Coda cx1 Short Form Functional Test Procedure

CDL 1-TP07-0100:0208
MIT Ref. 85-01050.01

Revision 2.0

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Contents

1.   Introduction

1.1   Activity Description

Following the initial configuration and preparation of the hardware and software, the procedures described in Section 4 are designed to show that the Coda cx1 sensor unit, markers and marker drive boxes meet all primary functionality and interface requirements within stated tolerances. Full hardware functionality and performance requirements are verified through the Coda cx1 Long Form Functional Test Procedure (CDL 1-TP07-0500:0211).

1.2   Test Item Description

The Coda system is used to track movement of infrared LED markers in 3 dimensions. The system under test comprises a Coda cx1 sensor unit, 8 markers and an externally powered 8-marker drive box. An additional marker, connected to an internally powered 8-marker drive box, is used where access is restricted. The DC power and RS-422 serial connections to the sensor unit are made via a single 37 way MIL-C-38999 connector on the end bulkhead of the unit. The Coda sensor unit contains 3 cameras each of which can locate the position of markers in one angular axis. Each camera contains a 32-element photo-detector array and associated amplifiers and analog multiplexers. Signals from the cameras are digitized on a camera interface board and then transmitted to a SHARC Digital Signal Processor (Analog Devices SHARC ADSP-21065L) within the sensor unit. The markers are powered and controlled by small drive boxes, which contain circuitry and a detector, which respond to synchronizing infrared signals produced by the sensor unit. The drive boxes cause the markers to emit flashes of infrared light in a predetermined time-multiplexed sequence thereby identifying each marker to the sensor unit. The cameras in the sensor unit are arranged such that two of them are mounted at the ends of the bar shaped casing and oriented so that they are sensitive to movement in the same direction parallel with the long axis of the case (x-axis). A baseline distance of some 670mm separates these two cameras. Signals from the cameras are processed in real time by the SHARC processor which calculates the distance of the marker from the baseline (y-axis). The third camera is mounted centrally in the sensor case and is oriented so that it is sensitive to motion at 90 degrees to the baseline (z-axis).

1.3   Support Item Description

1.3.1   Mini Hub

In the flight version of the system an active hub provides DC power and also contains an embedded Power PC processor for executing some of the real time data processing and control functions for the Coda cx1 units. These tests are intended to exercise the Coda cx1 units, markers and marker drive boxes under the environmental test conditions. For this purpose, an active hub is not necessary. Instead, a mini hub provides the DC power and communications link via the Coda interface cable to the Coda unit and then to the host computer via a serial cable. The mini hub contains a mains powered 12V DC supply. The DC power and RS-422 connections for the Coda sensor unit are provided via a single 37 way MIL-C-38999 connector on the hub bulkhead. The RS-422 connections are looped within the hub from the 37 way MIL-C-38999 connector to a standard 9-way D connector

on the hub bulkhead. DC power supplied to the Coda cx1 unit is controlled via a switch on the hub bulkhead. The hub is also provided with a pair of 4mm sockets connected across the switch to allow the current taken by the Coda sensor unit to be routed through an ammeter. Similarly, a pair of 4mm sockets are provided on the hub to facilitate monitoring the DC voltage supplied by the hub. To enable thermistor readings from within the Coda unit, the Coda interface cable has designated breakout wires assigned to pins 32 – 34 of the MIL-C-38999 connector.

1.3.2   Host PC

The host PC controls the operating modes of the sensor unit and receives the 3D motion data from it at a rate of up to 5Mbaud via the RS-422 serial link from the hub.

The host PC is an IBM compatible running under Windows 2000 or Windows XP. Minimum specification is 800MHz, 32Mb RAM, 1Gb HD, CD, RS-422 serial port.

1.3.3   Test Frame

The test frame is a device which facilitates folding the optical path between the Coda sensor unit and markers so as to achieve an optical path length of 2 meters. This is required when functional tests need to be conducted with the test items inside a thermal chamber of internal length less than 2.2 meters.

The test frame is manufactured from aluminium structural beams which form the edges of a rectangular box with internal working dimensions of 1000mm x 1000mm x 400mm. At one end of the frame, provision is made for mounting the Coda sensor unit under test together with the markers and drive boxes (which may also be under test). At the other end of the frame, a plane mirror is fixed at a distance of 1 meter from the front of the sensor unit. The light from the markers is reflected in the mirror back to the sensor unit and so covers a distance of 2 meters to reach the cameras.

