

# I/O Module

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*For Intrinsically Safe Systems  
Version 2.0*

## Installation Manual





# Contents

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<b>1.0</b>	<b>Introduction.....</b>	<b>1</b>
<b>2.0</b>	<b>Installation.....</b>	<b>2</b>
	2.1 Unpacking and Assembly .....	2
	2.2 Enclosure Disassembly .....	2
	2.3 Installation of the I/O Module .....	2
	2.3.1 AC Wiring/Installation .....	3
	2.4 Fiber Optics Assembly.....	3
	2.4.1 EDP and Printer Ports .....	3
	2.4.2 RS-232 Communications .....	3
	2.4.3 RS-485 Communications .....	4
	2.4.4 RS-422 Communications .....	4
	2.4.5 20mA Current Loop .....	4
	2.5 Analog Outputs .....	4
	2.6 Digital Inputs .....	5
	2.7 Relay Contact Outputs.....	5
	2.8 Board Removal.....	5
	2.9 Fuse Replacement .....	6
	2.10 I/O Module Mounting .....	6
	2.11 Battery Replacement .....	6
<b>3.0</b>	<b>Configuration .....</b>	<b>9</b>
<b>4.0</b>	<b>Appendix .....</b>	<b>10</b>
	4.1 Specifications.....	10



Technical training seminars are available through Rice Lake Weighing Systems. Course descriptions can be viewed at [www.rlws.com](http://www.rlws.com) or obtained by calling 715-234-9171 and asking for the training department.



# About This Manual

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This manual is intended for use by service technicians responsible for installing and servicing the I/O module. This manual applies to *I/O Module*s using version 2.0 or newer software.



## Warning

*Some procedures described in this manual require work inside the I/O Module enclosure. These procedures are to be performed by qualified service personnel only.*

*Improper specification, installation, or service of this equipment could result in personal injury or property damage.*



Authorized distributors and their employees can view or download this manual from the Rice Lake Weighing Systems distributor site at [www.rlws.com](http://www.rlws.com).

## 1.0 Introduction

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The *I/O Module* is an external device designed for use with the *320IS and 320IS Plus* digital weight indicators. When placed in the safe area, its fiber optic interface allows it to provide remote functions for indicators in hazardous environments. The *I/O Module* provides access to the indicator through two serial ports supporting several physical standards (RS-232, RS-485, RS-422, and 20mA current loop) and integrating the following I/Os:

- Two isolated 16-bit analog outputs
- Four digital inputs
- Four relay contact outputs

The *I/O Module* operating parameters are stored in the attached indicator. After both the indicator and *I/O Module* are connected and powered up, the module attempts to communicate with the indicator and download configuration parameters. The peripherals are operated by the indicator, which acts as the master device in the system.

# 2.0 Installation

This section describes procedures for connecting the analog and digital I/Os, fiber optic and serial communication cables to the *I/O Module*.

## Caution

- Use a wrist strap to ground yourself and protect components from electrostatic discharge (ESD) when working inside the indicator enclosure.
- It is mandatory to return the *I/O Module* to Rice Lake Weighing Systems for circuit board level service. Component level repair is not permitted on UL-approved equipment by anyone other than the manufacturer.

## 2.1 Unpacking and Assembly

Immediately after unpacking, visually inspect the *I/O Module* to ensure all components are included and undamaged. The shipping carton should contain the *I/O Module*, this manual, and a parts kit. If any parts were damaged in shipment, notify Rice Lake Weighing Systems and the shipper immediately.

## 2.2 Enclosure Disassembly

The *I/O Module* enclosure must be opened to connect cables for load cells, communications, and power.



## Warning

The *I/O Module* has no on/off switch. Before opening the unit, ensure the power cord is disconnected.

## 2.3 Installation of the I/O Module

The following section describes the wiring of various ports of the *I/O Module*. Table 2-1 below lists the connectors of the main board of the *I/O Module*. See Figure 2-1 for port locations.

