))
CHECK 1, (($LFDDIAGS[17] & hex("FF"))==hex("12"))
CHECK 1, (($LFDDIAGS[18] & hex("FF"))==hex("11"))
CHECK 1, (($LFDDIAGS[19] & hex("FF"))==hex("10"))
CHECK 1, (($LFDDIAGS[20] & hex("FF"))==hex("0F"))
CHECK 1, (($LFDDIAGS[21] & hex("FF"))==hex("0E"))
CHECK 1, (($LFDDIAGS[22] & hex("FF"))==hex("0D"))
CHECK 1, (($LFDDIAGS[23] & hex("FF"))==hex("0C"))
CHECK 1, (($LFDDIAGS[24] & hex("FF"))==hex("0B"))
CHECK 1, (($LFDDIAGS[25] & hex("FF"))==hex("0A"))
CHECK 1, (($LFDDIAGS[26] & hex("FF"))==hex("09"))
CHECK 1, (($LFDDIAGS[27] & hex("FF"))==hex("08"))
CHECK 1, (($LFDDIAGS[28] & hex("FF"))==hex("07"))
CHECK 1, (($LFDDIAGS[29] & hex("FF"))==hex("06"))
CHECK 1, (($LFDDIAGS[30] & hex("FF"))==hex("05"))
CHECK 1, (($LFDDIAGS[31] & hex("FF"))==hex("04"))
i
DTG 3, "4) Test 5.1.2.3 completed successfully"
WTO "Test 5.1.2.3 completed successfully"
```


Appendix C. Test Report stp5_1_2_3.rp1

```

333                               55555           1           222
333                               5           11           2  2           3
3                               ssss  ttttt  pppp  555           1           2
3                               s           t           p  p           5           1           2
3                               sssss  t           pppp  5           1           2
3                               s           t           p           5  5           1           2           3
3                               ssss  t           p           555  _____ 111  _____ 22222  _____
333

```

```

Len  CRC  Buffer          Data
-----
00B0 119E 1           74 01 12 0A 40 74 02 12 0A 40 74 03 12 0A 40 74 04 12 0A 40 74
05 12 0A 40 74 06 12 0A 40 74 07
12 0A 40 74 08 12 0A 40 74 09 12 0A 40 74 0A 12 0A 40 74 0B 12
0A 40 74 0C 12 0A 40 74 0D 12 0A
40 74 0E 12 0A 40 74 0F 12 0A 40 74 10 12 0A 40 74 11 12 0A 40
74 12 12 0A 40 74 13 12 0A 40 74
14 12 0A 40 74 15 12 0A 40 74 16 12 0A 40 74 17 12 0A 40 74 18
12 0A 40 74 19 12 0A 40 74 1A 12
0A 40 74 1B 12 0A 40 74 1C 12 0A 40 74 1D 12 0A 40 74 1E 12 0A
40 74 1F 12 0A 40 74 20 12 0A 40
74 21 12 0A 40 74 22 12 0A 40 74 23 12 0A 40 22

```

```

Ver 01.09 Thu Nov 16 23:52:56 2000 "(0) Sending two PORs, followed by one-second
WAITS"
Ver 01.09 Thu Nov 16 23:52:58 2000 "(1) Uploading special code"
Ver 01.09 Thu Nov 16 23:52:59 2000 "(2) Sending LFDUPL0D"
LFDUPL0D SCRATCH,NBYTES,CRC1
Ver 01.09 Thu Nov 16 23:53:00 2000 "(3) Sending LFDGOTO"
LFDGOTO SCRATCH

```

```

Addr Addr HK-Name          Value
-----
1780-179F LFDDIAGS          2423 2322 2221 2120 201F 1F1E 1E1D 1D1C 1C1B 1B1A 1A19
1918 1817 1716 1615 1514
17A0-17BF          1413 1312 1211 1110 100F 0F0E 0E0D 0D0C 0C0B 0B0A 0A09
0908 0807 0706 0605 0504

```

1640-1647 LFDERR 00 00 00 00 00 00 00 00

16F4-16F5 LFSBITS1 0000

```

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

```

```

CHECK: (($LFDDIAGS[ 0] & hex("FF"))==hex("23"))
eval:   ((0000[ 0] & hex("FF"))==hex("23"))

```

S U C C E S S