The design of the test frame is detailed in CDL drawing 1-TM07-0200:0209.

1.3.4   Markers and Marker Drive Boxes

The markers that are tracked by the Coda sensor unit are small infra-red light emitting diodes. The LED markers are powered from 8-marker drive boxes which contain circuitry and a detector. The drive boxes are themselves powered either externally from a 5V supply or internally with rechargeable batteries. Each drive box has 8 small sockets into which individual markers can be plugged. Each socket has a number which indicates the identity of the marker which is plugged into each socket. The markers do not intrinsically carry any particular identification, they take on the identity of whichever drive box numbered socket they are plugged into.

1.3.5   Marker Disc

The functional tests require markers to be moved through a circular path of diameter greater than 100mm in the x-z plane. This is facilitated by the marker disc which consists

of a 155mm diameter aluminium disc rotated at a constant 50 rpm by a synchronous motor. Two markers and a marker drive box are attached to the disc using clips.

The design of the marker disc is detailed in CDL drawing 1-TM07-0100:0209.

2. Requirements

2.1 Context

This procedure supports the activities contained in the Vibration Test Procedure (CDL 1-TP07-0300:0209), Thermal Cycle Test Procedure (CDL 1-TP07-0200:0209) and EMI/EMC Test Procedure (CDL 1-TP07-0400:0209).

2.2 List of Hardware Under Test

Coda cx1 sensor unit
Externally powered 8-marker drive box
8 markers

2.3 List of Support Hardware Items

Internally powered 8-marker drive box complete with 1 marker
Mini hub adapted for current and voltage monitoring
Host PC with RS-422 serial card
Power supply for marker drive boxes
Coda interface cable
Serial cable
Test frame (Required for thermal tests only)
Digital multi-meter
Marker disc

2.4 List of Software Requirements

Coda Motion Analysis Software V6.56
Coda cx1 calibration files
Coda cx1 configuration file
SHARC DSP system file V3.02

3.   Configuration

3.1   General Constraints

Electrostatic discharge (ESD) protection procedures per MIT 99-01003 shall be observed.

Connector mating/demating procedures per MIT 99-03002 shall be observed. Except that a mate/demate log will not be required.

3.2   Test Configuration

The 3D field of view of the Sensor Unit starts approximately 1.5 meters from the sensor unit (y-axis) and expands in the x and z directions as the distance y increases. The maximum range of the system is approximately 7 meters.

Two types of functional test are needed. One is designed to verify absence of obvious faults in the detector array channels within each of the three cameras within the sensor unit. This test requires some markers to be moved a minimum of 150mm in the x and z axes. The other test is to verify that stability of the reported position of stationary markers.

For the thermal tests, which may require use of a test chamber smaller than the minimum working field of view of the sensor unit, the test frame is required. (See Section 1.3.3)

When using the test frame the test configuration is as specified in CDL 1-TM07-0200:0209 and CDL 1-TM07-0400:0211

When the test frame is not required for purposes of cramming everything into the thermal test chamber, the test configuration may optionally still use the test frame in the above configuration. Alternatively the test may be conducted with items configured as per CDL 1-TM07-0300:0211.

4.   Procedures

Administrative information for this test is to be recorded in the space provided in Section 4.1.   In addition, the test conductor may annotate the procedures to more accurately document the course of the test whether routine or anomalous. The following pages, plus test data generated by the host PC, will be attached to the test report which is completed every time this test is conducted. The test conductor is assumed to have reasonable familiarity and competence in navigating through software applications which observe standard Windows conventions.

4.1   Identification of Equipment and Personnel

Coda cx1 sensor unit   _____

8 Coda markers   _____

Coda externally powered 8-marker drive box   _____

Test Conductor   _____

Test Date   _____

Test Location   _____

QA Representative   _____

Other individuals   _____

Coda Motion Analysis software version   _____

SHARC DSP system file version   _____

4.2   Prepare Equipment

4.2.1   Verify DC Power

With the multi-meter in voltage mode and set to a minimum range of 15V, connect the test leads across the 4mm DC volts test sockets (Red/Black) on the back panel of the mini hub. Connect together the current test sockets (Red/Yellow) by inserting the link provided. Switch on the mains power to the mini hub. The mains switch is on the back panel of the hub. Verify that the DC power voltage is 12V +/- 0.25V. Then, switch off mains power to the mini hub.