Connector	Description
CN1	Analog Outputs
CN2	EDP Port
CN3	Printer Port
CN4	Digital Inputs
CN5	Relay Outputs
CN8	DC Power
Optical Input	Light Port
Optical Output	Light Port

Table 2-1. *I/O Module* Wiring Ports

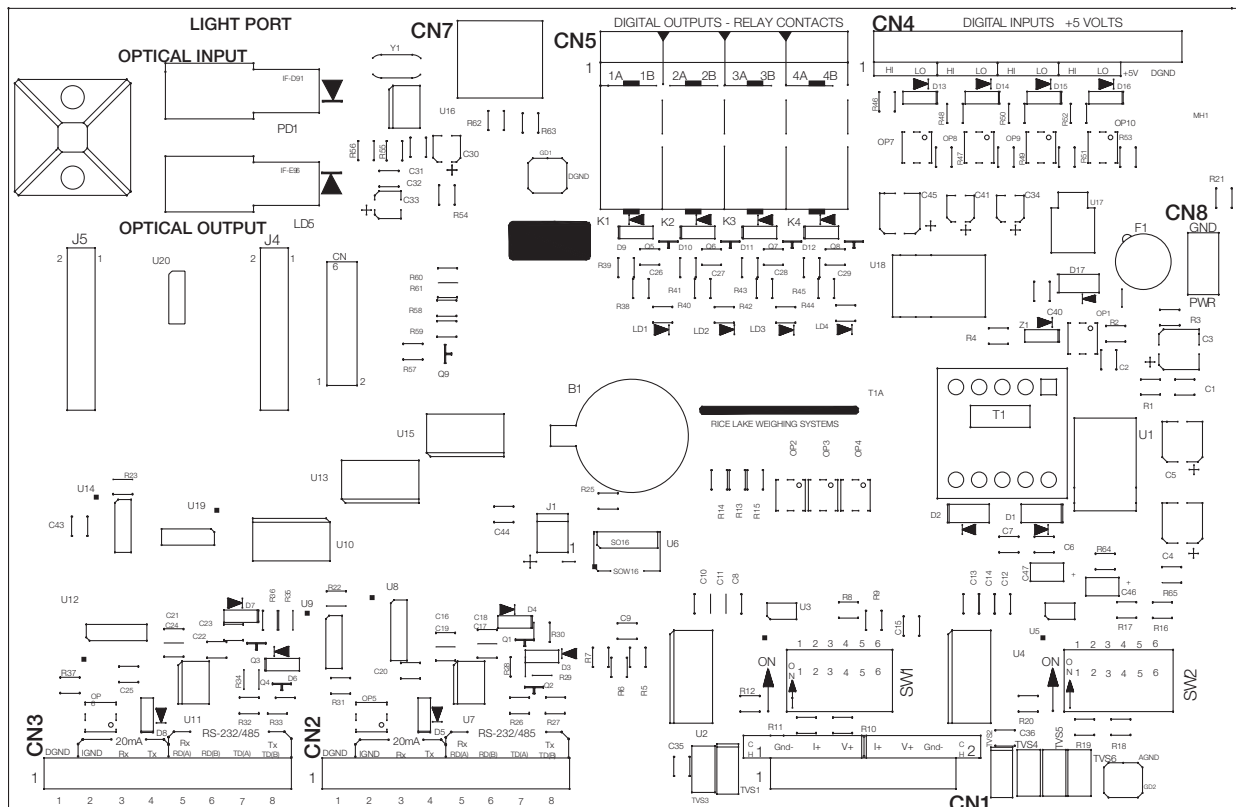


Figure 2-1. *I/O Module* Board

The *I/O Module* must be installed in a safe area. The internal power supply unit provides DC voltage for the *I/O Module's* main board. The DC power requirements of the I/O panel are as follows:

- Nominal input voltage: 7.5V
- Peak current consumption: 930mA
- Average input current: 630mA

The DC power cable should be attached to connector CN8. Care should be taken to apply the correct DC polarity. Power connection of the main board is listed in Table 2-2.

