LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

-LIGO-

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aLIGO HEPI Pier Interface Chassis Test Procedure		
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Performed by: _____
Date: _____
Board Serial Number: _____

1. Overview

The HEPI Pier Interface Chassis serves several functions close to the vacuum envelope. One is to pass through and parse out the hydraulic valve actuation channels. A second function is to read out the L4C Seismometer channels, amplify them, and send them differentially to the Anti-Alias Chassis. Its last function is to read in the Inductive Position Sensor signals, whiten them, and send them differentially to the Anti-Alias Chassis.

The function of this procedure is to check each channel from its input to the respective output and to verify proper DC power consumption.

2. Test Equipment

2.1 Power Supply capable of +/- 18 volts
2.2 Function generator (Stanford Research DS360 or the like)
2.3 Oscilloscope
2.4 Stanford Research SR785 Network Analyzer, or the like

3. Preliminaries

3.1 Perform visual inspection on board to check for missing components or solder deficiencies
3.2 Before connecting the power to the chassis, set power supplies to +/- 18 Volts, and then turn them off. Connect the power supplies to the chassis under test at the back panel 3-pin power connector labeled “Power In”.

4. DC Tests

4.1 Turn on the power supplies to the system under test and record the total current.

Measure	Voltage read	Current
+18V Supply	TP4 V (+15V +/- 0.5)	95mA +/- 10mA
-18V Supply	TP6 V (-15V +/- 0.5)	95mA +/- 10mA
Power LEDs	Equally bright?	N/A
IPS Power+	J10-1 / J10-3 V (-15V +/- 0.5)	N/A
IPS Power-	J10-2 / J10-3 V (-15V +/- 0.5)	N/A

5. **Dynamic Tests**

5.1 Valve throughput check: Set a function generator to a **5V** p-p sine wave. Split this signal with a BNC Tee, with one signal going to the designated pins below, and the other going to channel 2 of an oscilloscope. Observe the amplitude at the designated output pins. All of the outputs should be the same amplitude as the input, with no observable phase delay or high-frequency noise. Place a check in the correct cell if the signal looks correct.

Input (Valve Input)	**Output (Valve1 Out) or (Valve2 Out)**
J8-1 (+) / J8-6 (-)	J9T-1 (+) / J9T-6 (-)
J8-2 (+) / J8-7 (-)	J9T-1 (+) / J9T-6 (-)
J8-3 (+) / J8-8 (-)	J9B-1 (+) / J9B-6 (-)
J8-4 (+) / J8-9 (-)	J9B-1 (+) / J9B-6 (-)

5.2 L4C Seismometer Channel Check: Set a function generator to a **0.05V** p-p sine wave. Input the signal on the correct pins below, and observe the amplitude at the designated output pins differentially (A-B) relative to ground. The outputs should have a gain of 334 V/V.