```

CHECK: (($LFDDIAGS[ 1] & hex("FF"))==hex("22"))
eval:   ((0000[ 1] & hex("FF"))==hex("22"))

```

S U C C E S S

Center for Astrophysics & Space Astronomy

CHECK: ((\$LFDDIAGS[2] & hex("FF"))==hex("21"))
eval: ((0000[2] & hex("FF"))==hex("21"))

S U C C E S S

CHECK: ((\$LFDDIAGS[3] & hex("FF"))==hex("20"))
eval: ((0000[3] & hex("FF"))==hex("20"))

S U C C E S S

CHECK: ((\$LFDDIAGS[4] & hex("FF"))==hex("1F"))
eval: ((0000[4] & hex("FF"))==hex("1F"))

S U C C E S S

CHECK: ((\$LFDDIAGS[5] & hex("FF"))==hex("1E"))
eval: ((0000[5] & hex("FF"))==hex("1E"))

S U C C E S S

CHECK: ((\$LFDDIAGS[6] & hex("FF"))==hex("1D"))
eval: ((0000[6] & hex("FF"))==hex("1D"))

S U C C E S S

CHECK: ((\$LFDDIAGS[7] & hex("FF"))==hex("1C"))
eval: ((0000[7] & hex("FF"))==hex("1C"))

S U C C E S S

CHECK: ((\$LFDDIAGS[8] & hex("FF"))==hex("1B"))
eval: ((0000[8] & hex("FF"))==hex("1B"))

S U C C E S S

CHECK: ((\$LFDDIAGS[9] & hex("FF"))==hex("1A"))
eval: ((0000[9] & hex("FF"))==hex("1A"))

S U C C E S S

CHECK: ((\$LFDDIAGS[10] & hex("FF"))==hex("19"))
eval: ((0000[10] & hex("FF"))==hex("19"))

S U C C E S S

CHECK: ((\$LFDDIAGS[11] & hex("FF"))==hex("18"))
eval: ((0000[11] & hex("FF"))==hex("18"))

S U C C E S S

CHECK: ((\$LFDDIAGS[12] & hex("FF"))==hex("17"))
eval: ((0000[12] & hex("FF"))==hex("17"))

S U C C E S S

CHECK: ((\$LFDDIAGS[13] & hex("FF"))==hex("16"))
eval: ((0000[13] & hex("FF"))==hex("16"))

S U C C E S S

CHECK: ((\$LFDDIAGS[14] & hex("FF"))==hex("15"))
eval: ((0000[14] & hex("FF"))==hex("15"))

S U C C E S S

CHECK: ((\$LFDDIAGS[15] & hex("FF"))==hex("14"))
eval: ((0000[15] & hex("FF"))==hex("14"))

S U C C E S S

Center for Astrophysics & Space Astronomy

CHECK: ((\$LFDDIAGS[16] & hex("FF"))==hex("13"))
eval: ((0000[16] & hex("FF"))==hex("13"))

S U C C E S S

CHECK: ((\$LFDDIAGS[17] & hex("FF"))==hex("12"))
eval: ((0000[17] & hex("FF"))==hex("12"))

S U C C E S S

CHECK: ((\$LFDDIAGS[18] & hex("FF"))==hex("11"))
eval: ((0000[18] & hex("FF"))==hex("11"))

S U C C E S S

CHECK: ((\$LFDDIAGS[19] & hex("FF"))==hex("10"))
eval: ((0000[19] & hex("FF"))==hex("10"))

S U C C E S S

CHECK: ((\$LFDDIAGS[20] & hex("FF"))==hex("0F"))
eval: ((0000[20] & hex("FF"))==hex("0F"))

S U C C E S S

CHECK: ((\$LFDDIAGS[21] & hex("FF"))==hex("0E"))
eval: ((0000[21] & hex("FF"))==hex("0E"))

S U C C E S S

CHECK: ((\$LFDDIAGS[22] & hex("FF"))==hex("0D"))
eval: ((0000[22] & hex("FF"))==hex("0D"))

S U C C E S S

CHECK: ((\$LFDDIAGS[23] & hex("FF"))==hex("0C"))
eval: ((0000[23] & hex("FF"))==hex("0C"))

S U C C E S S

CHECK: ((\$LFDDIAGS[24] & hex("FF"))==hex("0B"))
eval: ((0000[24] & hex("FF"))==hex("0B"))

S U C C E S S

CHECK: ((\$LFDDIAGS[25] & hex("FF"))==hex("0A"))
eval: ((0000[25] & hex("FF"))==hex("0A"))

S U C C E S S

CHECK: ((\$LFDDIAGS[26] & hex("FF"))==hex("09"))
eval: ((0000[26] & hex("FF"))==hex("09"))

S U C C E S S

CHECK: ((\$LFDDIAGS[27] & hex("FF"))==hex("08"))
eval: ((0000[27] & hex("FF"))==hex("08"))

S U C C E S S

CHECK: ((\$LFDDIAGS[28] & hex("FF"))==hex("07"))
eval: ((0000[28] & hex("FF"))==hex("07"))

S U C C E S S

CHECK: ((\$LFDDIAGS[29] & hex("FF"))==hex("06"))
eval: ((0000[29] & hex("FF"))==hex("06"))

S U C C E S S

Center for Astrophysics & Space Astronomy

