

**COS DCE BOOT FSW v1.13 Component Test Results
Requirement 5.2.1.1 Error-Detecting Command Format**

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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 5.2.1.1 — Error Detecting — Command Format.

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 script verifies the proper responses of the DCE FSW to four types of command anomalies. The script initializes the software state as follows:

- it issues two POR packets, followed by one-second WAITs, to flush HK data resulting from any pre-test LFDNOOP commands
- it issues LFDDIAGC to ensure that the stack is not “contaminated” by codes resulting from antecedent activity
- it acquires an initial value, \$cmdx, of LFDCMDX, the command-executed count (which should be 1).

Following initialization, the script synthesizes and issues “defective commands” and checks for the occurrence of the appropriate corresponding diagnostic codes. The four cases are summarized below.

1.5.1 Improper Command Word Format

The requirement is to verify that an improper Command Word format is ignored, and produces the correct diagnostic (DIAG0004). The script synthesizes a pseudo-command with the opcode 0x7F (and correct opcode complement 0x80), then checks to ensure that DIAG0004 occurs in the diagnostic stack and that LFDCMDX has not incremented.

1.5.2 Improper Opcode Complement

The requirement is to verify that an improper Command Opcode complement is ignored, and produces the correct diagnostic (DIAG0006). The script synthesizes an LFDNOOP command with the opcode 0x80 (and invalid opcode-complement 0x00), then checks to ensure that DIAG0006 occurs in the diagnostic stack and that LFDCMDX has not incremented.

1.5.3 Improper Parameter Complement

The requirement is to verify that an improper Command Parameter complement is ignored, and produces the correct diagnostic (DIAG0006). The script synthesizes an LFDNOOP command with the opcode 0x80 and parameters P1...P5 = 0, but with the complement word for the fifth parameter =0 (rather than 0xFFFF), then checks to ensure that DIAG0006 occurs in the diagnostic stack and that LFDCMDX has not incremented.

1.5.4 Undefined Opcode

The requirement is to verify that a well-formed, but undefined, command string is ignored, and produces the correct diagnostic (DIAG0011). The script synthesizes a command with the unassigned opcode 0x84 (and valid complement 0x7B), then checks to ensure that DIAG0011 occurs in the diagnostic stack and that **LFDCMDX** has not incremented.

1.6 TEST SCRIPT IMPLEMENTATION

1.6.1 Test Script Arguments

There are no arguments to the test script.

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\uniscrpt\	UniScript.pl	UniScript interpreter
\disks\galex\users\galex\tcs\uniscrpt\stp5_2_1_1\	U	Shell script for this procedure
Ditto	stp5_2_1_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)	<i>NASA Basic Safety Manual</i>
2	COS-03-0055	<i>DCE FSW Test Procedure 5.2.1.1</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].

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

Step	QA	Operator Entry/System Response	Description
			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_2_1_1 eagcos:shorty% pwd /disks/galex/users/galex/tcs/uniscript/stp5_2_1_1	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_2_1_1.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>sh u \$estring=0,0,0,0,0,0,0,0 Parameters are: Script File: stp5_2_1_1 #0: 0 #1: 0 #2: 0 #3: 0 #4: 0 #5: 0 #6: 0 #7: 0 Report file >/disks/galex/users/galex/tcs/ver_1_13/stp5_2_1_1/ stp5_2_1_1.rp1 successfully opened. Report file >/disks/galex/users/galex/tcs/ver_1_13/stp5_2_1_1/</pre>	Shell to u . You should see the accompanying output as UniScript executes

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Step	QA	Operator Entry/System Response	Description
		<p>stp5_2_1_1.rp2 successfully opened. Script file</p> <p>/disks/galex/users/galex/tcs/ver_1_13/stp5_2_1_1/s tp5_2_1_1.tst successfully opened at level 0.</p> <p>"Sending two PORs, LFDDIAGC"</p> <p>LFDDIAGC</p> <p>WAIT 0: HKV0=1; HKV1=0; wc=5 WAIT 1: HKV1=0; wc=4 WAIT 1: HKV1=1; wc=3 "Sending opcode 0080" WAIT 0: HKV0=4; HKV1=2; wc=5 WAIT 1: HKV1=3; wc=4 WAIT 1: HKV1=4; wc=3 "Improper Command Word test completed successfully" "Sending opcode 8080 with zero complement" WAIT 0: HKV0=7; HKV1=6; wc=5 WAIT 1: HKV1=6; wc=4 WAIT 1: HKV1=8; wc=3 "Improper Opcode Complement test completed successfully" "Sending opcode 8080 with bad parameter complement" WAIT 0: HKV0=10; HKV1=8; wc=5 WAIT 1: HKV1=9; wc=4 WAIT 1: HKV1=10; wc=3 "Improper Parameter Complement test completed successfully" "Sending undefined opcode 8484" WAIT 0: HKV0=13; HKV1=11; wc=5 WAIT 1: HKV1=12; wc=4 WAIT 1: HKV1=13; wc=3 "Undefined Opcode test completed successfully"</p>	