Pass	Fail	Time	Initial

4.2.2   Connect Cables

Before applying power to any test or support item, connect cables in the following sequence:

With the mini hub mains switch in the off position, connect the mains cable to the hub. Next, with the DC power switch for the Coda sensor unit on the mini hub bulkhead in the off position, connect the Coda interface cable to the mini hub.

Connect the power cables to the host PC and monitor.

Connect the serial RS-422 cable between the host PC and the mini hub.

Connect the Coda interface cable to the Coda sensor unit.

4.3   Apply Power

4.3.1   Host PC

Switch on the mains power to the host PC. Allow the PC to boot up the Windows operating system.

4.3.2   Mini Hub and Coda Sensor Unit

Switch the multi-meter to current mode (2A range minimum) and connect the leads of the multi-meter to the 4mm current test sockets (Red/Yellow) on the back panel of the mini hub. Remove the link, at this stage, to allow connection if necessary. Switch on the mains power to the mini hub. With the current meter in circuit, switch on the DC power on the front panel of the mini hub. This will apply DC power to the Coda sensor unit. Record the current reading within the first minute after applying power.

Current, A	Limits 0.6 – 1.2 A	Pass	Fail	Time	Initial

4.3.3   Verify Thermistors

With the multi-meter set to read resistance, connect the first pair of thermistor breakout wires (WALL) from the Coda interface cable to the multi-meter and check the resistance is approximately 2.5Kohms. Repeat this procedure for the second pair of thermistor breakout wires (SHARC).

Thermistor Wires	Pass	Fail	Time	Initial
First Pair (WALL)				
Second Pair (SHARC)				

4.3.4   Launch and Configure Software

In what follows, the words in bold italics refer to software items such as menu options etc.

Launch the Coda Motion Analysis Software by double clicking the **Coda MA** icon on the Windows desktop. If Coda software and hardware are correctly initialized a message box will appear indicating **dsp version nn.yy initialized OK**. Click the **OK** button.

If the dsp program fails to load and initialize an error message will appear with an error code number. In this case record the error code and consult the Coda SHARC error code list (Appendix 1). If the error code list allows a clear understanding of how to remedy the fault condition, make note of the action taken, exit the Coda Motion Analysis Software by clicking on the exit **X** at top right of the screen and then re-launch the software.

From the **Setup** menu select **Load Setup.**

Browse to the directory:

C:\Coda

Select the setup file:

General Test.stp

Click **OK**.

The setup file defines marker 9 (the rotating marker) and marker 1 (the stationary marker) for acquisition at 200Hz sampling rate for 5 seconds. It also defines the position vs time graphs which display the vertical motion of all markers plotted against time.

4.4   Monitor Coda cx1 System Functions

The following tests exercise the Coda system in all its primary functions.

4.4.1   Position Rotating and Stationary Markers

Connect a marker to the marker 9 socket of an internally powered 8-marker drive box and secure to the marker disc. Position the marker disc approximately 2 meters from the sensor unit in normal configuration (CDL 1-TM07-0300:0211) or above the sensor unit in the test frame (CDL 1-TM07-0200:0211 and CDL 1-TM07-0400:0211). Activate the disk using the switch on the side of the marker disc unit or when this is not accessible, power-up directly from the mains plug socket.

Connect a further 8 markers to the appropriate sockets of an externally powered 8-marker drive box and position these next to the marker disc. Ensure the optical axis of each marker and drive box is pointing in the general direction of the sensor unit and its three cameras.

4.4.2   Monitor Correlation Peaks in Cameras

From the *CODA* menu select *Display CX1 data*. Press the *Camera A* button on the toolbar at the bottom of the screen. Then press the *Correln* button on the same toolbar. Next press the *Zoom* button and center the display using the *Centred* button.

A red correlation peak will be seen for marker 1. Verify the height of the peak is between the two horizontal white lines towards the top of the display.   The horizontal lines represent a correlation coefficient of between 0.99 and 1.0. (See Sample correlation peak display in Appendix 2).

Press the *Camera B* and *Camera C* buttons in turn to observe the correlation peaks for the B and C cameras and note the peak height as before. Record the observations:

Camera	Pass	Fail	Time	Initial
A				
B				
C				

4.4.3   Monitor Current

While the software is displaying correlation peaks, record the current taken by the Coda sensor unit. Also record the current while data is being acquired at 200Hz as per 4.4.4 below.

	Current, A	Limits 0.6 – 1.2A	Pass	Fail	Time	Initial
During correlations						

4.4.4 Acquire Data Files

From the ***CODA*** menu select ***Acquire Data***. A confirmation box will appear. Click ***OK.***
The system will then acquire a data file.

