LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

-LIGO-

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aLIGO HAMs 2&3 Internal Seismic Isolation Test Plan		
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1 Introduction

The tests described below are required to verify the correct installation and operation of the control and monitoring electronics for a two Single-Stage Internal Seismic Isolation (ISI) electronics system. The tests are designed to test the electronics needed to control up to two Horizontal Access Module (HAM) ISIs that are situated in the same rack. These systems should consist of a total of:
4) aLIGO HAM Anti-Alias Chassis
2) HEPI Anti-Alias Chassis
2) HEPI Anti-Image Chassis
1) Binary In Interface Chassis
1) Binary Out Interface Chassis
4) ISI Coil Driver Chassis
4) HAM ISI Interface Chassis
2) 8-Channel Valve Drivers

2 Test Equipment

Function Generator
Oscilloscope
Digital Multimeter (DMM)
STS-2/L4C/GS-13 Seismometer Emulator Box
Faux-flange Male-Male cable flippers
25-pinD to two 9-pinD vacuum cable or in-air cable with the same pinout as the vacuum cables D1100154.
Coil Driver load cable.

3 Tests

3.1 Input Power

Connect the power supplies, and turn on the power switches on the rear panels of the chassis. Record the current being drawn by the system. Nominal is in parentheses.

+18V_____A (6A?) -18V_____A (6A?)

+24V_____A (5A?) -24V_____A (5A?)

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3.2 GS-13 Seismometer Tests

3.2.1 Readbacks

Turn the Seismometer selector knob on the L4C/GS-13 Emulator box to the GS-13 setting. Plug in the appropriate connector of the two D9 connectors on the in-vac wiring cable. Check to see that the front panel power lights are green. If either is unlit, or red, disconnect the cable, and troubleshoot the power problem. Once the lights are both green, turn the front panel switch to "ON". Turn the front panel oscillator switch to "INT". Look at the appropriate channel with dataviewer, and verify that there is a >20Kcount p-p signal. In order to test the Vertical 1 channel, put the correct connector on the box, and look at: ISI-CORNER1_ GS13_Horz_IN1. The other channel names follow logically. Write the signal amplitude in the table below.

CORNER/Channel	Amplitude (20Kcounts p-p Nom.)
HAM2 CORNER1/V (GS-13)	
HAM2 CORNER1/H (GS-13)	
HAM2 CORNER2/V (GS-13)	
HAM2 CORNER2/H (GS-13)	
HAM2 CORNER3/V (GS-13)	
HAM2 CORNER3/H (GS-13)	
HAM3 CORNER1/V (GS-13)	
HAM3 CORNER1/H (GS-13)	
HAM3 CORNER2/V (GS-13)	
HAM3 CORNER2/H (GS-13)	
HAM3 CORNER3/V (GS-13)	
HAM3 CORNER3/H (GS-13)	

3.2.2 Whitening and Gain

With the Seismometer selector knob on the L4C/GS-13 Emulator box still set to the L4C setting, turn the front panel oscillator switch to "EXT". Using a signal generator, put a 6Hz, 0.1Vp-p sine wave into the "OSC In/Out" BNC. Switch the whitening on, and select a gain of x10. While looking at each channel in dataviewer, switch the gain selector switch in epics. Record whether the signal indeed changes by a factor of 10 from 850 counts p-p to 85 p-p with a small (-6 count) offset. Leave the gain set to x10. While watching the amplitude of the signal, and with the whitening still on, roll the frequency of the signal generator down to 0.1 Hz. Does the signal decrease? If it does, the whitening is truly on. Turn off the whitening, and roll the function generator back up to 6Hz. The signal should be flat at about 10p-p with an offset of ~200-300 counts. Finally, put 5VDC into the appropriate locker input, and read back the locker current monitor in dataviewer. It should appear as an approximately 3750 count readback. Fill out the table below with the collected data.

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CORNER/Channel	Gain Switch Amplitude (x1/x10) (85/850) Nom.	White Switch Amplitude (On/Off) (850/10) Nom.	Locker Current 3750 counts Nom.
HAM2 CORNER1/V (GS-13)	/	/	
HAM2 CORNER1/H (GS-13)	/	/	
HAM2 CORNER2/V (GS-13)	/	/	
HAM2 CORNER2/H (GS-13)	/	/	
HAM2 CORNER3/V (GS-13)	/	/	
HAM2 CORNER3/H (GS-13)	/	/	
HAM3 CORNER1/V (GS-13)	/	/	
HAM3 CORNER1/H (GS-13)	/	/	
HAM3 CORNER2/V (GS-13)	/	/	
HAM3 CORNER2/H (GS-13)	/	/	
HAM3 CORNER3/V (GS-13)	/	/	
HAM3 CORNER3/H (GS-13)	/	/	

3.3 Capacitive Position Sensor Tests

The easiest way to test the Capacitive Position Sensor readback, without the full signal chain connected, is to directly inject a signal into the appropriate pins of the front panel of the ISI Interface Chassis. For each channel below, input a 1V p-p signal of the appropriate frequency.

