

**LASER INTERFEROMETER GRAVITATIONAL WAVE
OBSERVATORY**

-LIGO-

CALIFORNIA INSTITUTE OF TECHNOLOGY
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Trillium 240 Interface Quick Start Guide		
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LIGO-T1000742-v1

Performed by: _____

Date: _____

Chassis Serial Number: _____

1. Overview

The Trillium-240 Seismometer Interface Chassis (D1002694) provides power and control channels for a single T-240 seismometer. Relevant documents are: [D1001872-v1 Trillium 240 Interface Chassis Back Board](#), [D1000749-v1 Trillium 240 Interface](#), and [D1000718-x0 Trillium In-Pod Pressure Sensor Board](#). The chassis receives 3 differential, and 4 single-ended signals from the seismometer that are sent as outputs to the AdL Anti-Alias Chassis for ultimate transmission to the ADCs. A summary of functions for the T-240 Seismometer Interface are:

- 1.1 DC power to the remotely located T-240 seismometer
- 1.2 Receives 3 channels of differential signals (X, Y, and Z, or U, V, and W), and 4 single-ended signals (Upos, Vpos, Wpos, and pressure) from the T-240 seismometer.
- 1.3 Interfaces analog signals to the AdL Anti-Alias Chassis by differential interface
- 1.4 Provides local front panel switches, USB-to-RS-232, and remote PCIX based control of T-240 functions

The function of this guide is to provide the user with fundamental knowledge needed to read out a Trillium 240 with a T-240 Seismometer Interface Chassis.

2. Power Up

- 2.1 With the rear panel power switch turned off, plug in a Power Supply providing +/- 18 volts (+/- 500mV) at 500mA.
- 2.2 Plug in the seismometer cable, being sure to take into consideration the two flange pin-flips that occur in the system. If this is confusing, please contact Ben Abbott for clarification.
(babbott@ligo.caltech.edu)
- 2.3 Turn on the supply, and then turn on the rear panel switch. The front panel lights that read “+15 and -15” should come on. One of the lights next to the Sig(nal) Sel(elector) switch should be on. It should be the light next to the depressed side of the switch. The lights next to the Cal selector switches should only be on if the switch is depressed in the upward direction. With a seismometer attached, the supplies should show a current draw of approximately 150mA from each supply.

3. Preliminaries

- 3.1** The connectors on the back panel should be connected to the appropriate chassis according to the wiring drawing that governs your particular system. If there is any confusion about this, please contact Ben.
- 3.2** At this point, everything should be in place to read out the signals from the seismometer into an ADC. A buffered sample of each coordinate signal can be read from the front panel monitor BNCs.

4. Response

(All readings below are being performed in low-gain mode of the interface. A high gain selection would multiply these signals by 56, and saturate the readout.)

4.1 Ambient signals

While reading the output differentially at the back panel connector, here in the lab, the ambient ground motion has an amplitude of $\sim 1.5\text{Vp-p}$, and can go higher than 8Vp-p if I petulantly stomp my foot.

4.2 Calibration Signals

The transfer function from Cal input to output reading is $\sim 4\text{V/V @ } 1\text{Hz}$. To check this, set the Sig Sel switch to “UVW”, input a measured 1Vp-p signal into the “Cal Coil Input” BNC, turn on the desired Cal switch (UCal, VCal, or WCal) and observe the output signal differentially at the back “To AA Chassis” connector, or on Dataviewer. (Note, the UCal, VCal and WCal switches are not in alphabetical order on the front panel).

4.3 Auto Centering

If the channels show a large DC offset, this can be fixed by auto centering (also called Auto Zeroing) the seismometer. This can be accomplished in four ways:

- 1) Push the Auto Z button on the front panel of the interface.
- 2) Push the Auto Z button on the medm screen.

- 3) Ground pin 8 on the “From Binary Out” connector.
- 4) Give the “center” command via the USB input on the front panel.
(See USB Control section 5).

5. USB Control

The seismometer can communicate with a computer via an RS-232 communications line. One can query the seismometer to find its state of health, temperature, and calibration parameters from this line. It is also possible to set the XYZ/UVW outputs, enable or disable the serial communications, reboot, center, or change the period of the seismometer through this line. Please refer to the Trillium 240 manual for an in-depth description of the serial communications options. This can be accomplished from a computer in the following way:

- 5.1** You’ll need a computer with a USB port, and a USB 2.0 A Male to A Male cable similar to this one:

http://www.monoprice.com/products/product.asp?c_id=103&cp_id=10303&cs_id=1030303&p_id=5443&seq=1&format=1#largeimage

Plug the cable between your computer and the USB connector on the front of the chassis.

- 5.2** Download the FTDI chip Installation Guide here:

http://www.ftdichip.com/Support/Documents/AppNotes/AN_119_FTDI_Drivers_Installation_Guide_for_Windows7.pdf and follow the

instructions on installing the drivers and programming the chip.

- 5.3** Download and install the Programming guide here:

http://www.ftdichip.com/Support/Documents/AppNotes/AN_124_User_Guide_For_FT_PROG.pdf

- 5.4** Using the above reference, under Device Specific-> Hardware Settings-> IO Controls make sure that C2 has been set to Sleep#. If it has not, you’ll have to set it and then program the device. Sometimes, after this, you need to cycle power to the chassis in order to make it work. If this is not set, the USB-to-RS232 converter will not transmit to the seismometer.

- 5.5** Have Daniel Clark at Stanford (Daniel.Clark@stanford.edu) email you the Multi-Threaded TTY program, and launch it. The settings at the top of the GUI should be set to the following:

Port	COM1
BAUD	9600
PARITY	NONE
Data Bits	8
Stop Bits	1

The following check boxes should all be checked:

- √ Local Echo
- √ Display Errors
- √ CR=> CR/LF
- √ Autowrap

5.6 The Sig Sel switch on the STS2-toT240 Interface Chassis (D0901489) should be set to XYZ. If it is set to UVW, it sets the RS232 TX line high, and you cannot communicate.

5.7 Click in the command line space, and write the following (<cr> means carriage return (Enter)):

tx <cr>

it should respond: Serial Transmit enabled.

help <cr>

it should print a list of useful commands like this:

Nanometrics Trillium User Menu (Version 3.33) Program A

- Help - Repeat this menu (also turns on Serial TX)
- Tx - Enable the Serial Transmit Signal
- TxOff - Disable the Serial Transmit Signal
- Upload - Upload software to the alternate program
- Switch - Switch to the alternate program
- Default - Set the current program as default
- Reboot - Reboot the instrument
- GetInfo - Get factory configuration information
- ReadFC - Read factory calibration parameters
- WriteUC - Write user calibration parameters
- ReadUC - Read the user calibration parameters
- Soh - Report state-of-health
- ShortPer - Set sensor to short period mode
- LongPer - Set sensor to long period mode
- SetXYZ - Set sensor to XYZ mode
- SetUVW - Set sensor to UVW mode
- Center - Center all masses or (u/v/w)
- Checksum - Print checksum value for both program A and B

Please type a command and hit return:

```
setuvw  
setxyz  
txoff  
Serial Transmit disabled.
```

■

txoff <cr>

it should respond: Serial Transmit disabled

always disable the serial transmit after communicating if the instrument is being used as a sensor, as we don't know if the transmitter would inject noise if it was left on.