```
CHECK: (($LFDDIAGS[30] & hex("FF"))==hex("05"))  
eval:  ((0000[30] & hex("FF"))==hex("05"))
```

S U C C E S S

```
CHECK: (($LFDDIAGS[31] & hex("FF"))==hex("04"))  
eval:  ((0000[31] & hex("FF"))==hex("04"))
```

S U C C E S S

Ver 01.09 Thu Nov 16 23:53:03 2000 "(4) Test 5.1.2.3 completed successfully"

Appendix D. Test Report stp5_1_2_3.rp2

```

333                               55555           1           222
3                               5           11           2  2           3
3                               ssss ttttt  pppp  555           1           2
3                               s           t  p  p    5           1           2
3                               sssss  t  pppp    5           1           2
3                               s           t  p    5  5           1           2           3
3                               ssss  t  p    555  _____ 111  _____ 22222  _____
333

```

Ver 01.09 Thu Nov 16 23:52:56 2000 "(0) Sending two PORs, followed by one-second WAITs"

```

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

```

```

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

```

Ver 01.09 Thu Nov 16 23:52:58 2000 "(1) Uploading special code"

```

-----
U P L O A D   P A C K E T
-----
00400174 00420A12 00447440 00461202 0048400A 004A0374 004C0A12 004E7440
00501204 0052400A 00540574 00560A12 00587440 005A1206 005C400A 005E0774
00600A12 00627440 00641208 0066400A 00680974 006A0A12 006C7440 006E120A
0070400A 00720B74 00740A12 00767440 0078120C 007A400A 007C0D74 007E0A12
00807440 0082120E 0084400A 00860F74 00880A12 008A7440 008C1210 008E400A
00901174 00920A12 00947440 00961212 0098400A 009A1374 009C0A12 009E7440
00A01214 00A2400A 00A41574 00A60A12 00A87440 00AA1216 00AC400A 00AE1774
00B00A12 00B27440 00B41218 00B6400A 00B81974 00BA0A12 00BC7440 00BE121A
00C0400A 00C21B74 00C40A12 00C67440 00C8121C 00CA400A 00CC1D74 00CE0A12
00D07440 00D2121E 00D4400A 00D61F74 00D80A12 00DA7440 00DC1220 00DE400A
00E02174 00E20A12 00E47440 00E61222 00E8400A 00EA2374 00EC0A12 00EE2240
-----

```

Ver 01.09 Thu Nov 16 23:52:59 2000 "(2) Sending LFDUPL0D"

```

-----
C O M M A N D   P A C K E T
-----
          PARM4          PARM3          PARM2          PARM1          PARM0
045AFFFF 04580000 0456FFFF 04540000 0452EE61 0450119E 044EFF4F 044C00B0 044A3FFF 0448C000
-----
          SN          OPCODE
0446FFFE 04440001 04425252 0440ADAD
-----

```

Ver 01.09 Thu Nov 16 23:53:00 2000 "(3) Sending LFDGOTO"

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C O M M A N D P A C K E T

 PARM4 PARM3 PARM2 PARM1 PARM0
045AFFFF 04580000 0456FFFF 04540000 0452FFFF 04500000 044EFFFF 044C0000 044A3FFF 0448C000

 SN OPCODE
0446FFFD 04440002 04421515 0440EAEA

C O M M A N D P A C K E T

 PARM4 PARM3 PARM2 PARM1 PARM0
045AFFFF 04580000 0456FFFF 04540000 0452FFFF 04500000 044EFFFF 044C0000 044AFFFF 04480000

 SN OPCODE
0446FFFC 04440003 04427F7F 04408080

C O M M A N D P A C K E T

 PARM4 PARM3 PARM2 PARM1 PARM0
045AFFFF 04580000 0456FFFF 04540000 0452FFFF 04500000 044EFFFF 044C0000 044AFFFF 04480000

 SN OPCODE
0446FFFB 04440004 04427F7F 04408080

Ver 01.09 Thu Nov 16 23:53:03 2000 "(4) Test 5.1.2.3 completed successfully"