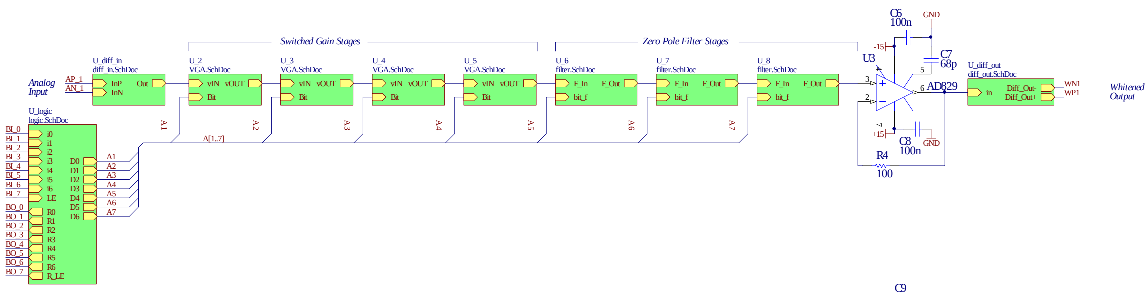
Title	*ISC Whitening Chassis Manual Test Procedure*
Author	*R. Abbott, Caltech*
Date	*16 March 2015*
Hardware Version	*D1002559 containing PCB D1001530-v5*

1 Overview

This test procedure applies to ISC Whitening Filter circuit board D1001530-v5, two of which are contained within chassis assembly D1002559. D1002559 is a remotely configurable 8-channel general purpose whitening filter bank. This test procedure provides instructions for performance verification for the entire assembled chassis.

Figure 1, Whitening Amplifier Block Diagram



2 Testing

2.1. Assumptions

2.1.1. Each whitening chassis requires a total of 64 individual parallel control lines (bits) to control all the gain and filter combinations. While this is possible to do with external switches or jumpers, it is far more efficient to test this chassis using an automated binary control chassis such as the Acromag 384 channel binary interface module D1100251. A dedicated manual control test fixture has also been built to aid in the control of the Whitening Chassis functionality.

2.1.2. Each production chassis must be functionally tested according to the procedure in this document. The test results are to be recorded using the form F1500002. The completed form is to be loaded in the DCC, in the chassis' S-number file card.

2.1.3. For most measurements taken during this procedure, signals will be input and read from connectors on the front and rear of the chassis under test. This convention yields the best overall test of functionality.

2.1.4. The person using this procedure is familiar with Dynamic Signal Analyzers and rudimentary test equipment including oscilloscopes, power supplies, and multimeters

2.2. Front and rear panel layout

Figure 2, ISC Whitening Chassis Front Panel

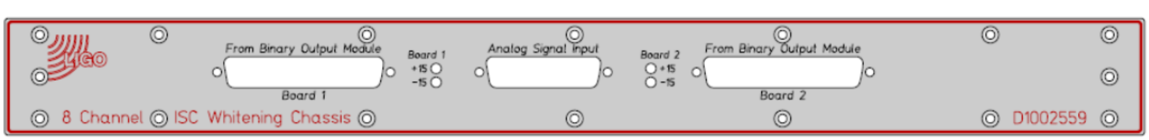
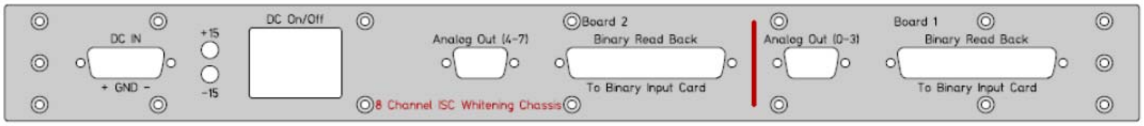


Figure 3, ISC Whitening Chassis Rear Panel



3 DC Measurements Section

3.1 Quiescent current draw

Apply +/-18VDC, +/-0.2VDC to the chassis and measure each internal power supply current and record the results in F1500006. Record data and mark each measurement as Pass or Fail in the results form depending on the configuration of the unit under test (bare board, chassis, etc.). Data are included for each possible scenario; use the data that suits the circumstance.