Pin	Description
1	+VDC
2	Ground

Table 2-2. Power Connections (CN8)

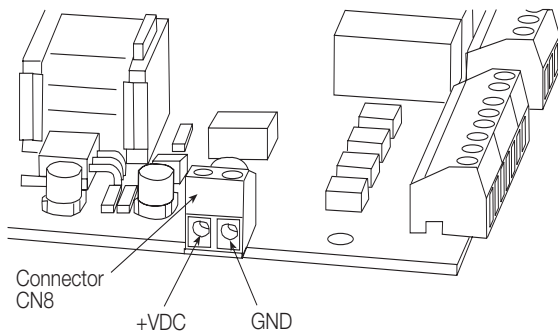


Figure 2-2. CN8 - DC Power Connector

### 2.3.1 AC Wiring/Installation

The *I/O Module* is to be permanently mounted with a readily accessible disconnect device incorporated in the building installation wiring. All wiring is to be done in accordance with the National Electric Code (NEC).

## 2.4 Fiber Optics Assembly

The *I/O Module* is equipped with duplex fiber optic ports for communicating with other devices located in the safe or hazardous area. It provides electrical isolation and eliminates the use of I/O barriers commonly used in intrinsically safe systems. The fiber optic wires are plastic; no polishing or further preparation is required. See Figure 2-1 on page 2 for the location of the fiber optic ports on the *I/O Module* main board.

**NOTE:** The fiber optic connections between the indicator and the *I/O Module* need to be cross-linked. The optical output of the indicator should be attached to the input of the *I/O Module*, and the indicator's input to the module's output.

Use the following steps for assembling the fiber optics connectors of the *I/O Module*:

1. Cut off the ends of the fiber optic cable with a single-edge razor blade or sharp knife. Try to obtain a precise 90° angle.
2. Insert the fiber through the locking nut and into the connector until the core tip seats against the internal micro-lens.
3. Screw the connector locking nut down to a snug fit, locking the fiber in place.
4. Secure duplex fiber optic cable to wire tie mounting button located on I/O Module circuit board (see Figure 2-1 on page 2) using wire ties included in parts kit.

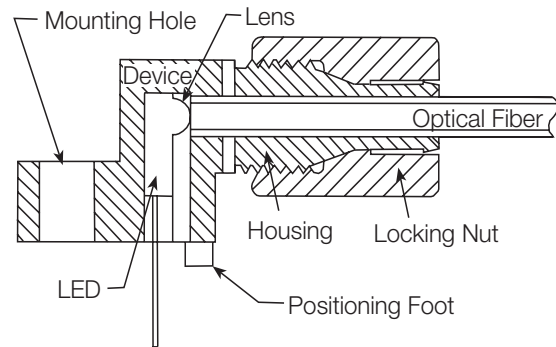


Figure 2-3. Fiber Optic Connector

### 2.4.1 EDP and Printer Ports

The indicator communicates with external devices through the *I/O Module* located in a remote location. The I/O board serves as a gateway with several types of communication interfaces (RS-232, RS-422, RS-485, and 20mA current loop). The following sections explain how to install and configure the communication interfaces to establish serial communications with peripheral devices.

### 2.4.2 RS-232 Communications

To attach a PC or other device to the *I/O Module's* RS-232 ports, select RS-232 standard in the indicator SERIAL menu for the appropriate port (EDP and/or printer). EDP and printer ports should be configured separately. See Table 2-3 below for information on connecting RS-232 communications.

Pin	Description (Sign)
1	Signal Ground (GND)
2 - 4	—
5	Receive Data (RXD)
6 - 7	—
8	Transmit Data (TXD)

Table 2-3. RS-232 Connections (CN2 and CN3)

### 2.4.3 RS-485 Communications

To attach a PC or other device to the *I/O Module's* RS-485 ports, select RS-485 standard in the indicator SERIAL menu for the desired port (EDP and/or printer). EDP and printer ports should be configured separately. See Table 2-4 below for information on connecting RS-485.

Pin	Description (Sign)
1	Signal Ground (GND)
2 - 6	—
7	RS-485 line (A)
8	RS-485 line (B)

Table 2-4. RS-485 Connections (CN2 and CN3)

### 2.4.4 RS-422 Communications

To attach a PC or other device to the *I/O Module's* RS-422 ports, select RS-422 standard in the indicator SERIAL menu for the desired port (EDP and/or printer). EDP and printer ports should be configured separately. See Table 2-5 below for information on connecting RS-422 communications.