CORNER/Channel	Input Pins on the appropriate Chassis CPS	Output with 0.1Hz input (Nom. 3.2Kcts)	Output with 10Hz input (Nom. 32Kcts)
HAM2 CORNER1 V	**C2-42, Pins 1(+) & 14(-)**		
HAM2 CORNER1 H	**C2-42, Pins 2(+) & 15(-)**		
HAM2 CORNER2 V	**C2-42, Pins 3(+) & 16(-)**		
HAM2 CORNER2 H	**C2-42, Pins 4(+) & 17(-)**		
HAM2 CORNER3 V	**C2-41, Pins 1(+) & 14(-)**		
HAM2 CORNER3 H	**C2-41, Pins 2(+) & 15(-)**		
HAM3 CORNER1 V	**C2-31, Pins 1(+) & 14(-)**		
HAM3 CORNER1 H	**C2-31, Pins 2(+) & 15(-)**		
HAM3 CORNER2 V	**C2-31, Pins 3(+) & 16(-)**		
HAM3 CORNER2 H	**C2-31, Pins 4(+) & 17(-)**		
HAM3 CORNER3 V	**C2-30, Pins 1(+) & 14(-)**		
HAM3 CORNER3 H	**C2-30, Pins 2(+) & 15(-)**		

3.4 Coil Driver Tests

For each channel, put a 10Ω power resistor onto the Coarse output, and a 10Ω Power resistor onto the Fine output. Put a minus (-)10,000 count DC level (which should correspond to 8.8VDC across the resistor) into the Coil Driver input, and read back the Vmon and Imon signals. Move the resistors to each channel under test, and record the results in the table below.

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CORNER/Channel	Volts across reistor (8.8VDC Nom.)	Vmon (counts) (20,500 Nom.)	Imon (counts) (31,500 Nom.)
HAM2 CORNER1 V	V		
HAM2 CORNER1 H	V		
HAM2 CORNER2 V	V		
HAM2 CORNER2 H	V		
HAM2 CORNER3 V	V		
HAM2 CORNER3 H	V		
HAM3 CORNER1 V	V		
HAM3 CORNER1 H	V		
HAM3 CORNER2 V	V		
HAM3 CORNER2 H	V		
HAM3 CORNER3 V	V		
HAM3 CORNER3 H	V		

3.5 HEPI L4C Tests

Each chamber has 8 HEPI L4C signals that must be read in to the ADCs. In order to test their signal chain functionality, put the 1Vp-p signal into the appropriate AA Chassis pins from the table below, and read out the appropriate signal in Dataviewer.

PIER/Channel	Input pins on AA Interface	Vmon (counts) (20,500 Nom.)
HAM2 PIER1 H	C2-20, J1 pin 1(+)&pin9 (-)	
HAM2 PIER1 V	C2-20, J1 pin 2(+)&pin10 (-)	
HAM2 PIER1 Wit	C2-20, J1 pin 3(+)&pin11 (-)	
HAM2 PIER2 H	C2-20, J2 pin 1(+)&pin9 (-)	
HAM2 PIER2 V	C2-20, J2 pin 2(+)&pin10 (-)	
HAM2 PIER2 Wit	C2-20, J2 pin 3(+)&pin11 (-)	
HAM2 PIER3 H	C2-20, J3 pin 1(+)&pin9 (-)	
HAM2 PIER3 V	C2-20, J3 pin 2(+)&pin10 (-)	
HAM2 PIER3 Wit	C2-20, J3 pin 3(+)&pin11 (-)	
HAM2 PIER4 H	C2-20, J4 pin 1(+)&pin9 (-)	
HAM2 PIER4 V	C2-20, J4 pin 2(+)&pin10 (-)	
HAM2 PIER4 Wit	C2-20, J4 pin 3(+)&pin11 (-)	
HAM3 PIER1 H	C2-14, J1 pin 1(+)&pin9 (-)	
HAM3 PIER1 V	C2-14, J1 pin 2(+)&pin10 (-)	
HAM3 PIER1 Wit	C2-14, J1 pin 3(+)&pin11 (-)	
HAM3 PIER2 H	C2-14, J2 pin 1(+)&pin9 (-)	
HAM3 PIER2 V	C2-14, J2 pin 2(+)&pin10 (-)	
HAM3 PIER2 Wit	C2-14, J2 pin 3(+)&pin11 (-)	
HAM3 PIER3 H	C2-14, J3 pin 1(+)&pin9 (-)	