Table 1 Power Supply Parameters

Condition	Quiescent Current Draw (mA)	Specified Value
ALL	+15V Supply Voltage	14.8VDC +/- 30mVDC
ALL	-15V Supply Voltage	15.2VDC +/- 30mVDC
Full Chassis	+15V Supply Current	570mA +/- 20mA
Full Chassis	-15V Supply Current	430mA +/- 20mA
Bare Chassis (no filter boards) Quiescent Current Draw	+15V Supply Current	30mA +/- 10mA
Bare Chassis (no filter boards) Quiescent Current Draw	-15V Supply Current	20mA +/- 10mA
1 Single Whitening Filter Circuit Board By Itself	+15V Supply Current	260mA +/- 20mA
1 Single Whitening Filter Circuit Board By Itself	-15V Supply Current	200mA +/- 20mA
	Front and Rear LED Functionality	Lit

3.2 Transfer Function Tests

Using an SR785 (or automated test setup), take a transfer function for each of the 8 channels associated with the front panel Analog Signal Input and rear panel Analog Out connectors as shown in Table 2.

Table 2 Front and Rear Connector Pinout

Front Panel Analog Input		Rear Panel Analog Out (0-3)	Rear Panel Analog Out (4-7)
Pin	Function	Pin	Pin
1 and 14	Chan. 0 +/-	1 and 6	n/a
2 and 15	Chan. 1 +/-	2 and 7	n/a
3 and 16	Chan. 2 +/-	3 and 8	n/a
4 and 17	Chan. 3 +/-	4 and 9	n/a
5 and 18	Chan. 4 +/-	n/a	1 and 6

Front Panel Analog Input		Rear Panel Analog Out (0-3)	Rear Panel Analog Out (4-7)
6 and 19	Chan. 5 +/-	n/a	2 and 7
7 and 20	Chan. 6 +/-	n/a	3 and 8
8 and 21	Chan. 7 +/-	n/a	4 and 9

4 Transfer Function and Noise Section

For each channel, verify the transfer function and noise spectra are in conformance with the following data. There's a lot of gain in this unit for some combinations of filters and gain, so use care with the analyzer source drive setting. At the highest gain setting, "Everything On", use 0.1mV source drive on the SR785. At lower gains, between 1mV and 10mV are acceptable.

Table 3, Transfer Function Predicted Data

Gain State	Gain at 10Hz	Phase at 10Hz	Gain at 1kHz	Phase at 1kHz
0dB	0dB +/- 1dB	0 +/- 3 deg.	0dB +/- 1dB	-7 +/- 3 deg.
3dB	3dB +/- 1dB	0 +/- 3 deg.	3dB +/- 1dB	-7 +/- 3 deg.
6dB	6dB +/- 1dB	0 +/- 3 deg.	6dB +/- 1dB	-7 +/- 3 deg.
12dB	12dB +/- 1dB	0 +/- 3 deg.	12dB +/- 1dB	-7 +/- 3 deg.
24dB	24dB +/- 1dB	0 +/- 3 deg.	24dB +/- 1dB	-7 +/- 3 deg.
45dB (all DC gain)	45dB +/- 1dB	0 +/- 3 deg.	45dB +/- 1dB	-7 +/- 3 deg.
1st Filter only	17 dB +/- 1dB	39 +/- 3 deg.	20dB +/- 1dB	-7 +/- 3 deg.
1st & 2nd Filter	35dB +/- 1dB	79 +/- 3 deg.	41dB +/- 1dB	-7 +/- 3 deg.
1st, 2nd & 3rd Filter	52dB +/- 1dB	118 +/- 3 deg.	61dB +/- 1dB	-7 +/- 3 deg.
Everything On	97dB +/- 1dB	119 +/- 3 deg.	106dB +/- 1dB	-8 +/- 3 deg.

Table 4, Noise Predictions (Inputs shorted to ground)

Gain State	Noise at 10Hz (dBVrms/√Hz)	Noise at 1kHz (dBVrms/√Hz)
0dB	-148 +/- 2dB	-150 +/- 2dB
3dB	-147 +/- 2dB	-148 +/- 2dB
9dB	-142 +/- 2dB	-143 +/- 2dB
22dB	-130 +/- 2dB	-132 +/- 2dB
45dB	-107 +/- 2dB	-107 +/- 2dB
1st Filter only	-133 +/- 2dB	-132 +/- 2dB
1st & 2nd Filter	-115 +/- 2dB	-112 +/- 2dB
1st, 2nd & 3rd Filter	-97 +/- 2dB	-91 +/- 2dB
Everything On	-53 +/- 2dB	-46 +/- 2dB