Step	QA	Operator Entry/System Response	Description
		"Test 5.2.1.1 completed successfully" eagcos:shorty%	

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_1_1.tst**, **stp5_2_1_1.rp1**, and **stp5_2_1_1.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: The script fails to clear the diagnostic stack between the various defective commands, thus making the automated result of case 3 (paragraph 1.5.3) ambiguous, since the same diagnostic (0006) is also generated by the second case. However, the printed report **stp5 2 1 1.rp1** makes it clear that the diagnostic code (0006) is in fact present twice after case 3 is executed.

TEST CONDUCTOR: _____
Signature/Date

QA REPRESENTATIVE: _____
Signature/Date

Appendix A. Shell Script u

```
#!/bin/sh  
kill cosnoopy  
perl ../UniScript.pl stp5_2_1_1 "0,0,0,0,0,0,0,0"  
cosnoopy&
```

Appendix B. Test Script `stp5_2_1_1.tst`

```

; *****
; * DCE FSW Requirement 5.2.1.1 -- Error-Detecting -- Command Format *
; * ----- *
; * a. Verify that an improper Command Word format is ignored, and *
; * produces the correct diagnostic (DIAG0004) *
; * *
; * b. Verify that an improper Command Opcode complement is ignored, *
; * and produces the correct diagnostic (DIAG0005) *
; * *
; * c. Verify that an improper Command Parameter complement is ig- *
; * nored, and produces the correct diagnostic (DIAG0006) *
; * *
; * d. Verify that a well-formed, but undefined, command string is *
; * ignored, and produces the correct diagnostic (DIAG0011) *
; *****
;
SYM      NSEC      =5
SYM      CMDX      =0x170C
SYM      DIAG0004=0x0004
SYM      DIAG0005=0x0005
SYM      DIAG0006=0x0006
SYM      DIAG0011=0x0011
;
ECHO     2
;
; *****
; * Clear diagnostic stack to avoid confusion *
; *****
;
DTG      3,"(0) Sending two PORs, LFDDIAGC"
WTO      "Sending two PORs, LFDDIAGC"
;
POR
WAIT     1
POR
WAIT     1
;
; *****
; * Acquire current value of LFD CMDX for comparisons later *
; *****
;
LFDDIAGC
WAIT     NSEC,HK
LOG      1,LFDDIAGS, LFDERR, LFDERRP, LFD CBUF, LFD CMDX
CHECK    1, ($cmdx==($cmdx=$LFD CMDX))
;
; *****
; * Send a synthesized NOOP command with faulty opcode (MSB != 1) *
; *****
;
DATA     1,
0,40,CONST=0x045AFFFF_04580000_0456FFFF_04540000_0452FFFF_04500000_044EFFFF_044C0000_044A
FFFF_04480000
DATA     1,40, 8,NEXT
DATA     1,48, 8,CONST=0x04428080_04407F7F
LOG      1,1
;
WAIT     1
DTG      3,"(1) Sending opcode 7F7F"
WTO      "Sending opcode 0080"
XCMD     1
WAIT     NSEC,HK
LOG      1,LFDDIAGS, LFDERR, LFDERRP, LFD CBUF, LFD CMDX
;
DIAG     1,ANY,DIAG0004
CHECK    1, ($LFD CMDX==(++$cmdx))
;

