LIGO Laboratory / LIGO Scientific Collaboration

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PI Band Pass Filter Board Test Procedure

Carl Adams, R. Abbott

California Institute of Technology
LIGO Project – MS 18-34
1200 E. California Blvd.
Pasadena, CA 91125
Phone (626) 395-2129
Fax (626) 304-9834
E-mail: info@ligo.caltech.edu

Massachusetts Institute of Technology
LIGO Project – NW22-295
185 Albany St
Cambridge, MA 02139
Phone (617) 253-4824
Fax (617) 253-7014
E-mail: info@ligo.mit.edu

LIGO Hanford Observatory
P.O. Box 1970
Richland WA 99352
Phone 509-372-8106
Fax 509-372-8137

LIGO Livingston Observatory
P.O. Box 940
Livingston, LA 70754
Phone 225-686-3100
Fax 225-686-7189

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

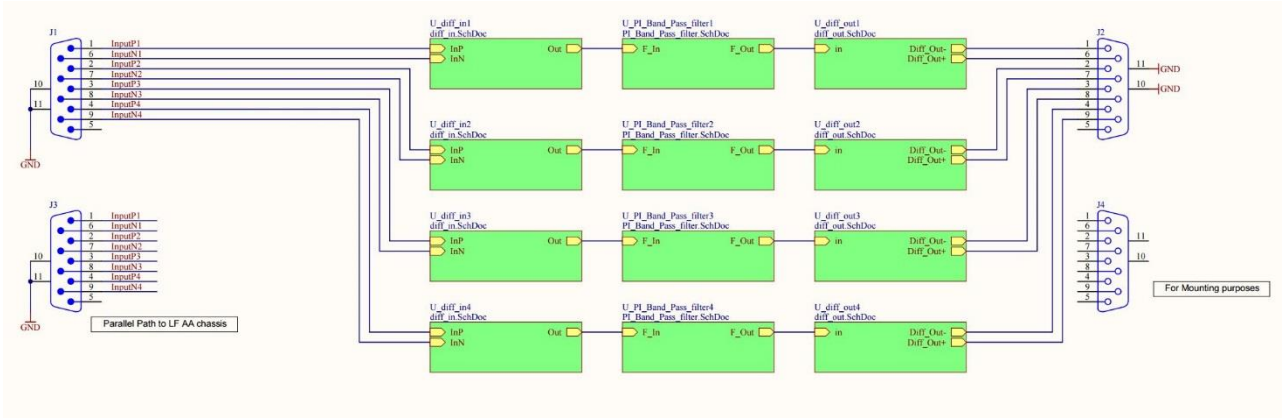
1 Overview

This test procedure applies to Parametric Instability Band Pass Filter circuit board LIGO-D1500172-v1. This is a 10 KHz to 80 KHz Band Pass Filter designed for use with parametric instability active damping electronics. The board consists of a differential receiver with -6dB gain, a high pass 2nd order Sallen-Key filter cascaded with a low pass 2nd order Sallen-Key filter with a pass band gain of -0.5dB, and ending with a differential driver with 6dB gain.

2 Testing

Each filter board assembly 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.

3 DB9 Pinouts



4 Test Data Tables

4.1 General Information

Table 1

Tested By	Board Serial Number	Date

4.2 DC Power Supply Data

Note that these boards are intended to be used within a chassis with a Chassis Power Regulator PCB D1000217-v1, and are not regulated. 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.

Apply +/- 15, +/-200 mV Volts DC to the board under test and record LED operation and the total positive and negative power supply current in Table 2.

Table 2, Record of DC Test Data

Parameter	Typical Value	Allowable Range	Measured Value mA
Front +/- 15VDC Power LEDs	Both Lit	N/A	
Rear +/- 15VDC Power LEDs	Both Lit	N/A	
+15VDC, +/-0.2VDC **TOTAL** supply current	180 mA	+/- 50mA	
-15VDC, +/-0.2VDC **TOTAL** supply current	170 mA	+/- 50mA	

4.3 DC Offsets on Each Differential Output

As a general measure of the health, the DC offset must be measured at the differential outputs for each channel. The input connector is to be left open.

