*LIGO Laboratory / LIGO Scientific Collaboration*

LIGO-T12000185-v2 *Advanced LIGO* 18 July 2012

 **aLIGO 4 Ch. LSC RFPD Interface Chassis Test Procedure**

R. Abbott

Distribution of this document:

LIGO Scientific Collaboration

This is an internal working note

of the LIGO Laboratory.

|  |  |
| --- | --- |
| **California Institute of Technology****LIGO Project – MS 18-34****1200 E. California Blvd.****Pasadena, CA 91125**Phone (626) 395-2129Fax (626) 304-9834E-mail: info@ligo.caltech.edu | **Massachusetts Institute of Technology****LIGO Project – NW22-295****185 Albany St****Cambridge, MA 02139**Phone (617) 253-4824Fax (617) 253-7014E-mail: info@ligo.mit.edu |
| **LIGO Hanford Observatory****P.O. Box 1970****Richland WA 99352**Phone 509-372-8106Fax 509-372-8137 | **LIGO Livingston Observatory****P.O. Box 940****Livingston, LA 70754**Phone 225-686-3100Fax 225-686-7189 |

http://www.ligo.caltech.edu/

# Overview

This procedure documents the testing of D1102079-v1, the aLIGO LSC Interface Chassis. This chassis supports up to 4 aLIGO LSC RFPD heads. The chassis houses 1 PD Interface boards (D1102060-v1), 1 Power Protection board (D1101816-v2), and an internal voltage regulator board

# Testing

Each production chassis must be functionally tested and the results recorded in Section 4. It is assumed that the person using this procedure is familiar with Dynamic Signal Analyzers, and rudimentary test equipment including oscilloscopes and multimeters.

**Serial Number Data**

* Record all serial number data in Table 1

**DC Tests**

* Apply +/- 18, +/-200 mV Volts DC to the chassis under test and record front panel LED operation, total positive and negative power supply current, internal regulator output voltage and individual circuit board power supply currents as required in Table 2.

# Reference for chassis front and rear panel layout

Figure 1: ISC LSC RFPD Interface Chassis Front Panel



Figure 2: ISC LSC RFPD Interface Chassis Rear Panel



# Test Data Tables

## General Information

Table General Data

|  |  |
| --- | --- |
| **Tested By** | **Date** |
|  |  |

Table 2 Serial Number Data

|  |  |  |  |
| --- | --- | --- | --- |
| **Chassis Serial Number** | **DC PWR Board** **PCB Serial #** | **Head 1-4 PCB Serial #** | **Power Protection Board Serial #** |
|  |  |  |  |

## DC Power Supply Data

Total chassis and individual circuit board quiescent current draw is recorded in Table 2. Use caution in believing the digital readouts of laboratory triple output power supplies. Their meters are not highly accurate. When in doubt, use a multimeter on the appropriate scale in series with the supply to be measured.

Table 3, Record of DC Test Data

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Typical Value** | **Allowable Range** | **Measured Value** |
| Front Panel +/- 15VDC Power LEDs |  All Lit | N/A |  |
| Front Panel +/- 18VDC Power LEDs |  All Lit | N/A |  |
|  Rear Panel +/- 15VDC  Power LEDs |  All Lit | N/A |  |
| +18VDC, +/-0.2VDC **TOTAL** supply current | 190 mA | +/- 20mA |  |
| -18VDC, +/-0.2VDC **TOTAL** supply current | 170 mA | +/- 20mA |  |
| Regulated Internal DC Voltage under full load (board 1) | ±15 VDC | +/- 0.5VDC per supply |  |
| Regulated Internal DC Voltage under full load (board 2) | ±15 VDC | +/- 0.5VDC per supply |  |

## DC Offsets on 9-pin D-sub Output

As a general measure of the health, the DC offset at the differential outputs for each channel must be measured. Using a multimeter, measure the DC offset at the 9-pin D-sub output on the rear panel. Each respective front panel input is to be left open during this measurement. For each measurement, cycle the light grey front panel whitening rocker switch through all three of its positions Record the results in Table 3.

Table 4, Differential Output DC Offset

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***Differential DC Measurement Point*** | ***State of Front Panel Whitening Switch*** | ***Typical DC Offset*** | ***Allowable Range*** | ***Measured Value*** | **Pass/Fail** |
| Rear D-sub, pin 1-6 | One | 0VDC | +/- 3mV |  |  |
| Rear D-sub, pin 1-6 | Both | 0VDC | +/- 3mV |  |  |
| Rear D-sub, pin 1-6 | None | 0VDC | +/- 3mV |  |  |
| Rear D-sub, pin 2-7 | One | 0VDC | +/- 3mV |  |  |
| Rear D-sub, pin 2-7 | Both | 0VDC | +/- 3mV |  |  |
| Rear D-sub, pin 2-7 | None | 0VDC | +/- 3mV |  |  |
| Rear D-sub, pin 3-8 | One | 0VDC | +/- 3mV |  |  |
| Rear D-sub, pin 3-8 | Both | 0VDC | +/- 3mV |  |  |
| Rear D-sub, pin 3-8 | None | 0VDC | +/- 3mV |  |  |
| Rear D-sub, pin 4-9 | One | 0VDC | +/- 3mV |  |  |
| Rear D-sub, pin 4-9 | Both | 0VDC | +/- 3mV |  |  |
| Rear D-sub, pin 4-9 | None | 0VDC | +/- 3mV |  |  |

## AC Transfer Function

Using an SR785 Dynamic Signal Analyzer, measure the transfer function from the indicated input to the indicated output and record the magnitude and phase at the frequencies called out in Table 5. Set the SR785’s output drive level to 10mV, and sweep from 5Hz to 50Hz using only 10 points. Ensure the SR785 is in A-B mode on the receiving channel so the measurement is fully differential.