Pin	Description (Sign)
1	Signal Ground (GND)
2 - 4	—
5	RS-422 input (R+)
6	RS-422 input (R-)
7	RS-422 output (T+)
8	RS-422 output (T-)

Table 2-5. RS-422 Connections (CN2 and CN3)

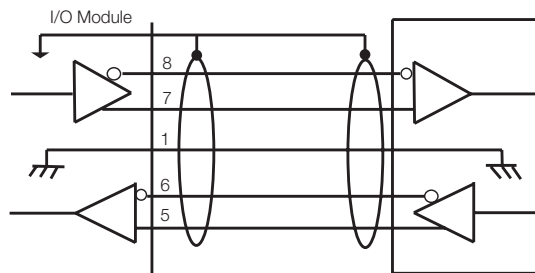


Figure 2-4. Typical RS-422 Wiring Paths

### 2.4.5 20mA Current Loop

To attach a PC or other device to the *I/O Module's* 20mA ports, select current loop (CL) standard in the indicator SERIAL menu for the desired port (EDP and/or printer). EDP and printer ports should be configured separately. See Table 2-6 below for information on connecting 20mA current loop.

Pin	Description (Sign)
1	Signal Ground (GND)
2	Isolated Ground (GNDx)
3	Receive Data (RCL)
4	Transmit Data (TCL)
5 - 8	—

Table 2-6. 20mA Current Loop Connections (CN2 and CN3)

## 2.5 Analog Outputs

The *I/O Module* uses two 16-bit isolated analog output channels with 4-20mA and voltage (0-5V/±5V/0-10V/±10V) outputs supplied from a DC/DC converter. The output voltage ranges are DIP-switch selectable (see Figure 2-1 on page 2). Analog output configuration is done via setup mode in the indicator used with the *I/O Module* (see the applicable indicator installation manual).

the analog output circuitry consists of two identical channels that can be assigned to gross or net weight values. The analog output can be configured to operate as either current or voltage outputs. the voltage output range is selected by configuring DIP switches SW1 (1-6) for channel 1 and SW2 (1-6) for channel 2 (see Figure 2-1 on page 2).

Range	SW1-1 SW2-1	SW1-2 SW2-2	SW1-3 SW2-3	SW1-4 SW2-4	SW1-5 SW2-5	SW1-6 SW2-6
0-5V	OFF	OFF	OFF	ON	X	X
0-10V	OFF	ON	X	OFF	ON	X
±5V	ON	OFF	OFF	OFF	ON	X
±10V	ON	OFF	ON	OFF	OFF	ON

Table 2-7. Output Range Configuration



The analog output port is powered by an isolated DC-DC converter. The outputs available on connector CN1 are listed in Table 2-8 below. See Figure 2-1 on page 2 for the location of CN1 and DIP switches.

Pin	Name
1	Ground (Analog Output 1 Common)
2	Analog Output 1 (current)
3	Analog Output 1 (voltage)
4	Analog Output 2 (current)
5	Analog Output 2 (voltage)
6	Ground (Analog Output 2 Common)

Table 2-8. CN1 Connectors

## 2.6 Digital Inputs

The *I/O Module* has four digital inputs that can be used to control pre-defined operations in the indicator. Table 2-9 outlines the various functions for the digital inputs.

Digital inputs are available on connector CN4 (see Figure 2-1 on page 2). All inputs are individually isolated via optocouplers. Table 2-9 outlines the pin connections for CN4.

Pin	State	Description
1	Hi	Digital Input 1 (+V)
2	Low	Ground 1 (-V)
3	Hi	Digital Input 2 (+V)
4	Low	Ground 2 (-V)
5	Hi	Digital Input 3 (+V)
6	Low	Ground 3 (-V)
7	Hi	Digital Input 4 (+V)
8	Low	Ground 4 (-V)
9	Hi	+5V
10	Low	DGND

Table 2-9. CN4 Connections

The digital inputs are designed to receive 0-24V/TTL signals on the incoming lines. Care should be taken to apply the right DC polarity. Pins 9 and 10 (+5V and DGND) can be used to supply power to the digital inputs. Maximum current draw should not exceed 0.25A.