Measure the DC offset differentially at the output D-sub for each channel and Record the results as measured by a multimeter in Table 3.

Table 3, Differential Output DC Offset

Differential DC Measurement Point	*Typical DC Offset mV*	*Allowable Range*	*Actual DC Offset* mV
Channel 1	14	+/- 5mV	
Channel 2	14	+/- 5mV	
Channel 3	14	+/- 5mV	
Channel 4	14	+/- 5mV	

4.4 Frequency Response

The transfer function of each channel of the filter should be measured using the dynamic signal analyzer SR785. The input drive level is 5V for all swept sine measurements. A differential input will be required.

Measure the magnitude and the phase differentially at the output D-sub for each channel as required. Record the results the following tables.

Table 4, Frequency Response Channel 1

Measurement Frequency	**Magnitude (dB)**	**Allowable Range**	**Phase (deg)**	**Allowable Range**	**Measured Magnitude**	**Measured Phase**	**Pass/Fail**
1KHz	-41	+/- 1dB	169.6	+/- 5 deg			
10.461KHz	-3.5	+/- 1dB	78.8	+/- 5 deg			
29KHz	-0.5	+/- 1dB	0.5	+/- 5 deg			
83.145KHz	-3.5	+/- 1dB	-81.4	+/- 5 deg			
100KHz	-5.3	+/- 1dB	-98.5	+/- 5 deg			

Table 5, Frequency Response Channel 2

Measurement Frequency	Magnitude (dB)	Allowable Range	Phase (deg)	Allowable Range	Measured Magnitude	Measured Phase	Pass/Fail
1KHz	-41	+/- 1dB	169.6	+/- 5 deg			
10KHz	-3.5	+/- 1dB	78.8	+/- 5 deg			
30KHz	-0.5	+/- 1dB	0.5	+/- 5 deg			
80KHz	-3.5	+/- 1dB	-81.4	+/- 5 deg			
100KHz	-5.3	+/- 1dB	-98.5	+/- 5 deg			

Table 6, Frequency Response Channel 3

Measurement Frequency	Magnitude (dB)	Allowable Range	Phase (deg)	Allowable Range	Measured Magnitude	Measured Phase	Pass/Fail
1KHz	-41	+/- 1dB	169.6	+/- 5 deg			
10KHz	-3.5	+/- 1dB	78.8	+/- 5 deg			
30KHz	-0.5	+/- 1dB	0.5	+/- 5 deg			
80KHz	-3.5	+/- 1dB	-81.4	+/- 5 deg			
100KHz	-5.3	+/- 1dB	-98.5	+/- 5 deg			

Table 7, Frequency Response Channel 4

Measurement Frequency	Magnitude (dB)	Allowable Range	Phase (deg)	Allowable Range	Measured Magnitude	Measured Phase	Pass/Fail
1KHz	-41	+/- 1dB	169.6	+/- 5 deg			
10KHz	-3.5	+/- 1dB	78.8	+/- 5 deg			
30KHz	-0.5	+/- 1dB	0.5	+/- 5 deg			
80KHz	-3.5	+/- 1dB	-81.4	+/- 5 deg			
100KHz	-5.3	+/- 1dB	-98.5	+/- 5 deg			

4.5 Output Noise Spectra

The output noise voltage of each channel of the filter board should be measured using the dynamic signal analyzer SR785. This measurement should be made while the input is open, and the frequency range is set from 1Hz to 100 kHz, differentially into a SR560 with 1000 gain.

Measure the output referred noise differentially at the rear panel D-sub output for each channel as required. Record the results in Table 8.

Table 8, Channel Noise

Channel	**Measurement Frequency**	**Typical Amplitude dBVrms/√Hz**	**Measured Amplitude dBVrms/√Hz**	**Pass/Fail**
1	30KHz	< -129		
2	30KHz	< -129		
3	30KHz	< -129		
4	30KHz	< -129		