



LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

LIGO Laboratory / LIGO Scientific Collaboration

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Advanced LIGO

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Test Procedure for Slow Controls Concentrator Auxiliary 5

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SERIAL NUMBER: S1300247

1 Overview

The slow controls concentrator auxiliary 5 supports 4 DC photodiode amplifiers.

2 Test Equipment

- Multimeter, scope and signal generator.
- Second slow controls concentrator auxiliary 5 ([D1201352 -v1](#)).
Replace the 2 Dual PD front-panel breakout boards with quad TNC breakouts.
Add 2 quad TNC/GND breakouts. Either use no front panel or use a slow controls concentrator auxiliary 1 front panel.
- Legacy LSC Photodetector with 15-pin D-sub extension cable.
- Flashlight
- DC power supplies.

3 Documentation

- Schematics—[D1201352 -v1](#)

4 Tests

Power up the measurement equipment and open the lid of the DUT. Connect a DB37 cable (male-male) between the DUT and the second slow controls concentrator.

4.1 Power

Check the voltages on the concentrator power board. The voltage should be within 5% of nominal. Test that the OK signal is a TTL low (<0.8V).

TP6 (+5V) **+5.04 V**

TP8 (+15V) **+14.50 V**

TP3 (-15V) **-14.87 V**

TP9 (OK) **+2.84 V**

4.2 LED

Check that the LED on the front panel and the 2 LEDs on the rear panel are lit.

Front panel LED **ON**

Rear panel LEDs **ON**

4.3 Testing

4.3.1 Dual Photodiode Amplifier

Connect the test cable to the PD Amp DC 1-4 connector. Measure the voltage of the photodiode amplifier monitors at the DUT at the second chassis and at the rear cable (should be close to zero). The quad TNC breakouts of the second chassis have the connectors assigned as Gain 1 input, Gain 2 input, Monitor 1, Monitor 2, respectively.

Signal	Voltage at DUT	Voltage at 2 nd unit	Cable
Photodiode amplifier monitor 1	<1mV		
Photodiode amplifier monitor 2	<1mV		
Photodiode amplifier monitor 3	~1.1mV		
Photodiode amplifier monitor 4	~1.3mV		

Clip a 100 k Ω resistor to the TNC PD input of each DC photodiode amplifier channel in turn. Measure the voltage of the photodiode amplifier monitors at the DUT at the second chassis and at the rear cable. Make one measurement at this gain (voltage should be 100mV).

Signal	Voltage at DUT	Voltage at 2 nd unit	Cable
Photodiode amplifier monitor 1	105mV		
Photodiode amplifier monitor 2	105mV		
Photodiode amplifier monitor 3	106mV		
Photodiode amplifier monitor 4	106mV		

Now ground the center pin of the corresponding gain input and measure again (should be 315mV).

Signal	Voltage at DUT	Voltage at 2 nd unit	Cable
Photodiode amplifier monitor 1	323mV		
Photodiode amplifier monitor 2	324mV		
Photodiode amplifier monitor 3	324mV		
Photodiode amplifier monitor 4	324mV		

Ground both the center pin and the outer shell to ground, measure again (should be 1.00V).

Signal	Voltage at DUT	Voltage at 2 nd unit	Cable
Photodiode amplifier monitor 1	1.01 V		
Photodiode amplifier monitor 2	1.01 V		
Photodiode amplifier monitor 3	1.02 V		
Photodiode amplifier monitor 4	1.02 V		

Ground the outer shell to ground, measure again (should be 3.15V).

Signal	Voltage at DUT	Voltage at 2 nd unit	Cable
Photodiode amplifier monitor 1	3.20 V		
Photodiode amplifier monitor 2	3.20 V		
Photodiode amplifier monitor 3	3.20 V		
Photodiode amplifier monitor 4	3.20 V		

4.3.2 Legacy LSC Photodetector

The 8 BNCs of the 2 quad TNC/GND breakout boards the in the second chassis have the connectors assigned as: not used, not used, status, D2, D1, D0, not used, PD monitor.

Connect the legacy LSC photodetector and watch the LED turn on. Check the status on the second chassis, which should be TTL levels.

Front panel LED of legacy PSC PD ON TTL level at status +4.66 V

Connect the test cable to the DC PD 1-4 connector.

Hook up a DVM to the front-panel monitor output of the legacy LSC PD, channel 1 of the test cable and the PD monitor of the second chassis. Use a flash light to illuminate the legacy LSC PD and monitor that the DVM readbacks change.

Signal	Voltage at DUT	Voltage at 2 nd unit	Cable
Photodetector monitor	<0.1V/-14.2V		

Mount the flashlight at fixed position and make sure the monitor readback does not read more than 100 mV. Using Gray-encoding ground D0-D2 on the second chassis in turn to cycle through all the gain stages.

Gain	D2	D1	D0	Voltage at DUT	Voltage at 2nd unit	Cable
0 dB	open	open	open	-7.21 V		
10 dB	open	open	GND	-7.21 V		
20 dB	open	GND	GND	-7.21 V		
30 dB	open	GND	open	-7.21 V		
40 dB	GND	GND	open	-2.28 V		
40 dB	GND	GND	GND	-0.72 V		
40 dB	GND	open	GND	-0.229 V		
40 dB	GND	open	open	-0.072 V		