See the applicable indicator installation manual for information on checking current digital input states.

## 2.7 Relay Contact Outputs

The *I/O Module* features four relay contact outputs, which default to open. This allows switching of maximum +30VDC, 5A or 250VAC, 5A for each of the four digital channels.

The relay contact outputs are controlled by user-configurable setpoints. The setpoint values and operating parameters can be defined in the SETPNT menu of the host indicator. See the indicator installation manual for information on configuring setpoints.

Table 2-10 show pin connections for CN5 of the *I/O Module* board.

Pin	Description
1	Output 1_A
2	Output 1_B
3	Output 2_A
4	Output 2_B
5	Output 3_A
6	Output 3_B
7	Output 4_A
8	Output 4_B

Table 2-10. CN5 Connections

The states of the relay contacts are indicated by LEDs LD1-LD4 (see Figure 2-1 on page 2). When an LED is lit, the contacts of the corresponding relay are closed. See the applicable indicator installation manual for information on checking relay contact functionality.

## 2.8 Board Removal

If the *I/O Module's* main board must be removed, use the following procedure:

1. Disconnect power to the board.
2. Unplug all connectors.
3. Remove the six screws holding the main board, then lift the board out of the enclosure.

To replace the board, reverse the above procedure. Be sure to reinstall cable ties to secure all cables inside the enclosure.

## 2.9 Fuse Replacement

Use the following steps to replace fuses in the *I/O Module*. See Figure 2-1 on page 2 for fuse locations.



### Caution

*To protect against the risk of fire, only replace fuses with same type and rating (see Section 4.1 on page 10 for proper fuse types and ratings).*

1. Disconnect power to the *I/O Module*.
2. Place *I/O Module* on an antistatic work mat. Loosen the clamps of the enclosure body, then open the *I/O Module* (see Figure 2-6 on page 8).
3. Remove fuse(s) from holders on power supply bracket and replace with new fuse(s) – (RLWS PN 80869).
4. Replace cover on enclosure and torque clamps until they bottom out and gasket fully compresses to maintain NEMA 4X integrity.

## 2.10 I/O Module Mounting

The *I/O Module* is capable of being mounted to any surface in the safe area using the mounting holes of the enclosure (see Figure 2-5 on page 7). Use 1/4" or larger mounting hardware.

**NOTE:** Mounting surface must be capable of holding four times the weight of the *I/O Module* and wiring.

## 2.11 Battery Replacement

The lithium battery on the *I/O Module* board maintains the real-time clock and protects data stored in the system RAM when it is not connected to AC power.

