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

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# Overview

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

# 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.

# 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



# Test Data Tables

## General Information

Tested By:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Table Serial Number Data

|  |  |  |
| --- | --- | --- |
| **Chassis Serial Number** | **DC PWR Board**  **PCB Serial #** | **Internal PCB 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 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 |  |

## 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 |  |  |

## 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 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 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 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 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 |  |  |  |

## 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 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 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 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 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 |  |  |