Table 5 AC Transfer Function

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ***Signal Injection Point*** | ***Differential AC Measurement Point*** | ***Front Panel Whitening Switch*** | ***Frequency (Hz)*** | ***Nominal Transfer Function (dB/Deg)*** | ***Allowable Range (dB/Deg)*** | ***Measured Value (dB/Deg)*** | **Pass/Fail** |
| Head 1 Pin 1-6 | Rear D-sub, pin 1-6 | One | 5Hz | 13.2dB/52.7Deg | +/- 0.5dB/5Deg |  |  |
|  |  |  | 25Hz | 19.6dB/19.7Deg | +/- 0.3dB/5Deg |  |  |
|  |  | Both | 5Hz | 26.5dB/105.4Deg | +/- 0.5dB/5Deg |  |  |
|  |  |  | 25Hz | 39.4dB/39.4Deg | +/- 0.3dB/5Deg |  |  |
|  |  | None | 5Hz | 0dB/0Deg | +/- 0.5dB/5Deg |  |  |
|  |  |  | 25Hz | 0dB/0Deg | +/- 0.3dB/5Deg |  |  |
| Head 2 Pin 1-6 | Rear D-sub, pin 2-7 | One | 5Hz | 13.2dB/52.7Deg | +/- 0.5dB/5Deg |  |  |
|  |  |  | 25Hz | 19.6dB/19.7Deg | +/- 0.3dB/5Deg |  |  |
|  |  | Both | 5Hz | 26.5dB/105.4Deg | +/- 0.5dB/5Deg |  |  |
|  |  |  | 25Hz | 39.4dB/39.4Deg | +/- 0.3dB/5Deg |  |  |
|  |  | None | 5Hz | 0dB/0Deg | +/- 0.5dB/5Deg |  |  |
|  |  |  | 25Hz | 0dB/0Deg | +/- 0.3dB/5Deg |  |  |
| Head 3 Pin 1-6 | Rear D-sub, pin 3-8 | One | 5Hz | 13.2dB/52.7Deg | +/- 0.5dB/5Deg |  |  |
|  |  |  | 25Hz | 19.6dB/19.7Deg | +/- 0.3dB/5Deg |  |  |
|  |  | Both | 5Hz | 26.5dB/105.4Deg | +/- 0.5dB/5Deg |  |  |
|  |  |  | 25Hz | 39.4dB/39.4Deg | +/- 0.3dB/5Deg |  |  |
|  |  | None | 5Hz | 0dB/0Deg | +/- 0.5dB/5Deg |  |  |
|  |  |  | 25Hz | 0dB/0Deg | +/- 0.3dB/5Deg |  |  |
| Head 4 Pin 1-6 | Rear D-sub, pin 4-9 | One | 5Hz | 13.2dB/52.7Deg | +/- 0.5dB/5Deg |  |  |
|  |  |  | 25Hz | 19.6dB/19.7Deg | +/- 0.3dB/5Deg |  |  |
|  |  | Both | 5Hz | 26.5dB/105.4Deg | +/- 0.5dB/5Deg |  |  |
|  |  |  | 25Hz | 39.4dB/39.4Deg | +/- 0.3dB/5Deg |  |  |
|  |  | None | 5Hz | 0dB/0Deg | +/- 0.5dB/5Deg |  |  |
|  |  |  | 25Hz | 0dB/0Deg | +/- 0.3dB/5Deg |  |  |

## Front Panel Test Switch

A rocker switch for each LSC head is present on the front panel of the chassis. This test verifies that the rocker switch provides the proper voltage to actuate the test relay in each LSC detector head served by this chassis. As required in Table 6, verify proper switching with a ohm-meter.

Table 6 Rocker Switch Operation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Switch Position** | **Measurement Point** | **Typical Value** | **Allowable Range** | **Pass or Fail (P or F)** |
| Head 1 Normal | Head1 D-sub Pins 4 to 9 | OPEN | - |  |
| Head 1 Test | Head1 D-sub Pins 4 to 9 | SHORT | Up to 2 Ohms |  |
| Head 2 Normal | Head2 D-sub Pins 4 to 9 | OPEN | - |  |
| Head 2 Test | Head2 D-sub Pins 4 to 9 | SHORT | Up to 2 Ohms |  |
| Head 3 Normal | Head3 D-sub Pins 4 to 9 | OPEN | - |  |
| Head 3 Test | Head3 D-sub Pins 4 to 9 | SHORT | Up to 2 Ohms |  |
| Head 4 Normal | Head4 D-sub Pins 4 to 9 | OPEN | - |  |
| Head 4 Test | Head4 D-sub Pins 4 to 9 | SHORT | Up to 2 Ohms |  |