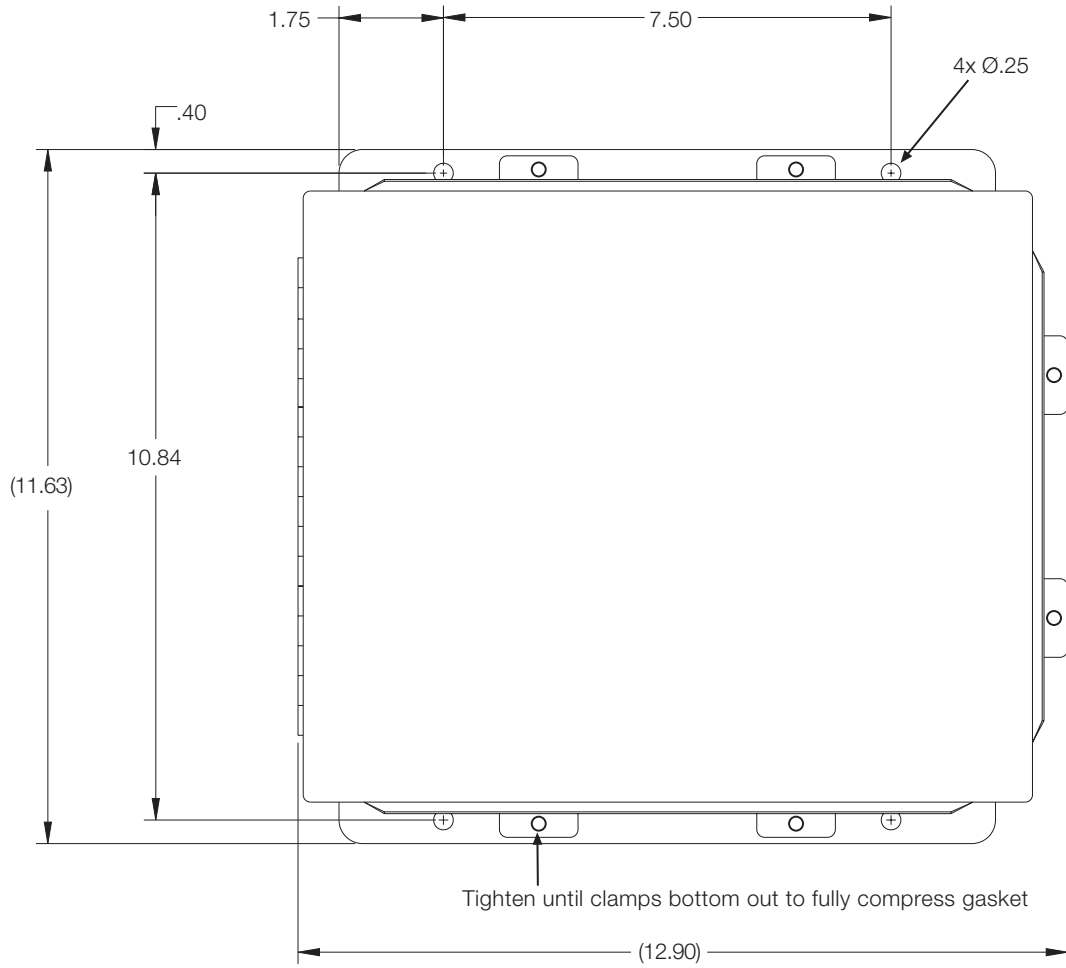
Data protected by the *I/O Module* board battery includes time and date.

Use *Revolution III* to store a copy of the indicator configuration on a PC before attempting battery replacement. If any data is lost, the indicator configuration can be restored from the PC.

Watch for the *LOWBAT* warning on the LED display and periodically check the battery voltage of your *320IS/320IS Plus*. Batteries should be replaced when the indicator low battery warning comes on, or when battery voltage falls to 2.2 VDC. Life expectancy of the battery is seven years.

See Figure 2-1 on page 2 for battery board battery location and orientation (positive side up).

Risk of explosion if battery is replaced with incorrect type. Dispose of batteries per manufacturer instruction.