Save this as a Motion Data File:

Test Data nn.mdf

in the directory:

C:\Coda\Test Data

The *nn* is an incremented integer for each file.

	Current, A	Limits 0.6 – 1.2A	Pass	Fail	Time	Initial
During Data Acquisition						

4.4.5 Analyse Data

4.4.5.1 Noise on Static Marker Data

On the graph for the stationary marker, bring up the data statistics information box by clicking the right mouse button. The system is deemed to have passed this test if the standard deviation (std.dev.) value in each direction (x,y,z) is less than 0.2mm (See Sample graphs and statistics text box in Appendix 3).

Filename	Time	Initial

Direction	Pass	Fail	std.dev.	Time	Initial
X					
Y					
Z					

4.4.5.2 Quality of Motion Data

The system shall be deemed to have passed this part of the test if the data shows the marker on the disc to be continuously in view and the motion looks smoothly sinusoidal in the x and z direction with no obvious jumps or discontinuities (See Sample graphs of x,y,z coordinates vs time in Appendix 4).

Filename	Pass	Fail	Time	Initial

4.5   Stopping Coda Software

Exit the Coda Motion Analysis Software by first closing the last data file and then clicking on the exit *X* at top right of the screen.

4.6   Power Down

4.6.1   Coda cx1 Unit

Switch off the DC power to the Coda sensor unit on the front panel of the mini hub. Switch off mains power to the mini hub (on back panel of mini hub).

4.6.2   Host PC

Exit Windows in the normal way. Then switch off mains power to the PC and its monitor.

4.7   In the Event of Test Failure

4.7.1   Host Computer Operations

In the event of a host computer failure, reboot Windows using the CTL-ALT-DEL mechanism or press the reset button on the front panel of the computer. If these actions fail to remedy the problem please seek further assistance.

4.7.2   Coda SHARC Processor

In the event of a SHARC processor failure, reset the SHARC board by toggling the switch on the front panel of the mini hub. Exit the Coda Motion Analysis Software by clicking on the exit *X* at top right of the screen. Re-launch and configure *Coda MA* as described in Section 4.3.4. If the SHARC processor board continues to malfunction, please seek further assistance.

4.7.3   Marker

Note which marker number has failed and at what point in the test.

4.7.4   Marker Drive Box

Note which drive box has failed and at what point in the test.

4.7.5   Mini Hub

Mini hub failure is only likely to be noticed as a malfunction of the DC power to the Coda sensor unit. If this is suspected the DC output voltage should first be monitored as per 4.2.1 and then current monitored as per 4.3.2. If the readings are not within nominal range the test cannot proceed before a replacement mini hub is obtained.

5.   Appendices

Appendix 1:   Coda SHARC Error code list

Appendix 2:   Sample Correlation Peak Display

Appendix 3:   Sample Graphs of Noise on Static Markers with Statistics Text Box

Appendix 4:   Sample Graphs of x,y,z, Coordinates vs Time

Appendix 1:   Coda SHARC Error Code List


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----------------------------------------------------------------
CODA Configuration for CODA Motion Analysis V6.56 (June 2004)
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Hardware initialization error codes (reported by Motion
Analysis on error)


[ErrorCodes]


1=Configuration file not present (CODA.CFG)
2=CODA.CFG error: [CodaSys] section not present
3=CODA.CFG error: [CodaSys]: Number
4=CODA.CFG error: [CodaSys]:
5=CODA.CFG error: [CodaSys]: TopStrobeRate
6=CODA.CFG error: [CodaSys]: StandbyStrobeCount < 1000


10=CODA.CFG error: [CODA_1] section not present (cf
[CodaSys]Number= )
11=CODA.CFG error: [CODA_1]: SerialNumber
12=CODA.CFG error: [CODA_1]: CommPort
13=CODA.CFG error: [CODA_1]: CommRate
14=CODA.CFG error: [CODA_1]: Cameras (must be 1,3,4)
15=CODA.CFG error: [CODA_1]: DSPProgramFile
16=CODA.CFG error: [CODA_1]: MaskType
17=CODA.CFG error: [CODA_1]: Orientation
18=CODA.CFG error: [CODA_1]: CodaType invalid
19=CODA.CFG error: [CODA_1]: Interface not specified or
invalid
20=CODA.CFG error: [CODA_1]: CommPacket invalid
21=CODA.CFG error: [CODA_1]: SerialNumber already specified
22=CODA.CFG error: [CODA_1]: CommPort already allocated


