LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

LIGO Laboratory / LIGO Scientific Collaboration

LIGO-T070010-C *LIGO* 01/22/2007

10-W Laser Head Interface Test Procedure

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Distribution of this document:
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1 Introduction

This document outlines the tests to be performed on the 10-W Laser Head Interface board D070001-0A-C. This board is a copy of the Lightwave Electronics 4-2436 Rev. B. LIGO Head Interface board.

The Head Interface board is the interface between the 10-W laser power supply and the NPRO master oscillator and power amplifier. Signals from the two EOT-3020 InGaAs photodetectors that monitor the power of the NPRO and 10-W laser, called 126MON and AMPMON respectively, are processed by the Head Interface board and are output on the 25-pin D-sub connector. The signals from the temperature sensors located under the amplifier are passed through the Head Interface board to the 10-W laser power supply and the Neslab RTE-140M refrigerated bath. The other function of the Head Interface board is to supply power to the shutter and for the current shunt.

2 Visual Check

Inspect the board for soldering mistakes. Check that shunts are installed at J4, J5, J6, J7, and that four shunts are either installed at JPZT1, JPZT2, JCM1, JSL1 or in jumper storage.

3 Required Equipment

The equipment required to test the Head Interface board is listed below:

- Dual DC power supply capable of 0-30 V, 0-1 A.
- Digital multimeter (DMM).
- Martel current calibrator or equivalent device.

4 On-board Power

Through the 25-pin D-sub connector, apply (+24.0 $\pm$ 0.5) V to pin 24, ground pins 2, 13 and 25 and, (-12.0 $\pm$ 0.5) V to pin 22. Using a DMM, check the voltages at the following locations and record the measured values in the tables below.

Location	Nominal Value	Measured Value	Pass/Fail
Q1 pin 3	(+5.00 $\pm$ 0.25) V		

Location	Nominal Value	Measured Value	Pass/Fail
U4 pin 3	(+12.0 $\pm$ 0.5) V		

Location	Nominal Value	Measured Value	Pass/Fail
J2 pin 1	(+24.0 ± 0.5) V		
J2 pin 4	ground (0 V)		

Location	Nominal Value	Measured Value	Pass/Fail
J8 pin 1	ground (0 V)		
J8 pin 2	(+5.00 ± 0.25) V		

Location	Nominal Value	Measured Value	Pass/Fail
JS1 pin 1	ground (0 V)		
JS1 pin 2	ground (0 V)		
JS1 pin 12	(-12.0 ± 0.5) V		
JS1 pin 14	(+12.0 ± 0.5) V		
JS1 pin 15	(+12.0 ± 0.5) V		
JS1 pin 16	ground (0 V)		

Location	Nominal Value	Measured Value	Pass/Fail
U1 pin 4	(+12.0 ± 0.5) V		
U1 pin 11	(-12.0 ± 0.5) V		

Location	Nominal Value	Measured Value	Pass/Fail
U2 pin 4	(-12.0 ± 0.5) V		
U2 pin 7	(+12.0 ± 0.5) V		

Location	Nominal Value	Measured Value	Pass/Fail
U3 pin 4	(-12.0 ± 0.5) V		
U3 pin 7	(+12.0 ± 0.5) V		

5 Circuit Continuity Checks

Using the continuity function of the DMM, check the following connections for continuity.

From	To	Pass/Fail
J14 pin 1	J8 pin 7	
J14 pin 4	J8 pin 8	
J14 pin 7	J8 pin 9	
J14 pin 9	J8 pin 10	

From	To	Pass/Fail
J13 pin 7	J8 pin 3	
J13 pin 8	J8 pin 5	
J13 pin 19	J8 pin 4	
J13 pin 20	J8 pin 6	

Making sure that no shunts are installed at JPZT1, JPZT2, JCM1 and JSL1, check the following connections.

From	To	Pass/Fail
J10 pin 2	J1 pin 9	

From	To	Pass/Fail
J11 pin 1	J1 pin 15	
J11 pin 2	J1 pin 14	

From	To	Pass/Fail
J12 pin 2	J1 pin 11	

Install shunts on JPZT1, JPZT2, JCM1 and JSL1. Check the following connections.

From	To	Pass/Fail
J15 pin 1	J1 pin 1	
J15 pin 2	J1 pin 2	
J15 pin 3	J1 pin 3	
J15 pin 4	J1 pin 4	
J15 pin 5	J1 pin 5	
J15 pin 6	J1 pin 6	
J15 pin 7	J1 pin 7	
J15 pin 8	J1 pin 8	
J15 pin 9	J1 pin 9	
J15 pin 10	J1 pin 10	
J15 pin 11	J1 pin 11	
J15 pin 12	J1 pin 12	
J15 pin 13	J1 pin 13	
J15 pin 14	J1 pin 14	
J15 pin 15	J1 pin 15	

With the shunts installed, the following connections should be **open** circuit.

From	To	Pass/Fail
J15 pin 1	J15 pin 2	
J15 pin 1	J15 pin 9	
J15 pin 2	J15 pin 3	
J15 pin 2	J15 pin 9	
J15 pin 2	J15 pin 10	
J15 pin 3	J15 pin 4	
J15 pin 3	J15 pin 10	
J15 pin 3	J14 pin 11	
J15 pin 4	J15 pin 5	
J15 pin 4	J15 pin 11	
J15 pin 4	J15 pin 12	
J15 pin 5	J15 pin 6	
J15 pin 5	J15 pin 12	
J15 pin 5	J15 pin 13	
J15 pin 6	J15 pin 7	
J15 pin 6	J15 pin 13	
J15 pin 6	J15 pin 14	
J15 pin 7	J15 pin 8	
J15 pin 7	J15 pin 14	
J15 pin 7	J15 pin 15	
J15 pin 8	J15 pin 15	

6 Laser Power Monitors

A pair of ET-3020, 3 mm diameter InGaAs photodetectors are used to monitor the NPRO power and the 10-W laser power. These have a response of 0.8 A/W and typically in a new 10-W laser about 3 mW falls incident on each photodetector, resulting in a photocurrent of 2.4 mA.

If using a Martel current calibrator, set up the calibrator to supply 2.4 mA. Apply the Martel output to J3 and measure the voltage at TP1. Adjust the trimming potentiometer P1 so that the voltage at TP1 is (8.0 ± 0.1) V. Record the final voltage at TP1 in the table below.

Now apply the Martel output to J9 and measure the voltage at TP2. Adjust the trimming potentiometer P2 so that the voltage at TP2 is (8.0 ± 0.1) V. Record the final voltage at TP2 in the table below.

Location	Nominal Value	Measured Value	Pass/Fail
TP1	(8.0 ± 0.1) V		
TP2	(8.0 ± 0.1) V		