*Figure 2-5. I/O Module Enclosure Dimensions*

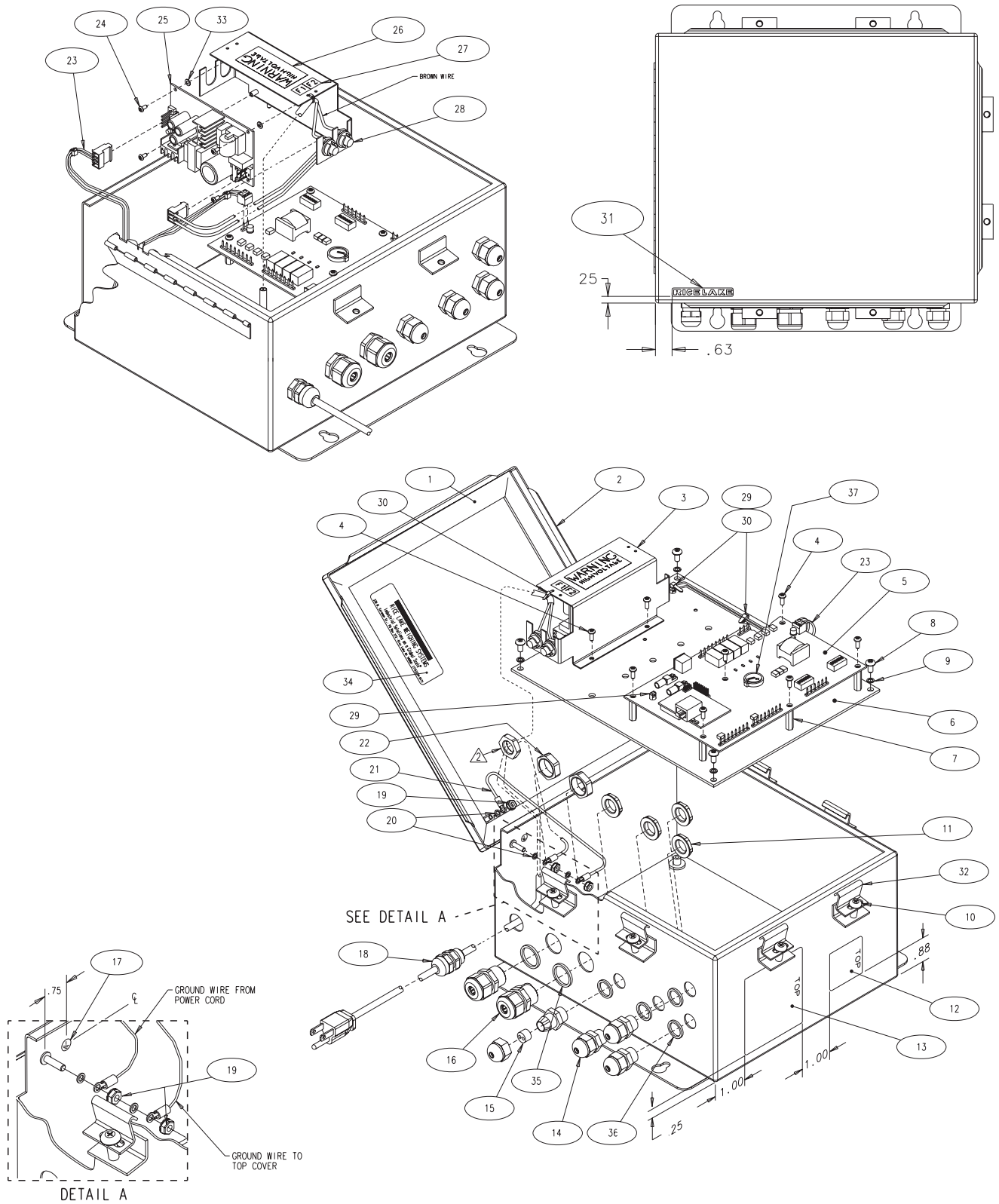


Figure 2-6. I/O Module Assembly

## 3.0 Configuration

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Configuration of the external *I/O Module* is done through the SETUP menu of the attached indicator acting as the master device.

All operating parameters are stored in the host indicator's EEPROM memory, and can be edited after placing the indicator in SETUP mode. See the indicator installation or operation manual for instructions on editing configuration parameters.

The *I/O Module* works as the "slave" device of the indicator and will not work as a stand-alone unit. After both the indicator and *I/O Module* are powered up, the module attempts to communicate with the indicator through the fiber optic port and all necessary working parameters are sent to the *I/O Module*. All inputs and outputs function as peripherals of the indicator. Communication must remain constant between the two devices for data to be transferred through the various ports.

See Table 3-1 for parameters that are sent to the *I/O Module* during power up.

Data Type	Parameters
ID	Device code, Revision, Version text
EDP, Print Ports	Baud Rate, Parity, Stop Bits, End of Line Delay, Termination, Port Interface, Address for RS-485 Operation
Analog Output	Output (voltage, current), Error Action (full scale, hold, zero scale), Tweak Zero Value, Tweak Span Value
Digital Output	Output (On/Off) Enable Mask
Digital Input	Enable Mask

Table 3-1. Configuration Parameters Sent to I/O Module

# 4.0 Appendix

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The following sections contains specifications and warranty information for the *I/O Module* .