30=CODA.CFG error: [ADC_1] section not present with
[CodaSys]NumADC=1
31=CODA.CFG error: [ADC_1]: serial number
32=CODA.CFG error: [ADC_1]: NumAnalogue (should be 32 or 64)
33=CODA.CFG error: [ADC_1]: NumDigital
34=CODA.CFG error: [ADC_1]: DSPboard address
35=CODA.CFG error: [ADC_1]: DSPProgramFile name
36=CODA.CFG error: [ADC_1]: CalFile name
37=CODA.CFG error: [ADC_1]: Type number
38=CODA.CFG error: [ADC_1]: InputRange (should be n,n =
0,1,2)


40=CODA.CFG error: [ForcePlate_N] section not present with
[CodaSys]NumForce=N
41=CODA.CFG error: [ForcePlate_1]: Type number
```

42=CODA.CFG error: [ForcePlate_1]: CalFile name
43=CODA.CFG error: [ForcePlate_1]: DSPboard number
44=CODA.CFG error: [ForcePlate_1]: DSPboard letter
45=CODA.CFG error: [ForcePlate_1]: Rotation value
46=CODA.CFG error: [ForcePlate_1]: Mat Thickness value
47=CODA.CFG error: [ForcePlate_1]: Center offset value
48=CODA.CFG error: [ForcePlate_1]: BridgeVoltage value
49=CODA.CFG error: [ForcePlate_1]: AmpGain value
50=CODA.CFG error: [ForcePlate_1]: ParameterFile name
51=CODA.CFG error: [ForcePlate_1]: CommPort missing or bad
(Type=20)
52=CODA.CFG error: [ForcePlate_1]: Type=20 plate already
twinned
53=
54=
59=CODA.CFG unsupported: [ForcePlate_N] on different
interface types

60=CODA.CFG error: [EMG_N] section not present with
[CodaSys]NumEMG=N
61 80=CODA.CFG error: [EMG_1]: Type number missing
62 81=CODA.CFG error: [EMG_1]: Type not supported
63 82=CODA.CFG error: [EMG_1]: Calfile missing or bad
64 83=CODA.CFG error: [EMG_1]: DSPboard number
65 84=CODA.CFG error: [EMG_1]: DSPboard letter
66 85=CODA.CFG error: [EMG_1]: Transmitters entry missing or
invalid (1 or 2)

80=CODA.CFG error: [Digital_1]:
81=CODA.CFG error: [Digital_1]: DSPboard number
82=CODA.CFG error: [Digital_1]: DSPboard letter

110=Coda_1: memory allocation error.
111=Coda_1: memory allocation error.
112=Coda_1: missing Calibration LUT file (coda\CX1xxx-CalLUT-
5.cx1)(binary).
113=Coda_1: CX1xxx-CalLUT.cx1 data error: wrong or missing
serial number.
