

LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

-LIGO-

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aLIGO BSC 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-stage Internal Seismic Isolation (ISI) electronics system. The tests are designed to test the electronics needed to control a single Beam Splitter Chamber (BSC) ISI. This system should consist of :

- 3) aLIGO BSC Anti-Alias Chassis
- 1) HEPI Anti-Alias Chassis
- 1) aLigo Anti-Image Chassis
- 1) HEPI Anti-Image Chassis
- 2) Binary In Interface Chassis
- 1) Binary Out Interface Chassis
- 3) Trillium Interface Chassis
- 3) ISI Coil Driver Chassis
- 3) BSC ISI Interface Chassis
- 1) STS-2 Interface Chassis,
- 1) STS-2 Distribution Chassis

2 Test Equipment

Function Generator

Oscilloscope

Digital Multimeter (DMM)

STS-2/LAC/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.

Sam

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)

3.2 Ground STS-2 Seismometer Tests

Plug one end of a 25-pin cable into the STS-2 Seismometer Interface Chassis, and the other end into a cable flipper that takes the place of the pin-flip that happens when going through a flange. Plug the other side of the cable-flipper into the STS-2 side of a seismometer Emulator Box. If the green power indicator LEDs are lit, turn on the Power switch. If any lights are red, unplug the cable, and find out why the power is inverted. Once the power is correct, and the switch is on, inject a 0.03 Vp-p sine wave into the appropriate input of the STS-2 Seismometer Interface Chassis below. In dataviewer, look for the signal at the appropriate channel. For example, a signal input into the UCAL BNC of the first Interface Chassis (Corner1) will be seen on channel ISI-CORNER1_STS_X_IN1. WCAL will be seen on ISI-CORNER1_STS_Y_IN1, and VCAL will be seen on ISI-CORNER1_STS_Z_IN1. At the same time, check the signal at the frontpanel BNC of the Emulator Box. The signals should be seen a bit mixed, so UCAL goes to WPOS, VCAL goes to VPOS, and WCAL goes to UPOS. Be aware that signals that have

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no inputs will float to a rail. This is normal. Record the signal amplitude in the table below. While the cable is still attached to each Corner Interface, use the STS-2 Locker/Unlocker to input a locking signal into the first channel of the STS-2 Breakout Chassis DB9 Connector. If the lock signal has appropriate power, the LED on the Emulator will light. Repeat this with each of the three channels per Interface Chassis. Record the results below. Also, push the AutoZ button on the Interface Chassis, and look for the Auto-Zero LED on the Emulator to flicker. Record once per chassis below.

Channel	Counts P-P (IN1) 40,000 counts p-p Nom.	V p-p (Emulator frontpanel) 40 mVp-p Nom.	AutoZ Light? Y/N
UCAL	STS_X	WPOS	
VCAL	STS_Y	VPOS	
WCAL	STS_Z	UPOS	

3.3 Trillium Seismometer Tests

Plug one end of a 25-pin cable into the STS-2 Seismometer Interface Chassis, and the other end into a cable flipper that takes the place of the pin-flip that happens when going through a flange. Plug the other side of the cable-flipper into the STS-2 side of a seismometer Emulator Box. If the green power indicator LEDs are lit, turn on the Power switch. If any lights are red, unplug the cable, and find out why the power is inverted. Once the power is correct, and the switch is on, inject a 0.03 Vp-p sine wave into the appropriate input of the STS-2 Seismometer Interface Chassis below. In dataviewer, look for the signal at the appropriate channel. For example, a signal input into the UCAL BNC of the first Interface Chassis (Corner1) will be seen on channel ISI-CORNER1_STS_X_IN1. WCAL will be seen on ISI-CORNER1_STS_Y_IN1, and VCAL will be seen on ISI-CORNER1_STS_Z_IN1. At the same time, check the signal at the frontpanel BNC of the Emulator Box. The signals should be seen a bit mixed, so UCAL goes to WPOS, VCAL goes to VPOS, and WCAL goes to UPOS. Be aware that signals that have no inputs will float to a rail. This is normal. Record the signal amplitude in the table below. While the cable is still attached to each Corner Interface, use the STS-2 Locker/Unlocker to input a locking signal into the first channel of the STS-2 Breakout Chassis DB9 Connector. If the lock signal has appropriate power, the LED on the Emulator will light. Repeat this with each of the three channels per Interface Chassis. Record the results below. Also, push the AutoZ button on the Interface Chassis, and look for the Auto-Zero LED on the Emulator to flicker. Record once per chassis below.

