LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

LIGO Laboratory / LIGO Scientific Collaboration

LIGO-T010118-01-C *LIGO* 11/16/01

RF Photodiode Functional Test

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1 FUNCTIONAL TEST OF THE RF PHOTODIODE ASSEMBLY

Last updated 11/16/01

Serial Number: _____

Date tested: _____

Tested by: _____

Operational frequency: _____

This procedure is written for function testing of the RFPD Part number D980454 Rev B. Steps 1 and 2 can be done prior to assembling the circuit board in the box.

1. SUPPLYING POWER TO THE ASSEMBLY

Power is supplied to the unit via the 15 pin D-sub connector J5, or to the 14 pin IDC connector on the board as follows:

+15V J4 pin 1, or J5 pin 1

-15V J4 pin 3, or J5 pin 2

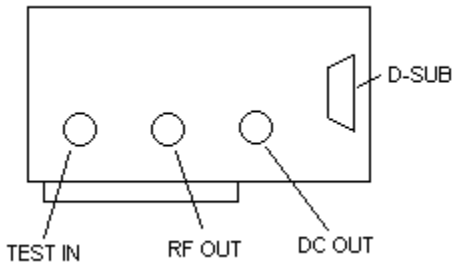
GND Any even numbered pin on J4, or J5 pin 9

Typical power supply currents are 175 mA on the +15 volt supply, and 43 mA on the –15 volt supply.

Power supply currents: +15 V line _____

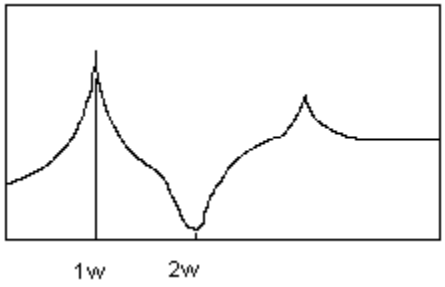
-15 V line _____

The connectors on the assembly are:



2. INITIAL CHECK AND CIRCUIT TUNING

This portion of the functional test can be done on the board prior to installation into the box. A network analyzer is used to check the performance of the tuned circuits. The signal from the network analyzer is injected into the TEST IN jack, and then observed at the RF OUT jack. The response should resemble:



A resonance should be present at the operating frequency of the diode (1ω), and a notch should be present at twice the operating frequency (2ω). The second peak is not required, and is a secondary characteristic of the circuit.

Another way to inject the signal is to use the output of the network analyzer to modulate a laser, which is directed on to the photodiode. The output is still taken from the RF OUT jack. This method has the advantage of avoiding RF coupling directly from the input to the output, which can distort the data. I found this method particularly useful for the 33.289 MHz units.

TUNING THE CIRCUIT

To tune the circuit, first adjust C34 to place the notch at the desired 2ω frequency. Then adjust L5 to place the resonance peak at the desired 1ω frequency.

Level of the 1ω peak (dB) _____

Level of the 2 ω notch (dB) _____

3. DC OFFSET AND RESPONSE

Monitor the dc voltage at the DC OUT jack or J4 pin 9, or J5 pin 5, with no laser light applied to the photodiode. This is the dc offset voltage, and it should be 0 vdc.

Shine a laser on the photodiode (a laser pointer is sufficient). A dc voltage should be present at the output.

Voltage level with no laser light applied: _____

Voltage level with laser light applied: _____

4. TEMPERATURE SENSOR

Check the temperature by measuring the voltage at J4 pin 7, or J5 pin 4. The temperature indication is scaled to 10 mV / °C. At normal room ambient conditions, the voltage should be about 250 mV, which corresponds to 25 °C.

Voltage: _____

5. BIAS ENABLE / BIAS STATUS BIT

a. Use network analyzer to monitor the photodiode response, as described in the tuning section.

b. Monitor the STATUS/OTEMP OUT bit at J4 pin 13, or J5 pin 7.

c. Monitor the photodiode bias voltage on U4 pin 6, if possible.

d. Tie the ENABLE IN pin (J4 pin 11, or J5 pin 6) to ground.

e. Observe that the photodiode bias voltage is removed. This is done by either observing that the bias voltage on U4 pin 6 goes from approximately 7 volts to less than 0.5 volts, or by observing that the response on the network analyzer goes to zero.

Voltage prior to tying ENABLE IN to ground: _____

Voltage after tying ENABLE IN to ground: _____

Analyzer response goes to zero (check): _____

f. Observe that the STATUS/OTEMP OUT bit goes from 5V to close to 0V.

Voltage prior to tying ENABLE IN to ground: _____

Voltage after tying ENABLE IN to ground: _____