114=Coda_1: CX1xxx-CalLUT.cx1 data error.
115=Coda_1: missing Calibration data file (coda\CX1xxx-
CalGeom.dat)(text)
116=Coda_1: CX1xxx-CalGeom.dat data error: wrong or missing
serial number.
117=Coda_1:
118=Coda_1:
119=Coda_1: missing Gains file (coda\CX1xxx-
Gains.cx1)(binary).
120=Coda_1: CX1xxx-Gains.cx1 data error: wrong serial number
or bad data.

121=Coda_1: missing Correlation LUT file (coda\CX1xxx-CorrelLUT.cx1)(binary).
122=Coda_1: memory allocation error.
123=Coda_1: CX1xxx-CorrelLUT.cx1 data error.
124=Coda_1: CX1xxx-CorrelLUT.cx1 data error: 'TNORM' table.
125=Coda_1: missing DSPProgramFile (coda\CodaSharc_xxx.stk).
126=Coda_1: missing Template file (coda\CX1xxx-TemplLUT.dat)(hex)
127=Coda_1: missing TNorm file (coda\CX1xxx-TNormLUT.dat)(hex)
128=Coda_1:
129=Coda_1: CommPort error: not available (doesn't exist or is in use)(SH_CheckCommPort)
130=Coda_1: Comms error (SH_OpenCodaComms)
131=Coda_1: Reset failed (SH_ResetBoard)- check Comms/Power/Cable
132=Coda_1: SHARC: SH_SetBaud() fail
133=Coda_1: SHARC: SH_VerifyComms() fail - Config.CommRate/CommPacket too big?
134=Coda_1: SHARC: SH_ResetDSP() fail
135=Coda_1: SHARC: SH_LoadProgramFile() fail
136=Coda_1: SHARC: SH_LoadHexFile(CX1xxx-TemplLUT.dat) fail
137=Coda_1: SHARC: SH_LoadHexFile(CX1xxx-TNormLUT.dat) fail
138=Coda_1: CX1xxx-CalGeom.dat data error: [Geometry]: BaseLine, FocalDist, ABseparation
139=Coda_1: CX1xxx-CalGeom.dat data error: [Geometry]: CalDistances missing
140=Coda_1: CX1xxx-CalGeom.dat data error: [Geometry]: CalDistances bad
141=Coda_1: CX1xxx-CalGeom.dat data error: [Calibrated Range]:
142=Coda_1: CX1xxx-CalGeom.dat data error: [Camera Calibration]: IScale
143=Coda_1: CX1xxx-CalGeom.dat data error: [Correction Factors]: SkewA, SkewB, TiltA, TiltB, YawB
144=Coda_1: CX1xxx-CalGeom.dat data error: [Correction Factors]: bad value
145=Coda_1: CX1xxx-CalGeom.dat data error: [Geometry]: CTCentre missing or bad
146=Coda_1: SHARC: SH_StartDSP() fail
147=Coda_1: SHARC: SH_VerifyComms() fail after SH_StartDSP()
