COS DCE BOOT FSW v1.13 Component Test Results
Requirement 5.5.1.3 Check Upload Integrity

Date: February 13, 2001
Document Number: COS-03-0063
Revision: Initial Release
Contract No.: NAS5-98043
CDRL No.: N/A

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

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

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

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

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

Center for Astrophysics & Space Astronomy
University of Colorado
Campus Box 593
Boulder, Colorado 80309
<table>
<thead>
<tr>
<th>Letter</th>
<th>ECO No.</th>
<th>Description</th>
<th>Check</th>
<th>Approved</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Initial Release</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**THE UNIVERSITY OF COLORADO**
At Boulder

**The Center for Astrophysics and Space Astronomy**

COS DCE BOOT FSW v1.13 Component Test Results
Requirement 5.5.1.3 Check Upload Integrity

<table>
<thead>
<tr>
<th>Size</th>
<th>Code Indent No.</th>
<th>Document No.</th>
<th>Rev</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>COS-03-0063</td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

Scale: N/A
# Table of Contents

1. Introduction ................................................................................................................. 2
   1.1 Purpose.................................................................................................................... 2
   1.2 Scope .......................................................................................................................2
   1.3 Limitations and Constraints .................................................................................... 2
   1.4 Procedure Overview .............................................................................................. 2
   1.5 Theory of Test ........................................................................................................ 3
   1.6 Test Script Implementation .................................................................................. 3
      1.6.1 Test Script Arguments....................................................................................3
      1.6.2 Test Script Coding..........................................................................................3
2. Special Instructions ..................................................................................................... 3
   2.1 Quality Assurance ................................................................................................. 3
   2.2 Safety .....................................................................................................................3
      2.2.1 Personal Safety ............................................................................................... 3
      2.2.2 Test Article and Equipment Safety ............................................................... 4
   2.3 Contamination ....................................................................................................... 4
3. Support Requirements ................................................................................................. 4
   3.1 Personnel ............................................................................................................... 4
   3.2 Tools, Equipment, and Materials ........................................................................ 4
   3.3 Data/Software ........................................................................................................ 5
   3.4 Required Documentation ...................................................................................... 5
4. Procedure/Task Steps .................................................................................................. 5
   4.1 Pre-Operation Activities....................................................................................... 5
      4.1.1 Make Sure that **hks** Tools Are Active...................................................... 5
      4.1.2 Make Sure that the Proper ROM Is Installed .............................................. 6
      4.1.3 Log In to the EGSE ...................................................................................... 6
      4.1.4 Set Current Directory .................................................................................... 6
      4.1.5 Slogin as eagcos ........................................................................................... 6
      4.1.6 Set Current Directory .................................................................................... 7
      4.1.7 Ensure that Proper Files are Present .......................................................... 7
   4.2 Operation Execution............................................................................................... 7
      4.2.1 Establish Initial Test Conditions ................................................................. 7
      4.2.2 Execute the Script......................................................................................... 7
   4.3 Post-Operation Activities ...................................................................................... 9
      4.3.1 Copy Reports to PC Files and Print Them .................................................. 9
      4.3.2 Complete The Test Procedure Form .......................................................... 9
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 5.5.1.3 — Check Upload Integrity.

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
inger.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 generates 256 bytes of pseudo-random data into UniScript Buffer 1 and uploads this data to a “scratch” region in the DCE 8051 external RAM. The script then issues an LFDCRC SCRATCH,256,0 command to force the FSW to compute the CRC of the scratch region and return it as the HK variable LFMCR. This value is then compared with the value, CRC1, automatically computed for Buffer 1.

1.6 TEST SCRIPT IMPLEMENTATION

1.6.1 Test Script Arguments

The script is parameterized as shown in the following Table:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Meaning</th>
<th>Correct Argument for Version 1.13</th>
</tr>
</thead>
<tbody>
<tr>
<td>#0</td>
<td>Absolute hex storage address of 8051 “scratch” area</td>
<td>C000</td>
</tr>
</tbody>
</table>

