



LIGO Laboratory / LIGO Scientific Collaboration

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**ISI Fine/Coarse Coil Driver
User Guide**

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ISI Fine/Coarse Coil Driver – Quick Start Guide

LIGO – T070065-00-C

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Hardware Revision Applicability – Rev. B1

1. Overview

- 1.1 ISI Fine/Coarse actuators are custom manufactured by PSI (Planning Systems Inc.) and are used to actuate in the horizontal and vertical directions at each of the three locations around the BSC. In some cases, the course and fine actuators are referred to as the large and small actuators, respectively.
- 1.2 The Coarse actuator is capable of generating a continuous force 50 lb., maximum. The ISI Fine/Coarse Coil Driver (D070034) shall be capable of providing the current to produce this force.
- 1.3 The Fine actuator is capable of generating a continuous force 10 lb., maximum. The ISI Fine/Coarse Coil Driver (D070034) shall be capable of providing the current to produce this force.
- 1.4 Using the 50 lb. maximum force and force constant of 14.4 lb/amp gives a maximum driver current of:

$$I_{max} = (50 \text{ lb}) / (14.4 \text{ lb/amp}) = 3.47 \text{ amp}$$

The maximum DC voltage for driver (neglecting cable losses) would then be:

$$V_{max} = (3.47 \text{ amp}) * (4.3 \text{ ohm}) = 14.9 \text{ volts}$$

- 1.5 Using the 10 lb. maximum force and force constant of 6.9 lb/amp gives a maximum driver current of:

$$I_{max} = (10 \text{ lb}) / (6.9 \text{ lb/amp}) = 1.45 \text{ amp}$$

The maximum DC voltage for driver (neglecting cable losses) would then be:

$$V_{max} = (1.45 \text{ amp}) * (9.3 \text{ ohm}) = 13.5 \text{ volts}$$

This Chassis contains potentially lethal voltages and currents. Extreme care must be used.

- 1.6 The chassis is designed to hold two Fine and two Coarse Coil Drivers. And the rear panel interfaces with the ISI Interface Board (D060551). The chassis can be modulated with the frequency 1 -10 Hz. Modulation can be applied from a DAC (Digital to Analog) interface.
- 1.7 Each Coil Driver has a separate voltage and current monitors.

2. Electrical Interfaces

- 2.1. The inputs are true differential, bipolar +/-10V range. The input impedance is 500 ohms on all inputs. Inputs voltages should be limited to +/- 10 volts to avoid damage.
- 2.2. The required voltage power supply is +/-24VDC @ 12 Amp
- 2.3. Detailed electrical schematics are available in LIGO Document D060504.

Figure 1 and 2 show the front and rear of the ISI Fine/Coarse Coil Driver Chassis. A functional description of each connector is provided.

2.4. Front Panel Diagram

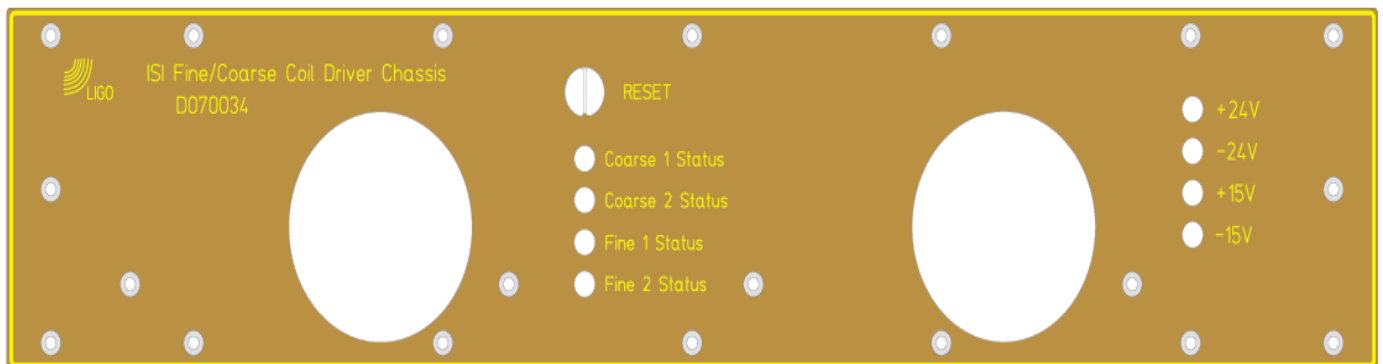


Figure 2: Front Panel

2.5. Front Panel functions

- 2.5.1. **Coarse 1, Fine 1, Coarse 2 and Fine 2 Status LED's** - They are ON for normal operation. The LED's can be turned off when the LM12's in the coil

driver and the chassis are over heated, or for any other malfunction not stated here.

2.5.2. **Reset switch** – It is for the reset purpose

2.5.3. **+15, -15, +24 and -24 volt LED's** – When lit, indicate the presence of DC Power from the power supply and from the output of the internal regulator board.