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HAM3 PIER3 V	**C2-14, J3 pin 2(+)&pin10 (-)**	
HAM3 PIER3 Wit	**C2-14, J3 pin 3(+)&pin11 (-)**	
HAM3 PIER4 H	**C2-14, J4 pin 1(+)&pin9 (-)**	
HAM3 PIER4 V	**C2-14, J4 pin 2(+)&pin10 (-)**	
HAM3 PIER4 Wit	**C2-14, J4 pin 3(+)&pin11 (-)**	

3.6 HEPI Inductive Position Sensor Tests

PIER/Channel	Input pins on AA Interface	Vmon (counts) (20,500 Nom.)
HAM2 PIER1 IPS X	**C2-20, J1 pin 1(+)&pin9 (-)**	
HAM2 PIER1 IPS Y	**C2-20, J1 pin 2(+)&pin10 (-)**	
HAM2 PIER2 IPS X	**C2-20, J2 pin 1(+)&pin9 (-)**	
HAM2 PIER2 IPS Y	**C2-20, J2 pin 2(+)&pin10 (-)**	
HAM2 PIER3 IPS X	**C2-20, J3 pin 1(+)&pin9 (-)**	
HAM2 PIER3 IPS Y	**C2-20, J3 pin 2(+)&pin10 (-)**	
HAM2 PIER4 IPS X	**C2-20, J4 pin 1(+)&pin9 (-)**	
HAM2 PIER4 IPS Y	**C2-20, J4 pin 2(+)&pin10 (-)**	
HAM3 PIER1 IPS X	**C2-14, J1 pin 1(+)&pin9 (-)**	
HAM3 PIER1 IPS Y	**C2-14, J1 pin 2(+)&pin10 (-)**	
HAM3 PIER2 IPS X	**C2-14, J2 pin 1(+)&pin9 (-)**	
HAM3 PIER2 IPS Y	**C2-14, J2 pin 2(+)&pin10 (-)**	
HAM3 PIER3 IPS X	**C2-14, J3 pin 1(+)&pin9 (-)**	
HAM3 PIER3 IPS Y	**C2-14, J3 pin 2(+)&pin10 (-)**	
HAM3 PIER4 IPS X	**C2-14, J4 pin 1(+)&pin9 (-)**	
HAM3 PIER4 IPS Y	**C2-14, J4 pin 2(+)&pin10 (-)**	

3.7 HEPI Valve Driver Tests

Using a 9-pin breakout board and clip leads, put an 80Ohm resistor between pins 1&6, and one between pins 3&8. Put a 32K count signal in the appropriate channel on the MEDM screen. With a DMM, read the voltage across the resistor.

PIER/Channel	Output pins on Valve Driver	Voltage across 80 Ohm resistor (Nominal 3.4V)
HAM2 PIER1 VALVE X	**C2-18, 1&2 pin 1(+)&pin6 (-)**	
HAM2 PIER1 VALVE Y	**C2-18, 1&2 pin 3(+)&pin8 (-)**	
HAM2 PIER2 VALVE X	**C2-18, 3&4 pin 1(+)&pin6 (-)**	
HAM2 PIER2 VALVE Y	**C2-18, 3&4 pin 3(+)&pin8(-)**	
HAM2 PIER3 VALVE X	**C2-5, 5&6 pin 1(+)&pin6(-)**	
HAM2 PIER3 VALVE Y	**C2-18, 5&6 pin 3(+)&pin8(-)**	
HAM2 PIER4 VALVE X	**C2-18, 7&8 pin 1(+)&pin6(-)**	
HAM2 PIER4 VALVE Y	**C2-18, 7&8 pin 3(+)&pin8(-)**	

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HAM3 PIER1 VALVE X	**C2-12, 1&2 pin 1(+)&pin6(-)**	
HAM3 PIER1 VALVE Y	**C2-12, 1&2 pin 3(+)&pin8(-)**	
HAM3 PIER2 VALVE X	**C2-12, 3&4 pin 1(+)&pin6(-)**	
HAM3 PIER2 VALVE Y	**C2-12, 3&4 pin 3(+)&pin8(-)**	
HAM3 PIER3 VALVE X	**C2-12, 5&6 pin 1(+)&pin6(-)**	
HAM3 PIER3 VALVE Y	**C2-12, J3 pin 3(+)&pin8(-)**	
HAM3 PIER4 VALVE X	**C2-12, J4 pin 1(+)&pin6(-)**	
HAM3 PIER4 VALVE Y	**C2-12, J4 pin 3(+)&pin8(-)**	