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):

```plaintext
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 shorty</td>
<td>Ginger ETU</td>
</tr>
<tr>
<td>X</td>
<td>DCE #1 X</td>
</tr>
</tbody>
</table>

3.3 DATA/SOFTWARE

The following files must be present:

**Table 3-1: Required Program and Data Files**

<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_5_1_3\</td>
<td>u</td>
<td>Shell script for this procedure</td>
</tr>
<tr>
<td>Ditto</td>
<td>stp5_5_1_3.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-03-0063</td>
<td>DCE FSW Test Procedure 5.5.1.3 (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>QA</td>
<td>C:\tcs\us&gt; telnet shorty.ssl.berkely.edu</td>
<td>Establish connection to shorty via Telnet client program</td>
</tr>
<tr>
<td>2</td>
<td>QA</td>
<td>Login: xxx Password: --------</td>
<td>Using telnet window, login as user tcs</td>
</tr>
</tbody>
</table>

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    | QA | 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    | QA | tcs@shorty% slogin –l eagcos  
shorty.ssl.berkley.edu  
eagcos@shorty.ssl.berkley.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>
<tbody>
<tr>
<td>5</td>
<td></td>
<td>eagcos:shorty% cd /disks/galex/users/galex/tcs/uniscript/stp5_5_1_3</td>
<td>Change current directory as shown</td>
</tr>
<tr>
<td></td>
<td></td>
<td>eagcos:shorty% pwd /disks/galex/users/galex/tcs/uniscript/stp5_5_1_3</td>
<td></td>
</tr>
</tbody>
</table>

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>List files; the .tst file and the shell script u should be present</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 stp5_5_1_3.tst</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-rw-r--r-- 1 tcs eag 62 Oct 9 17:44 u</td>
<td></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=(/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>Shell to u. You should see the accompanying output as UniScript executes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$pstring=C000,0,0,0,0,0,0,0 Parameters are: Script File: stp5_5_1_3 #0: C000 #1: 0 #2: 0 #3: 0 #4: 0 #5: 0 #6: 0 #7: 0</td>
<td></td>
</tr>
<tr>
<td>Step</td>
<td>QA</td>
<td>Operator Entry/System Response</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>----</td>
<td>-------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Report file</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><code>/disks/galex/users/galex/tcs/ver_1_13/stp5_5_1_3/stp5_5_1_3.rp1</code> successfully opened.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><code>/disks/galex/users/galex/tcs/ver_1_13/stp5_5_1_3/stp5_5_1_3.rp2</code> successfully opened.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Script file</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><code>/disks/galex/users/galex/tcs/ver_1_13/stp5_5_1_3/stp5_5_1_3.tst</code> successfully opened at level 0.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;Sending two PORs with WAITs&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;Generating and uploading 256 bytes of random data&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LFDUPLOD SCRATCH,NBYTES,0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;Sending LFDCRC&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LFDCRC SCRATCH,NBYTES,EXTERN</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LFDNOOP</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>WAIT 0: HKV0=3; HKV1=1; wc=5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>WAIT 1: HKV1=2; wc=4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>WAIT 1: HKV1=3; wc=3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;Checking generated CRC&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;Test 5.5.1.3 completed successfully&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>eagcos:shorty%</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_5_1_3.tst, stp5_5_1_3.rp1, and stp5_5_1_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