2.6. **Rear Panel Diagram**

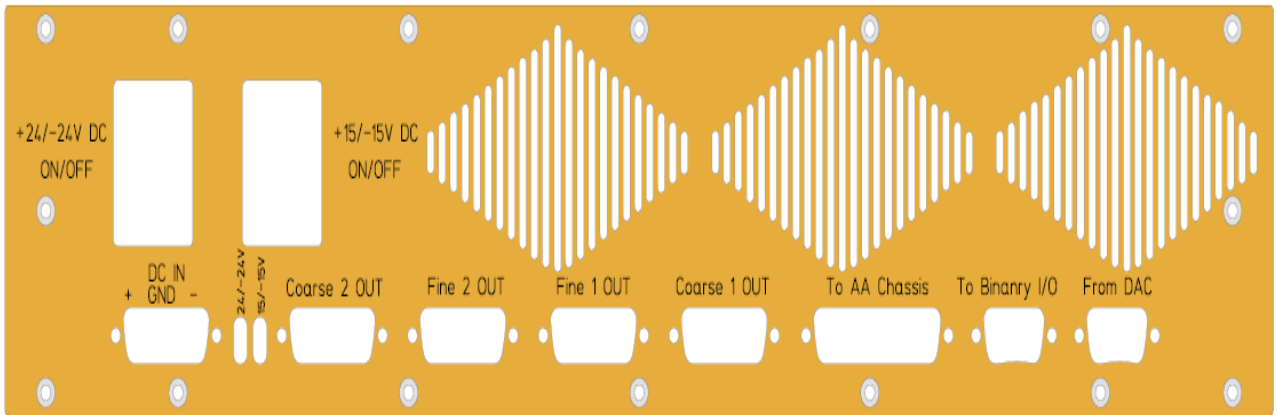


Figure 2: Rear Panel

2.7. Rear Panel functions

- 2.7.1 **DC IN** – A three terminal input in a D-15 shell. This input supplies the DC power to the chassis. The nominal input is +/- 24VDC @ 10 amps.
- 2.7.2. **+24 / -24 VDC ON/OFF and +15/-15 VDC ON/OFF** – Switch to turn power on and off
- 2.7.3. **+15, -15, +24 and -24 volt LED's** – When lit, indicate the presence of DC Power from the power supply and from the output of the internal regulator board.
- 2.7.4. **Coarse 1 Out, Coarse 2 OUT, Fine 1 OUT and Fine 2 OUT** - A three terminal input in a D-15 shell. Output of each coil driver.
- 2.7.5. **To AA Chassis** – It is a DB25 Female Connector sends the signals Fine1 Vmon+/Fine1 Vmon-, Coarse1 Vmon+/Coarse1 Vmon-, Fine2 Vmon+/ Fine2 Vmon-, Coarse2 Vmon+/Coarse2 Vmon- to the AA chassis.
- 2.7.6. **To Binary I/O** - It is a DB9 Female Connector sends the signals Fine 1 Status, Coarse 1 Status, Fine 2 Status and Coarse 2 Status to the Binary I/O.
- 2.7.7. **From DAC** – It is a DB9 Male connector receives the Fine 1 DAC IN+/ Fine 1 DAC IN-, Coarse 1 DAC IN+/Coarse 1 DAC IN-, Fine 2 DAC IN+/Fine 2 DAC IN-, Coarse 2 DAC IN+/ Coarse 2 DAC IN- from the DAC.

3. Chassis Protection

3.1. Thermal Protection

Thermal protection of the electronics is provided by an internal thermostat which interrupts DC power to the amplifier. If an amplifier is overheated the status LED's on the front panel will go off. When the chassis is cooled off 'Reset' the chassis and the LED's should turn ON.



Digi Key Part #: 317-1013-ND

3.2 Electrical Protection

Each individual amplifier module is protected by 5A mini fuses internal to the chassis. The +/-24 volt feed to the chassis is protected by a 2 pole 15A thermal breaker.

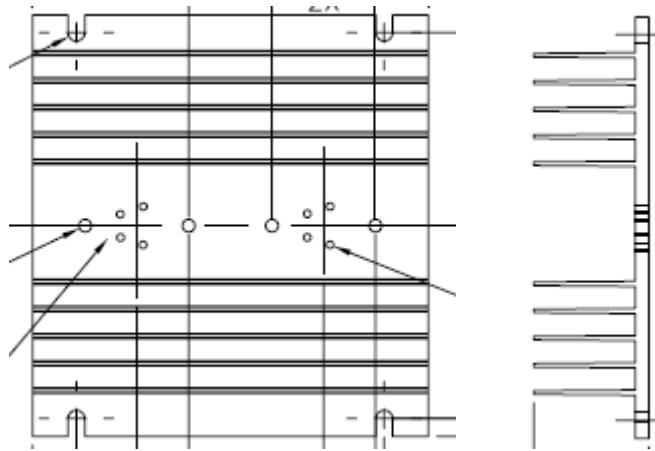
The +/-15 volt feed to the chassis is protected by a 2pole 1A thermal breaker



Internal 5A Fuse: Digi Key Part # F989-ND

4. LM12 Module Assembly

The LM12 amplifiers on the board have been mounted so that they can be replaced without soldering or de soldering. MS02 cage jacks have been used for each pin. The heat sink used in the design is a model 60840, from Aavid Thermalloy



Due to the high voltages present and thermal considerations it is extremely important that the assembly procedure for the LM12/heatsink need to be followed as specified.



ISI Coil Driver Board



Heat Sink with the drilled hole

