LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

LIGO Laboratory / LIGO Scientific Collaboration

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aLIGO 4 Ch. Differential to Single Ended Converter Chassis Test Procedure

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1 Overview

This test procedure applies to ISC 4 Channel, Differential to Single Ended Converter circuit board LIGO-D1100457-v1 contained within chassis assembly D1100482.

2 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 Tested By:___________________ Date:________________

- 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.

3 Reference for chassis front and rear panel layout

Figure 1: ISC 4 Channel, Differential to Single Ended Converter Chassis Front Panel

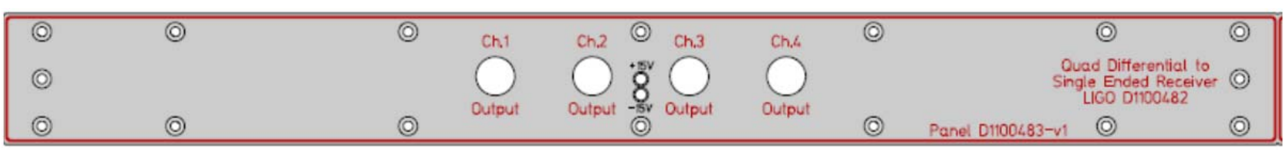
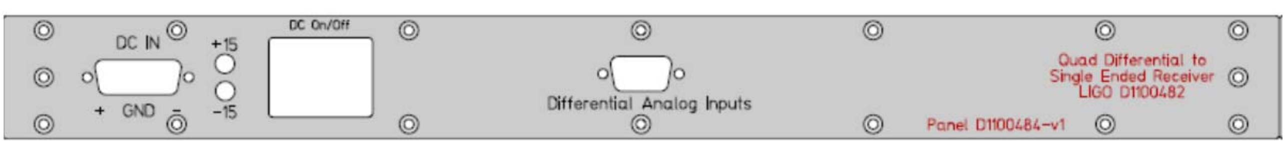


Figure 2: ISC 4 Channel, Differential to Single Ended Converter Chassis Rear Panel



4 Test Data Tables

4.1 General Information

Tested By:__________________ Date:_______________

Table 1 Serial Number Data

Chassis Serial Number	DC PWR Board PCB Serial #	Internal PCB Serial #

4.2 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 2, Record of DC Test Data

Parameter	Typical Value	Allowable Range	Measured Value
Front Panel +/- 15VDC Power LEDs	Both Lit	N/A	
Rear Panel +/- 15VDC Power LEDs	Both Lit	N/A	
+18VDC, +/-0.2VDC **TOTAL** supply current	100 mA	+/- 20mA	
-18VDC, +/-0.2VDC **TOTAL** supply current	90 mA	+/- 20mA	
Regulated Internal DC Voltage under full load (both boards)	15 VDC	+/- 0.5VDC	
Regulated Internal DC Voltage under full load (both boards)	-15VDC	+/- 0.5VDC	

4.3 DC Offsets on Each BNC 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 each BNC output on the associated front panel connector. Each respective input is to be left shorted to ground during this measurement. Record the results in Table 3.

Table 3, Differential Output DC Offset

Differential DC Measurement Point	*Typical DC Offset*	*Allowable Range*	*Measured Value*	**Pass/Fail**
Channel 1	0VDC	+/- 3mV		
Channel 2	0VDC	+/- 3mV		
Channel 3	0VDC	+/- 3mV		
Channel 4	0VDC	+/- 3mV		

4.4 Frequency Response

The transfer function of each channel of the amplifier should be measured using an SR785 dynamic signal analyzer. The SR785 input drive level is 100mV for all swept sine measurements.

Measure the magnitude and the phase by driving into the rear panel D-sub and taking a signal at each front panel BNC output for each channel as required. The rear panel D-sub is pinned according to the LIGO convention of: Ch1 (pin 1&6), Ch2 (pin 2&7), Ch3 (pin 3&8), Ch4 (pin 4&9). Record the results in Table 4 through Table 7.

Table 4 Frequency Response Channel 1

Measurement Frequency	**Magnitude (dB)**	**Phase (degrees)**	**Measured Magnitude**	**Measured Phase**	**Pass/Fail**
100Hz	0 +/- 0.1dB	-1 +/- 3deg			
1KHz	-0.07 +/- 0.1dB	-10 +/- 3deg			
10KHz	-5.03 +/- 0.1dB	-82 +/- 3deg			

Table 5 Frequency Response Channel 2

Measurement Frequency	Magnitude (dB)	Phase (degrees)	Measured Magnitude	Measured Phase	Pass/Fail
100Hz	0 +/- 0.1dB	-1 +/- 3deg			
1KHz	-0.07 +/- 0.1dB	-10 +/- 3deg			
10KHz	-5.03 +/- 0.1dB	-82 +/- 3deg			

Table 6 Frequency Response Channel 3

Measurement Frequency	Magnitude (dB)	Phase (degrees)	Measured Magnitude	Measured Phase	Pass/Fail
100Hz	0 +/- 0.1dB	-1 +/- 3deg			
1KHz	-0.07 +/- 0.1dB	-10 +/- 3deg			
10KHz	-5.03 +/- 0.1dB	-82 +/- 3deg			

Table 7 Frequency Response Channel 4

Measurement Frequency	Magnitude (dB)	Phase (degrees)	Measured Magnitude	Measured Phase	Pass/Fail
100Hz	0 +/- 0.1dB	-1 +/- 3deg			
1KHz	-0.07 +/- 0.1dB	-10 +/- 3deg			
10KHz	-5.03 +/- 0.1dB	-82 +/- 3deg			

4.5 Output Noise Spectra

The output noise voltage of each channel should be measured using the dynamic signal analyzer SR785. This measurement should be made while each respective input is shorted to ground.

Measure the output referred noise at the front panel BNC output for each channel as required. Record the results in Table 8 through Table 11.

Table 8 Channel 1 Output Noise

Measurement Frequency	Typical Amplitude nVrms/√Hz	Allowable Range nVrms/√Hz	Measured Amplitude nVrms/√Hz	Pass/Fail
10Hz	50	<60		
100Hz	20	<25		
1KHz	18	<23		

Table 9 Channel 2 Output Noise

Measurement Frequency	Typical Amplitude nVrms/√Hz	Allowable Range nVrms/√Hz	Measured Amplitude nVrms/√Hz	Pass/Fail
10Hz	50	<60		
100Hz	20	<25		
1KHz	18	<23		

Table 10 Channel 3 Output Noise

Measurement Frequency	Typical Amplitude nVrms/√Hz	Allowable Range nVrms/√Hz	Measured Amplitude nVrms/√Hz	Pass/Fail
10Hz	50	<60		
100Hz	20	<25		
1KHz	18	<23		

Table 11 Channel 4 Output Noise

Measurement Frequency	Typical Amplitude nVrms/√Hz	Allowable Range nVrms/√Hz	Measured Amplitude nVrms/√Hz	Pass/Fail
10Hz	50	<60		
100Hz	20	<25		
1KHz	18	<23		