148=Coda_1: SHARC: Wrong Code Version
149=Coda_1: SHARC: Memory test failed
150=Coda_1: CX1xxx-CalLin-A.dat data error: wrong or missing serial number.
151=Coda_1: CX1xxx-CalLin-A.dat data error:
152=Coda_1: CX1xxx-Alignment.dat data error: wrong or missing serial number.
153=Coda_1: CX1xxx-Alignment.dat data error: no [Transforms]

154=Coda_1: CX1xxx-Alignment.dat data error: bad transform
name
155=Coda_1: CX1xxx-Alignment.dat data error: bad transform
data
156=Coda_1: CX1xxx-Alignment.dat data error: transform not
orthogonal
157=Coda_1:
158=Coda_1:
159=Coda_1:
160=Coda_1:

200=ADC_1: Can't initialize ADC dsp interface card - check
base address.
201=ADC_1: Can't find DSPProgramFile ADC64*.OUT.
202=ADC_1: Error loading program file ADC64*.OUT to DSP
interface.
203=ADC_1: Wrong program version on DSP interface.
204=ADC_1: Error creating GS16AIO interface
205=ADC_1: Error starting GS16AIO - see CodaLog.txt
206=ADC_1: Not enough channels available (NumAnalogue too
large?)
210=[ADC_1]CalFile: error opening file.
211=[ADC_1]CalFile error: [Serial Number]
212=[ADC_1]CalFile error: [ADC Offsets]
213=[ADC_1]CalFile error: [ADC Gains]

300=[ForcePlate_1]CalFile: error opening file.
301=[ForcePlate_1]CalFile error: [Serial Number]
302=[ForcePlate_1]CalFile error: [Force Offsets]
303=[ForcePlate_1]CalFile error: [Force Gains]
304=[ForcePlate_1]CalFile error: [Force Offsets High]
305=[ForcePlate_1]CalFile error: [Force Gains High]
306=[ForcePlate_1]ParameterFile: error opening file.
307=[ForcePlate_1]ParameterFile error in [ForcePlate] section
308=[ForcePlate_1]ParameterFile error in [CalibrationMatrix]
section
309=[ForcePlate_1] OpenComms() error
310=[ForcePlate_1] SetDataRate() error - check Power / Serial
connection
311=[ForcePlate_1] AutoZero() error: Expected two plates, got
one.
312=[ForcePlate_1] AutoZero() error: Expected one plate, got
two.
313=[ForcePlate_1] AutoZero() error
314=[ForcePlate_1] GetDataSample() error
315=[ForcePlate_1] GetSerialNumber() error
316=[ForcePlate_1] Serial number miss-match (plate 1)