```bash
#!/bin/sh
pkill cosnoopy
perl ../UniScript.pl stpS_5_1_3 "C000,0,0,0,0,0,0,0"
cosnoopy&
```
Appendix B. Test Script stp5_5_1_3.tst

; **********************************************************************************
; * STP 5.5.1.3 -- Check Upload Integrity *
; * **********************************************************************************
; * Prepare a block of data in the EGSE; compute the CRC of this block in the *
; * EGSE; using LF DuploD, upload the data, suppressing the CRC checking by setting *
; * the CRC parameter to 0; compute the CRC of the uploaded block by using LFDCRC; *
; * verify the integrity of the upload by means of the HK data. *
; ** **************************************************************************

; **********************************************************************************
; * Parameters: #0 = scratch area = C000 *
; ************************************************************************************
;
ECHO 2
;
SYM SCRATCH=0x#0
SYM NBYTES =256
SYM EXTERN =0
;
DTG 3,"(0) Sending two PORs with WAITs"
WTO "Sending two PORs with WAITs"
;
POR
WAIT 1
POR
WAIT 1
;
DTG 3,"(1) Generating and uploading 256 bytes of random data"
WTO "Generating and uploading 256 bytes of random data"
;
DATA 1,0,NBYTES,RAND=56
LOG 1,1
XMIT 1,NBYTES
LF DuploD SCRATCH,NBYTES,0
WAIT 1
;
DTG 3,"(2) Sending LFDCRC"
WTO "Sending LFDCRC"
LFDCRC SCRATCH,NBYTES,EXTERN
WAIT 1
LF Duplo
WAIT 5,HK
;
DTG 3,"(3) Checking generated CRC"
WTO "Checking generated CRC"
;
LOG 1,LFMCRC
CHECK 1,($LFMCRC==$CRC1)
;
DTG 3,"(4) Test 5.5.1.3 completed successfully"
WTO "Test 5.5.1.3 completed successfully"
Appendix C. Test Report stp5_5_1_3.rp1

Ver 01.13 Wed Jan 17 18:16:16 2001 "(0) Sending two PORs with WAITs"

Ver 01.13 Wed Jan 17 18:16:18 2001 "(1) Generating and uploading 256 bytes of random data"

Len CRC Buffer Data
----- ---- ------ ----
0100 1E57 1 C6 C1 CE D9 85 09 CF 9F 31 E3 34 A3 64 AD 8B 4B 5C 19 DE 1D 1E
47 69 BD 06 67 3B 77 AD A3 8D 1D 8C 6D 2B CB 6C F5 0C 5F AE E1 C2 35 50 15 3A 0B 8D 8F 44 69 9B
3B 80 A5 48 C3 7A CD 4D 2D AC 7D
42 4F EA 11 F4 FD FB 0B 7B F7 0E 45 2B 47 C7 BD E1 71 2F 75 6E
DB 2E SF 73 DB E7 BB 64 PF 7A B5
7C B3 F2 E1 DD 23 BE CB 12 4D 5F 69 B8 21 63 E9 67 CD B9 35 82
E5 14 CF 8A 9D 45 99 54 B7 D2 97
7F 69 E8 EF E0 E3 90 45 36 95 CD B5 EC 01 2B 95 50 31 65 21 DC
9B 1B 5B 27 77 D9 3B 9F 75 AB 5D
1D BF 88 75 97 3D 1D 9D 9C FD A2 C3 CF C3 89 4F 9C AD 80 2F 2C
B5 CE EB 5C 57 C8 F9 CB D5 7A 79
9A B3 07 27 52 AB EA 7D E7 31 B9 A5 5F C7 95 01 E2 CB 80 D3 D7
77 C1 E5 92 AB 7C A5 43 F5 92 B5
88 03 74 3B 01 2D B0 09 7E 5F DE F3 6B ED 74 4F 69 9D 67 05 CC
9B EC 2B 6B 61 FD 99 35 75 84 57
LFDUPLOD SCRATCH,NBYTES,0
Ver 01.13 Wed Jan 17 18:16:20 2001 "(2) Sending LFDCRC"

LFDCRC SCRATCH,NBYTES,EXTERN
LFDNOOP
Ver 01.13 Wed Jan 17 18:16:24 2001 "(3) Checking generated CRC"

Addr Addr HK-Name Value
----- ---- -------------- ----- 171A-171B LFMCR 1E57
CHECK: ($LFMCRC==$CRC1)
eval: (1E57==1E57)
SUCCESS
Ver 01.13 Wed Jan 17 18:16:24 2001 "(4) Test 5.5.1.3 completed successfully"
Appendix D. Test Report stp5_5_1_3.rp2

Ver 01.13 Wed Jan 17 18:16:16 2001 "(0) Sending two PORs with WAITs"

-------------------------------
POR PACKET
-------------------------------
80000000
-------------------------------
POR PACKET
-------------------------------
80000000
-------------------------------
Ver 01.13 Wed Jan 17 18:16:18 2001 "(1) Generating and uploading 256 bytes of random data"

-------------------------------
UPLOAD PACKET
-------------------------------
0040C1C6 0042D9CE 00440985 00469FCF 0048E331 004AA334 004CAD64 004E4B8B
0050195C 00521DE0 0054471E 0056B669 00586706 005A773B 005CA3AD 005E1B8D
006068DC 0062CB2B 0064F56C 0066F0FC 006881AE 006A35C2 006C1550 006E0B1A
00708F8D 00726944 00743B9B 0076A5B0 0078C348 007AC7A7 007CD2AD 007EF7DC
00804F42 008211EA 0084FDF4 00860BFB 0088F775 008A450E 008C672B 008EBCD7
009071E1 0092752F 0094DB66 0096F52E 0098DB73 009ABBE7 009CFF64 009EFE5A
00A0B37C 00A2E1F2 00A423DD 00A6CBBE 00A8695F 00A91B8B 00AEE963
00B0CD67 00B235B9 00B4E5B2 00B6CF14 00B8994A 00BCCF75 00BEE97D2
00C0697F 00C2EFE8 00C4E3B0 00C64590 00C89536 00CAD5CD 00CEC51EC 00CE952B
00D03150 00D22165 00D498D0 00D65B1B 00D87727 00DA37BD9 00DCCF59F 00DED5AB
00E0BF1D 00E27588 00E43D97 00E691D1 00E8FD9C 00EAC3A2 00ECC3CF 00EE4589
00F0AD9C 00F22FB0 00F4B52C 00F6BEC8 00F8575C 00FA99C8 00FCD5CB 00FE797A
0100B39A 01022707 0104AB52 01067DEA 01025407 010AA5B9 010CC75F 010ED195
0110CBE2 0112D380 011477D7 01165E5C1 0118AB92 011AA57C 011CF543 011EB592
0120388 01223B74 01242D01 012609B0 012857F7E 012AF3DE 012CED6B 012EE4F74
01309D69 01320567 01349BCC 01362BEC 0138616B 013A99FD 013C7535 013E5784

-------------------------------
COMMAND PACKET
-------------------------------
OPCODE
0446FFFE 04440001 04425252 0440ADAD

University of Colorado at Boulder
Ver 01.13 Wed Jan 17 18:16:20 2001 "(2) Sending LFDCRC"

```
<table>
<thead>
<tr>
<th>COMMAND PACKET</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARM4 PARM3 PARM2 PARM1 PARM0</td>
</tr>
<tr>
<td>045AFFFF 04580000 0456FFFF 04540000 0452FFFF 04500000 044EFEFF 044C0100 044A3FFF 0448C000</td>
</tr>
<tr>
<td>SN OPCODE</td>
</tr>
<tr>
<td>0446FFFFD 04440002 04427D7D 04408282</td>
</tr>
</tbody>
</table>
```

Ver 01.13 Wed Jan 17 18:16:24 2001 "(3) Checking generated CRC"

Ver 01.13 Wed Jan 17 18:16:24 2001 "(4) Test 5.5.1.3 completed successfully"