```

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```

DTG      3,"(2) Improper Command Word test completed successfully"
WTO      "Improper Command Word test completed successfully"
;
; *****
; * Send a synthesized NOOP command with faulty opcode complement *
; *****
;
DATA      1,
0,40,CONST=0x045AFFFF_04580000_0456FFFF_04540000_0452FFFF_04500000_044EFFFF_044C0000_044A
FFFF_04480000
DATA      1,40, 8,NEXT
DATA      1,48, 8,CONST=0x04420000_04408080
LOG      1,1
;
DTG      3,"(3) Sending LFDDIAGC followed by opcode 8080 with zero complement"
WTO      "Sending LFDDIAGC followed by opcode 8080 with zero complement"
WAIT     1
LFDDIAGC
WAIT     1
XCMD     1
WAIT     NSEC,HK
LOG      1,LFDDIAGS, LFDERR, LFDERRP, LFDCCBUF, LFDCCMDX
;
DIAG     1,ANY,DIAG0006
CHECK    1,($LFDCCMDX==+$$cmdx)
;
DTG      3,"(4) Improper Opcode Complement test completed successfully"
WTO      "Improper Opcode Complement test completed successfully"
;
; *****
; * Send a synthesized NOOP command with faulty parameter complement *
; *****
;
DATA      1,
0,40,CONST=0x045A0000_04580000_0456FFFF_04540000_0452FFFF_04500000_044EFFFF_044C0000_044A
FFFF_04480000
DATA      1,40, 8,NEXT
DATA      1,48, 8,CONST=0x04427F7F_04408080
LOG      1,1
;
WAIT     1
DTG      3,"(5) Sending LFDDIAGC followed by opcode 8080 with bad parameter complement"
WTO      "Sending LFDDIAGC followed by opcode 8080 with bad parameter complement"
WAIT     1
LFDDIAGC
WAIT     1
XCMD     1
WAIT     NSEC,HK
LOG      1,LFDDIAGS, LFDERR, LFDERRP, LFDCCBUF, LFDCCMDX
;
DIAG     1,ANY,DIAG0006
CHECK    1,($LFDCCMDX==+$$cmdx)
;
DTG      3,"(6) Improper Parameter Complement test completed successfully"
WTO      "Improper Parameter Complement test completed successfully"
;
; *****
; * Send a synthesized command with undefined opcode (84) *
; *****
;
DATA      1,
0,40,CONST=0x045AFFFF_04580000_0456FFFF_04540000_0452FFFF_04500000_044EFFFF_044C0000_044A
FFFF_04480000
DATA      1,40, 8,NEXT
DATA      1,48, 8,CONST=0x04427B7B_04408484
LOG      1,1
;
WAIT     1
DTG      3,"(7) Sending LFDDIAGC followed by undefined opcode 8484"
WTO      "Sending LFDDIAGC followed by undefined opcode 8484"

```


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```
WAIT      1
LFDDIAGC
WAIT      1
XCMD      1
WAIT      NSEC, HK
LOG       1, LFDDIAGS, LFDERR, LFDERRP, LFDCBUF, LFDCMDX
;
DIAG      1, ANY, DIAG0011
CHECK     1, ($LFDCMDX==+$cmdx)
;
DTG       3, "(8) Undefined Opcode test completed successfully"
WTO       "Undefined Opcode test completed successfully"
;
DTG       3, "(9) Test 5.2.1.1 completed successfully"
WTO       "Test 5.2.1.1 completed successfully"
```

Appendix C. Test Report stp5_2_1_1.rp1

```

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

```

Ver 01.13 Wed Jan 17 19:23:13 2001 "(0) Sending two PORs, LFDDIAGC"

LFDDIAGC

Addr	Addr	HK-Name	Value
1780-179F	LFDDIAGS	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		

1640-1647	LFDERR	00 00 00 00 00 00 00 00
1648-1657	LFDERRP	0000 0000 0000 0000 0000 0000 0000 0000
1664-167F	LFDCBUF	F4F4 0B0B 0001 FFFE 0000 FFFF 0000 FFFF 0000 FFFF 0000 FFFF 0000
170C-170D	LFDCMDX	0001

CHECK: (\$cmdx==(\$cmdx=\$LFDCMDX))
eval: (0000==(0000=0001))

S U C C E S S

Len	CRC	Buffer	Data
0038	C799	1	04 5A FF FF 04 58 00 00 04 56 FF FF 04 54 00 00 04 52 FF FF 04 50 00 00 04 4E FF FF 04 4C 00 00 04 4A FF FF 04 48 00 00 04 46 FF FB 04 44 00 04 04 42 80 80 04 40 7F 7F

Ver 01.13 Wed Jan 17 19:23:18 2001 "(1) Sending opcode 7F7F"

Addr	Addr	HK-Name	Value
1780-179F	LFDDIAGS	0204 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		

1640-1647	LFDERR	04 00 00 00 00 00 00 00
1648-1657	LFDERRP	0004 0000 0000 0000 0000 0000 0000 0000
1664-167F	LFDCBUF	7F7F 8080 0004 FFFB 0000 FFFF 0000 FFFF 0000 FFFF 0000 FFFF 0000
170C-170D	LFDCMDX	0001

DIAG 1,ANY,DIAG0004
Found: DIAG0004 == 4.