317=[ForcePlate_1] Serial number miss-match (plate 2)

400=[EMG_1]CalFile: error opening file.

401=[EMG_1]CalFile error: [Serial Number]
402=[EMG_1]CalFile error: [EMG Offsets]
403=[EMG_1]CalFile error: [EMG Gains]
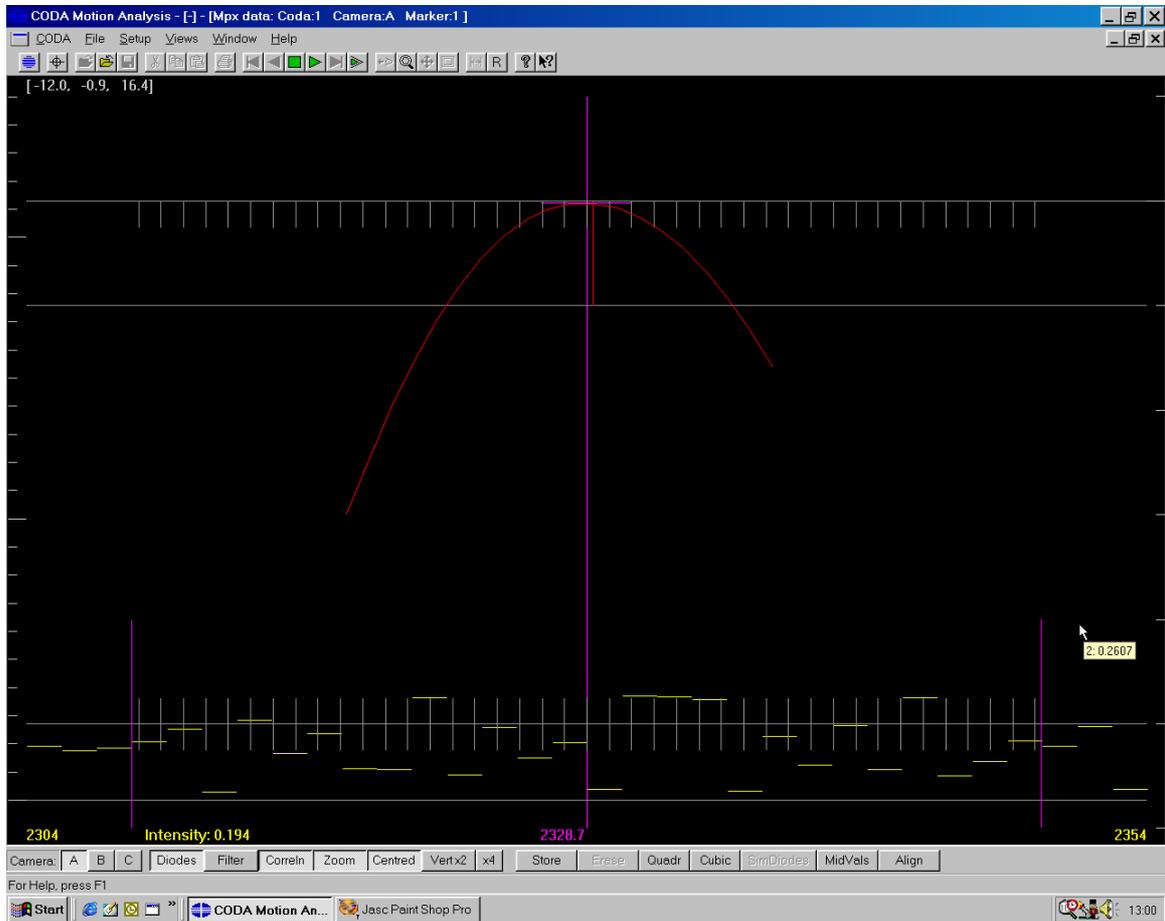404=[EMG_1] Couldn't load Noraxon driver dll (nxnair.dll)

900=CODA Install failed: CODASYS.DAT not found
901=CODA Install failed: NT device driver
902=CODA Install failed: CODA95.DLL not found
903=CODA Install failed: Bad DSP config (CODASYS.DAT) or DSPs
not responding

:Dsp Timeouts:
:bit-flags
1001=Coda 1 not ready (ResetControl() fail) (not switched
on?).
1002=Coda 2 not ready (not switched on?).
1004=Coda 3 not ready (not switched on?).
1008=Coda 4 not ready (not switched on?).
1016=Coda 5 not ready (not switched on?).
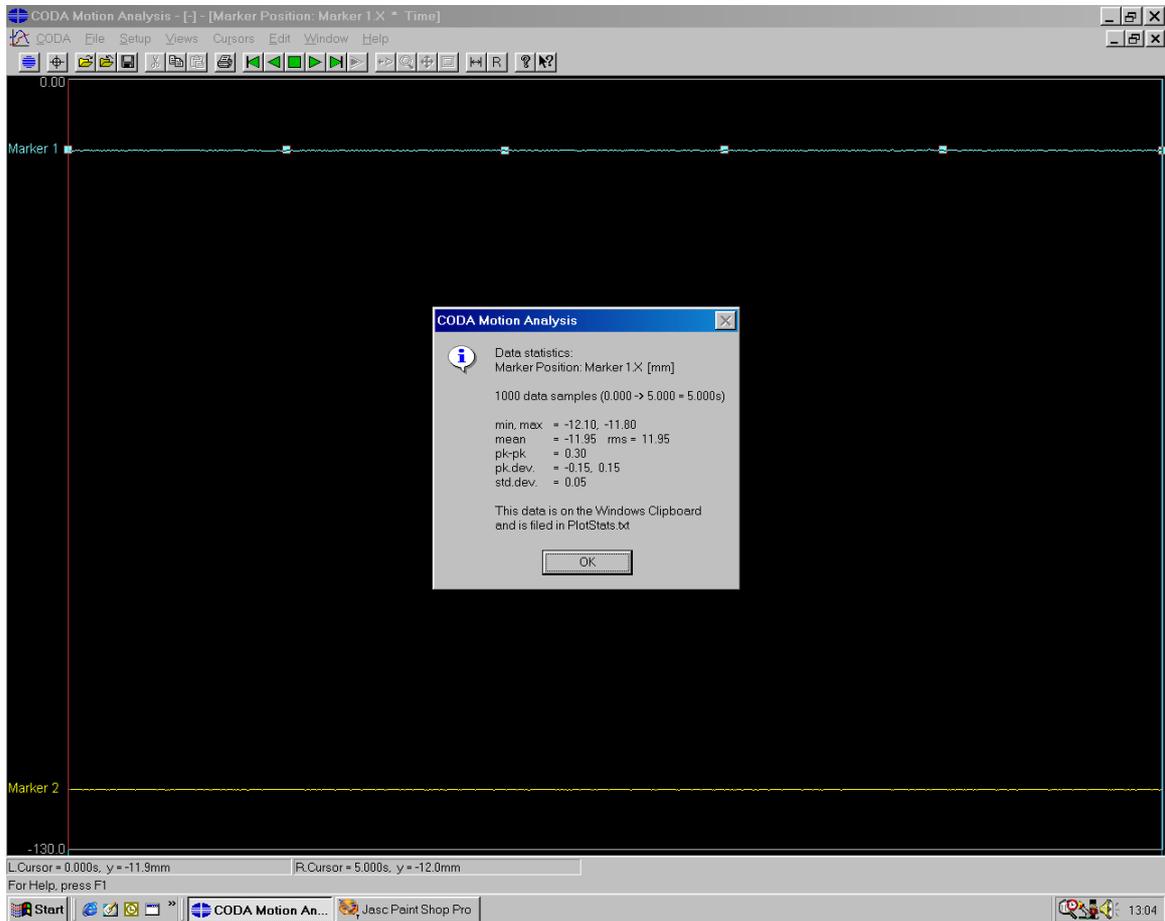1032=Coda 6 not ready (not switched on?).

2001=Coda 1 timeout on Handshake test after initialization
2002=Coda 2 timeout on Handshake test after initialization
(not sync'd?)
2004=Coda 3 timeout on Handshake test after initialization
(not sync'd?)
2008=Coda 4 timeout on Handshake test after initialization
(not sync'd?)
2003=Codas 1+2 timeout on Handshake test after initialization
2012=Codas 3+4 timeout on Handshake test after initialization
(no sync between MiniHubs?))
2007=Codas 1+2+3 timeout on Handshake test after
initialization
2015=Codas 1+2+3+4 timeout on Handshake test after
initialization
2000 + n: Timeout error on second Coda handshake (n =
bitflags)

2024=Timeout error on handshake test of ADC_1 dsp card (ADC-
64 unit not connected?)
2000 + ?:Timeout error on handshake test of ADC_1 dsp card
(ADC unit not connected?)
2001=Timeout error on handshake test of ADC_1 dsp card (ADC
unit not connected?)
3001=Not ready: ADC_1 dsp card (ADC unit not switched on or
Coda sync not connected?)

Appendix 2: Sample Correlation Peak Display

Appendix 3:   Sample Graphs of Noise on Static Markers with Statistics Text Box

Appendix 4:   Sample Graphs of x,y,z Coordinates vs Time