# **LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY**

# -LIGO-

# CALIFORNIA INSTITUTE OF TECHNOLOGY

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| Document TypeTest Procedure | DCC Number**LIGO- T1300352-v1**  | Date14 May, 2013 |
| aLIGO HEPI Pump Servo Test Procedure |
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Distribution of this draft: NSF reviewers, LIGO scientists

This is an internal working note of the LIGO Laboratory

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LIGO-T1300352-v1

Performed by: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Board Serial Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **Overview**

The HEPI Pump Servo monitors all of the HEPI Pressure Sensor and Level signals, and sends out a drive signal to up to four of the HEPI Pump Station Variable Frequency Drive units. This procedure is broken into two main areas: circuit board level testing, and integrated computer testing. The function of this procedure is to check each channel from its input to the respective output and to verify proper DC power consumption.

1. **Test Equipment**
	1. Power Supply capable of 3A at +/- 15 volts
	2. Function generator (Stanford Research DS360 or the like)
	3. Oscilloscope
2. **Preliminaries**
	1. Perform visual inspection on board to check for missing components or solder deficiencies
	2. Before connecting the power to the chassis, set power supplies to +/- 15 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”.
3. **DC Tests**
	1. Turn on the power supplies to the system under test and record the total current.

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| --- | --- | --- |
| **Measure**  | **Voltage read**  | **Current** |
| +15V Supply | TP1 V(+15V +/- 0.5)  | 1A +/- 200mA |
| -15V Supply | TP9 V(-15V +/- 0.5) | 0.18A +/- 15mA |

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1. **Integrated Tests**
	1. **Starting the Pump Servo:**
2. Make sure all of the cables are plugged in for the monitor, keyboard, mouse and power.
3. Connect the included DC power wires to a dual power supply that is set for +/- 15V. The white wire is +15V, the green wire is -15V, and the black wire is ground. The extra black wire is there to tie the negative of the positive supply to the positive of the negative supply.
4. Turn on the power supply, and verify that the current being drawn is ~-20mA and ~+25mA.
5. Plug in the Single Board Computer’s AC power cord to a wall socket.
6. The computer should start on its own.
7. To get everything running, follow the procedure below. Things written in blue should be typed by you. Hit Enter (or carriage return) after each command.

Localhost login: controls

Password: epics123

[controls@localhost~]$ startx

Open a terminal by clicking on the middle icon at the top of the screen.

[controls@localhost~]$ cd /target

[controls@localhost target]$ sudo bash

[root@localhost target]$ ./run

(This starts the program. At this point, you should hear the relays click in the box.)

[root@localhost target]$ exit

[controls@localhost~]$ medm &

In the box that comes up, click “Execute”

In the other box, click “Open”

Double click on “/target/medm”

Double click on “a.adl”

This should start the medm screen for the servo.

The database for the servo is currently a17.db and is in the /target directory. Values for the Proportional, Integral, and Derivative terms can be changed by entering new values in the medm windows. The servo can be turned on and off from there as well. The servo runs pretty slowly, due to all of the pressure readings.

* 1. **Level test**

The Level Alarm LED and medm indicator should be on at this point, as nothing is hooked up to the Level input. Short the “Level Sensor” Dsub pins 1 and 4 together, and they should turn off, indicating that the fluid level is good. Did this happen? (Y/N)\_\_\_\_\_

* 1. **Pressure input tests**

Input a 10mV DC level into the correct channels below, and read the output in counts. The acceptable output is 31.5 counts +/- 1.5 counts. If it is an end station chassis, the signal for channels 1&2 should first go through a HEPI Pressure Satellite box (D1101839), then to the Pump Servo.

|  |  |
| --- | --- |
| **Input** | **Output**  |
| Pressure CH1, Pins 4 (+) and 6(-) | Pressure 1  |
| Pressure CH2, Pins 4 (+) and 6(-) | Pressure 2  |
| Pressure CH3, Pins 4 (+) and 6(-) | Pressure 3  |
| Pressure CH4, Pins 4 (+) and 6(-) | Pressure 4  |
| Pressure CH5, Pins 4 (+) and 6(-) | Pressure 5  |
| Pressure CH6, Pins 4 (+) and 6(-) | Pressure 6  |
| Pressure CH7, Pins 4 (+) and 6(-) | Pressure 7  |
| Pressure CH8, Pins 4 (+) and 6(-) | Pressure 8  |
| Pressure CH9, Pins 4 (+) and 6(-) | Pressure 9  |
| Pressure CH10, Pins 4 (+) and 6(-) | Pressure 10  |
| Pressure CH11, Pins 4 (+) and 6(-) | Pressure 11  |
| Pressure CH12, Pins 4 (+) and 6(-) | Pressure 12  |
| Pressure CH13, Pins 4 (+) and 6(-) | Pressure 13  |
| Pressure CH14, Pins 4 (+) and 6(-) | Pressure 14  |
| Pressure CH15, Pins 4 (+) and 6(-) | Pressure 15  |

* 1. **Drive Output test:**

Set the output drive to 1,000 counts. The output of all 4 BNCs should be 5.0 Volts, +/- 0.1V. Enter the actual output voltage in the table below:

|  |  |
| --- | --- |
| **Input** | **Output** |
| 1,000 Counts | Out1  |
| 1,000 Counts | Out2  |
| 1,000 Counts | Out3  |
| 1,000 Counts | Out4  |

Some useful links:

The SBC manufacturer, with lots of documentation: <http://www.diamondsystems.com/products/athenaii#sss>

The epics page (lots of documentation on writing epics databases):

<http://www.aps.anl.gov/epics/EpicsDocumentation/AppDevManuals/RecordRef/Recordref-1.html>

The Pump Servo schematic:

<https://dcc.ligo.org/DocDB/0004/D0901559/001/aLIGOPumpServoSchem.pdf>