**Piezo Driver Test Procedure, LIGO-T080032-00**
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The following checkout procedure pertains to the high voltage driver board used for the ELIGO OMC Piezo driver. The schematic drawing number for this device is D060283, Revision B1.

This board uses lethal voltages. Do not attempt this procedure without training on safely working with exposed high voltages. Consult the LIGO Safety Officer for instructions on what constitutes sufficient training.

This board generates excess voltage noise unless there is a modification to U16. It is necessary to put a series 1k resistor in the feedback of the U16 follower stage. Add the resistor, if needed, before executing this procedure.

| Parameter | Required Value | Check if present |
|---|---|---|
| Resistor in feedback of U16 | 1 kΩ | |

1. **DC Operating Conditions:**
    a. With no external loads on the inputs or outputs to the board, apply the three DC power forms to the board at the appropriate points. Visually check that the power LED indicators are illuminated.
        i. + low voltage = +13 to +15.5 volts
        ii. – low voltage = -13 to -15.5 volts
        iii. + high voltage = +300 volts
    b. Measure the output high voltage of the board at P4, pins 1 & 2. If needed, adjust potentiometer R42 until the output voltage at P4 measures 150 volts +/- 1%. Record the measured value of the output voltage in Table 1.
    c. Measure and record the high voltage monitoring point at J2, pins 1 & 6. Record the result in Table 1.
    d. Measure the quiescent operating voltages and currents. Record the results in Table 1.

**Table 1**

| Parameter | Required Value | Measured Value |
|---|---|---|
| DC Power LEDs | Illuminated while energized | |
| HV output at P4, pins 1 and 2 | 150 volts DC +/- 1% | |
| + low voltage | +13 to +15.5 volts<br>235 mA +/- 10% | |
| - low voltage | -13 to -15.5 volts<br>-200 mA +/- 10% | |
| **Parameter** | **Required Value** | **Measured Value** |

| | | |
|---|---|---|
| + High Voltage Supply | + 300 volts +/- 5%<br>1.8 mA +/- 20% | |
| High voltage monitoring point at J2, pin 1 & 6 | +6 volts +/- 5% | |

e. **Normal Signal Path DC Gain Check:** Apply 1 volt DC to J3, pins 2 & 7, positive and negative respectively. Measure the output voltage at P4, pins 1 & 2 and record the result in Table 2. The output voltage should go down by 20 volts from the quiescent 150 volt operating point. The board is nominally set for a voltage gain of -20, but it is configurable for other gains.

**Table 2**

| Parameter | Required Value | Measured Value |
|---|---|---|
| Voltage output at P4, pins 1 and 2 | 120 volts DC +/- 5% | |

f. **Normal Signal Path AC Gain Check:** Apply 10 volts peak-to-peak at a frequency of 100 Hz to J3, pins 2 & 7, positive and negative respectively, and measure the output at TP14. The filters in this path attenuate the output signal. Record the measured peak-to-peak voltage in Table 3.

**Table 3**

| Parameter | Required Value | Measured Value |
|---|---|---|
| Voltage at TP12 | 1.653 volts peak-to-peak +/- 10% | |

g. **Dither Signal Path AC gain Check:** Verify C30 is not stuffed. Apply 5 volts peak-to-peak at a frequency of 10 kHz to J3, pins 1 & 6, positive and negative respectively. Check the front panel BNC input path using the same input values. Measure the peak-to-peak output voltage at P4, pins 1 & 2. Record the measured voltage in Table 4. At this stage, it is convenient to record the Dither Monitoring circuit response in Table 4 as well.

**Table 4**

| Parameter | Required Value | Measured Value |
|---|---|---|
| Voltage input at J3 pins 1 & 6. Voltage output at P4, pins 1 & 2 | 1.25 volts peak-to-peak +/- 10% | |

| | | |
|---|---|---|
| Voltage input at J3 pins 1 & 6. Voltage output at J2, pins 2 & 7 | 1.25 volts peak-to-peak +/- 10% | |
| Voltage input at front panel BNC. Voltage output at J2, pins 2 & 7 | 1.25 volts peak-to-peak +/- 10% | |

h. **Output Current Limit Check:**

i. With no drive voltages applied to the board, turn off the 300-volt DC power supply used to power the board. After waiting for the output voltage to decay to less than 20-volts DC, use a clip-lead to short the high voltage at TP12 to ground.

ii. Attach a voltmeter between TP14 and ground.

iii. Re-energize the 300-volt DC supply, and measure the voltage from TP14 to ground. Record the current limit ( $I_{Limit}$ ) in Table 5 as calculated using Equation 1:

$$I_{Limit} = \frac{V_{TP14}}{9.524 \times 10^3} \qquad \text{(Equation 1)}$$

iv. After recording the current limit, de-energize the 300-volt DC supply and remove the shorting jumper from TP12. Disconnect the meter from TP14.

**Table 5**

| Parameter | Required Value | Measured Value |
|---|---|---|
| Calculated Current Limit | 4.2 mA, +/- 20% | |