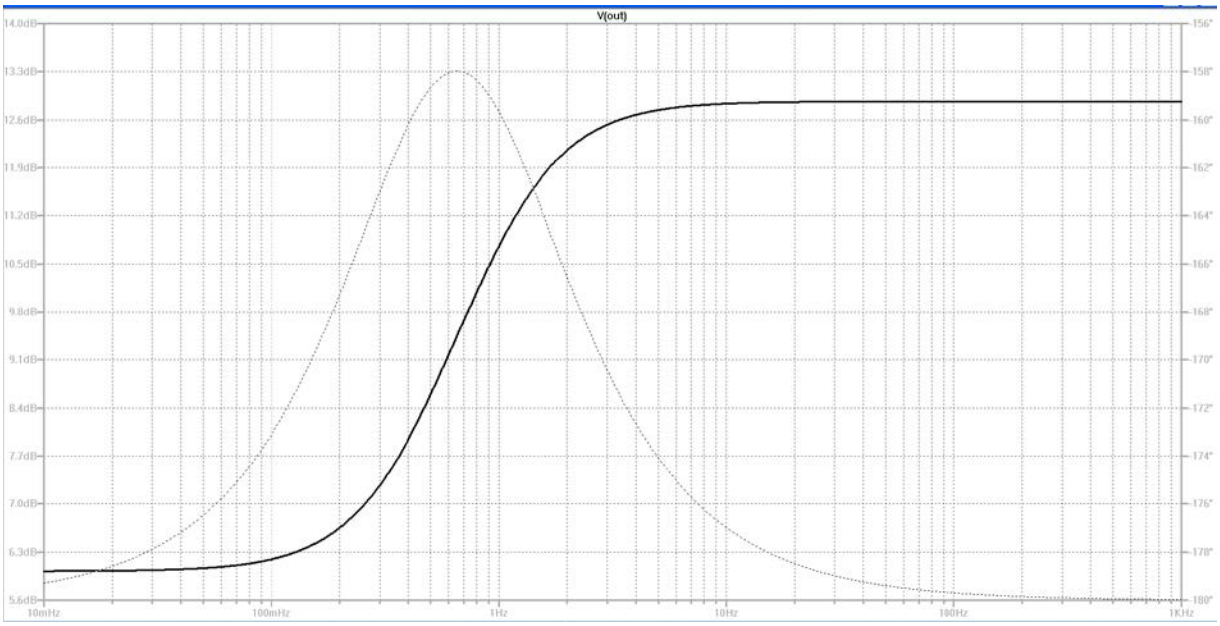
INPUT L4C INPUT	**OUTPUT TO AA CHASSIS (A) – (B)**	**VALUE NOM 16.7V +/- 1V**
L4C Horiz. In J1T-1 / J1T-6	To AA Chassis (J4-1/GND) – (J4-9/GND)	
L4C Vert. In J1B-1 / J1B-6	To AA Chassis (J4-2/GND) – (J4-10/GND)	
L4C Wit. In J5-1 / J5-6	To AA Chassis (J4-3/GND) – (J4-11/GND)	

5.3 L4C Channel Noise Tests

To test the noise of the position sensor channels, ground the appropriate pins on the input connector, and do a noise measurement from 0 to 100Hz on the output connector pins specified below. Read the noise at 1Hz and 10Hz. The observed numbers should be below the specification to pass this test.

L4C	Ground the following	To Rack connector J4	Noise @1 Hz Nominal is under 6.5µV/√Hz	Noise @10Hz Nominal is under 4.2µV/√Hz
L4C Horizontal	L4C Horiz. In J1T-1 / J1T-6	Pins 1(+) and 9(-)		
L4C Vertical	L4C Vert. In J1B-1 / J1B-6	Pins 2(+) and 10(-)		
L4C Witness	L4C Wit. In J5-1 / J5-6	Pins 3(+) and 11(-)		

5.4 Inductive Position Sensor Channel Check: Set the SR785 for a 100mV source, and do a Swept Sine measurement from 10mHz to 10KHz on each channel. The nominal response is a Zero at 0.38Hz, and a pole at 0.86Hz. This should result in a gain change from 4 V/V at DC to 9 V/V at higher frequencies. The plot should look similar to the graph below.



INPUT IPS INPUT (DIFFERENTIAL)	OUTPUT TO AA CHASSIS (A) – (B)	VALUE LOOK LIKE THE GRAPH?
IPS X In J10-4 / J10-5	To AA Chassis (J4-4/GND) – (J4-12/GND)	
IPSY In J10-6 / J1B-7	To AA Chassis (J4-5/GND) – (J4-13/GND)	

5.5 Position Sensor Channel Noise Tests

To test the noise of the position sensor channels, ground the appropriate pins on the input connector, and do a noise measurement from 0 to 100Hz on the output connector pins specified below. Read the noise at 1Hz and 10Hz. The observed numbers should be below the specification to pass this test.

Position Sensor	Ground the following	To Rack connector J4	Noise @1 Hz Nominal is under 500nV/√Hz	Noise @10Hz Nominal is under 200nV/√Hz
IPS X	IPS X In J10-4 / J10-5	To AA Chassis (J4-4/GND) – (J4-12/GND)		
IPS Y	IPSY In J10-6 / J10-7	To AA Chassis (J4-5/GND) – (J4-13/GND)		