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S U C C E S S

CHECK: (\$LFDCMDX==\$cmdx)
eval: (0001==0001)

S U C C E S S

Ver 01.13 Wed Jan 17 19:23:21 2001 "(2) Improper Command Word test completed successfully"

Len	CRC	Buffer	Data
0038	CE87	1	04 5A FF FF 04 58 00 00 04 56 FF FF 04 54 00 00 04 52 FF FF 04 50 00 00 04 4E FF FF 04 4C 00 00 04 4A FF FF 04 48 00 00 04 46 FF F8 04 44 00 07 04 42 00 00 04 40 80 80

Ver 01.13 Wed Jan 17 19:23:22 2001 "(3) Sending opcode 8080 with zero complement"

Addr	Addr	HK-Name	Value
1780-179F	LFDDIAGS	0306 0204 0000 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	0000 0000	0000	
1640-1647	LPDERR	00 00 00 00 00 00 00 00	
1648-1657	LPDERRP	0007 0000 0000 0000 0000 0000 0000 0000	
1664-167F	LPDCBUF	8080 7F7F 0008 FFF7 0000 FFFF 0000 FFFF 0000 FFFF 0000 FFFF 0000	
FFFF 0000	FFFF		
170C-170D	LPDCMDX	0001	

DIAG 1,ANY,DIAG0006
Found: DIAG0006 == 6.

S U C C E S S

CHECK: (\$LFDCMDX==\$cmdx)
eval: (0001==0001)

S U C C E S S

Ver 01.13 Wed Jan 17 19:23:24 2001 "(4) Improper Opcode Complement test completed successfully"

Len	CRC	Buffer	Data
0038	4587	1	04 5A 00 00 04 58 00 00 04 56 FF FF 04 54 00 00 04 52 FF FF 04 50 00 00 04 4E FF FF 04 4C 00 00 04 4A FF FF 04 48 00 00 04 46 FF F5 04 44 00 0A 04 42 7F 7F 04 40 80 80

Ver 01.13 Wed Jan 17 19:23:25 2001 "(5) Sending opcode 8080 with bad parameter complement"

Addr	Addr	HK-Name	Value
1780-179F	LFDDIAGS	0406 0306 0204 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	0000 0000	0000	
1640-1647	LPDERR	06 00 00 00 00 00 00 00	
1648-1657	LPDERRP	000A 0000 0000 0000 0000 0000 0000 0000	

Appendix D. Test Report stp5_2_1_1.rp2

```

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

```

Ver 01.13 Wed Jan 17 19:23:13 2001 "(0) Sending two PORs, LFDDIAGC"

P O R P A C K E T

80000000

P O R P A C K E T

80000000

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
0446FFFE 04440001 04420B0B 0440F4F4

```

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
0446FFFD 04440002 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
0446FFFC 04440003 04427F7F 04408080

```

Ver 01.13 Wed Jan 17 19:23:18 2001 "(1) Sending opcode 7F7F"

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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 044AFFFF 04480000
-----
      SN      OPCODE
0446FFFB 04440004 04428080 04407F7F
-----

```

```

-----
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
0446FFFA 04440005 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
0446FFF9 04440006 04427F7F 04408080
-----

```

Ver 01.13 Wed Jan 17 19:23:21 2001 "(2) Improper Command Word test completed successfully"

Ver 01.13 Wed Jan 17 19:23:22 2001 "(3) Sending opcode 8080 with zero complement"

```

-----
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
0446FFF8 04440007 04420000 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
0446FFF7 04440008 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
0446FFF6 04440009 04427F7F 04408080
-----

```

Center for Astrophysics & Space Astronomy

Ver 01.13 Wed Jan 17 19:23:24 2001 "(4) Improper Opcode Complement test completed successfully"

Ver 01.13 Wed Jan 17 19:23:25 2001 "(5) Sending opcode 8080 with bad parameter complement"

```

-----
C O M M A N D   P A C K E T
-----
          PARM4          PARM3          PARM2          PARM1          PARM0
045A0000 04580000 0456FFFF 04540000 0452FFFF 04500000 044EFFFF 044C0000 044AFFFF 04480000
-----
          SN          OPCODE
0446FFF5 0444000A 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
0446FFF4 0444000B 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
0446FFF3 0444000C 04427F7F 04408080
-----

```

Ver 01.13 Wed Jan 17 19:23:28 2001 "(6) Improper Parameter Complement test completed successfully"

Ver 01.13 Wed Jan 17 19:23:29 2001 "(7) Sending undefined opcode 8484"

```

-----
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
0446FFF2 0444000D 04427B7B 04408484
-----

```

```

-----
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
0446FFF1 0444000E 04427F7F 04408080
-----

```

```

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

```

Center for Astrophysics & Space Astronomy

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

	SN		OPCODE
0446FFFF	0444000F	04427F7F	04408080

Ver 01.13 Wed Jan 17 19:23:31 2001 "(8) Undefined Opcode test completed successfully"

Ver 01.13 Wed Jan 17 19:23:31 2001 "(9) Test 5.2.1.1 completed successfully"