Channel	Counts P-P (IN1) 40,000 counts p-p Nom.	V p-p (Emulator frontpanel) 40 mVp-p Nom.	Motor Light? Y/N	AutoZ Light? Y/N
CORNER1/UCAL	TRILLIUM_X	X		
CORNER1/VCAL	TRILLIUM_Y	Y		
CORNER1/WCAL	TRILLIUM_Z	Z		
CORNER2/UCAL	TRILLIUM_X	X		
CORNER2/VCAL	TRILLIUM_Y	Y		
CORNER2/WCAL	TRILLIUM_Z	Z		
CORNER3/UCAL	TRILLIUM_X	X		
CORNER3/VCAL	TRILLIUM_Y	Y		
CORNER3/WCAL	TRILLIUM_Z	Z		

3.4 L4C Seismometer Tests

3.4.1 Readbacks

Turn the Seismometer selector knob on the L4C/GS-13 Emulator box to the L4C 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_L4C_Horz_IN1. The other channel names follow logically. Write the signal amplitude in the table below.

CORNER/Channel	Amplitude (25Kcounts p-p Nom.)
CORNER1/V (L4C1)	
CORNER1/H (L4C2)	
CORNER2/V (L4C1)	
CORNER2/H (L4C2)	
CORNER3/V (L4C1)	
CORNER3/H (L4C2)	

3.4.2 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, 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, using the Arbitrary Waveform Generator, put a 1,000 count, 2Hz sine wave excitation onto each channel’s “Test In” channel. This signal should appear as a 300mVp-p sine wave as seen by a scope on the “L4C Test Monitor” BNC. Fill out the table below with the collected data.

CORNER/Channel	Gain Switch Amplitude (x1/x10) (85/850) Nom.	White Switch Amplitude (On/Off) (850/10) Nom.	Test In Amplitude 300mVp-p Nom.
CORNER1/V (L4C1)	/	/	mV
CORNER1/H (L4C2)	/	/	mV
CORNER2/V (L4C1)	/	/	mV
CORNER2/H (L4C2)	/	/	mV
CORNER3/V (L4C1)	/	/	mV
CORNER3/H (L4C2)	/	/	mV

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3.5 GS-13 Seismometer Tests

3.5.1 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 (25Kcounts p-p Nom.)
CORNER1/V (GS-13)	
CORNER1/H (GS-13)	
CORNER2/V (GS-13)	
CORNER2/H (GS-13)	
CORNER3/V (GS-13)	
CORNER3/H (GS-13)	

3.5.2 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, 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.

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

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3.6 Coil Driver Tests

For each channel, put a 5Ω 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.

CORNER/Channel	Volts across reistor (8.8VDC Nom.)	Vmon (counts) (20,500 Nom.)	Imon (counts) (31,500 Nom.)
CORNER1 Fine1	V		
CORNER1 Fine2	V		
CORNER1 Coarse1	V		
CORNER1 Coarse2	V		
CORNER2 Fine1	V		
CORNER2 Fine2	V		
CORNER2 Coarse1	V		
CORNER2 Coarse2	V		
CORNER3 Fine1	V		
CORNER3 Fine2	V		
CORNER3 Coarse1	V		
CORNER3 Coarse2	V		