## 4.1 Specifications

### Power

Line Voltages	115 or 230 VAC
Power Frequency	50 or 60 Hz
Consumption	160mA (9.3 Watts)
Fusing	1.25A, 250V Wickmann TR5 Time-Lag 3741125041; UL Listed, CSA Certified and Approved RLWS PN 80869

### Analog Specifications

Resolution	16-bit
Operating Modes	Current or voltage output
Current Output Range	4-20mA
Maximum Load Resistance	490 $\frac{3}{4}$
Voltage Output Ranges	0-5V/ $\pm$ 5/0-10V/ $\pm$ 10V
Minimum Load Resistance	500 $\frac{3}{4}$
Maximum Output Current in Voltage Mode	20 mA
Calibration Method	Software

### Digital Specifications

Microcomputer	Rabbit RCM 2200 @ 22.1184 MHz
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### Optical Port

Physical Medium	2.2mm plastic fiber @ 640 nm
Maximum Transmission Length	246 ft. (~75 m)
Transmission Type	Full duplex

### EDP and Printer Ports

Supported Physical Standards	RS-232; RS-485; RS-422; Current Loop
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### Relay Contact Outputs

Relay Rating	250 VAC 5A; 30 VDC 5A Non-latching SP-ST-NO (single pole-single throw-normally open contacts)
Contact Resistance	30m $\Omega$
Operate (Set) Time	10ms Max
Release (Reset) Time	10ms Max
LED Annunciators	SMD LEDs indicate closed state

### Digital Inputs

Incoming Signal Range	0-24V (TTL level)
Interfacing Circuitry	Opto-couplers with 5KV isolation voltage rating

### Environmental

Operating Temperature	-10 to +40°C (Legal-for-Trade applications); -10 to +50°C (industrial applications)
Storage Temperature	-25 to +70°C
Humidity	0-95% relative humidity

### Enclosure

Enclosure Dimensions	12.90in x 11.63in x 6.25in 327.7mm x 295.4mm x 158.8mm
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### Battery Replacement

Panasonic (PN 69291)	CR1632, 16 mm 3V, Lithium Coin, 125mAH
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### Certifications and Approvals



# I/O Module Limited Warranty

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Rice Lake Weighing Systems (RLWS) warrants that all RLWS equipment and systems properly installed by a Distributor or Original Equipment Manufacturer (OEM) will operate per written specifications as confirmed by the Distributor/OEM and accepted by RLWS. All systems and components are warranted against defects in materials and workmanship for two years.

RLWS warrants that the equipment sold hereunder will conform to the current written specifications authorized by RLWS. RLWS warrants the equipment against faulty workmanship and defective materials. If any equipment fails to conform to these warranties, RLWS will, at its option, repair or replace such goods returned within the warranty period subject to the following conditions:

- Upon discovery by Buyer of such nonconformity, RLWS will be given prompt written notice with a detailed explanation of the alleged deficiencies.
- Individual electronic components returned to RLWS for warranty purposes must be packaged to prevent electrostatic discharge (ESD) damage in shipment. Packaging requirements are listed in a publication, *Protecting Your Components From Static Damage in Shipment*, available from RLWS Equipment Return Department.
- Examination of such equipment by RLWS confirms that the nonconformity actually exists, and was not caused by accident, misuse, neglect, alteration, improper installation, improper repair or improper testing; RLWS shall be the sole judge of all alleged non-conformities.
- Such equipment has not been modified, altered, or changed by any person other than RLWS or its duly authorized repair agents.
- RLWS will have a reasonable time to repair or replace the defective equipment. Buyer is responsible for shipping charges both ways.
- In no event will RLWS be responsible for travel time or on-location repairs, including assembly or disassembly of equipment, nor will RLWS be liable for the cost of any repairs made by others.

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**RLWS AND BUYER AGREE THAT RLWS'S SOLE AND EXCLUSIVE LIABILITY HEREUNDER IS LIMITED TO REPAIR OR REPLACEMENT OF SUCH GOODS. IN ACCEPTING THIS WARRANTY, THE BUYER WAIVES ANY AND ALL OTHER CLAIMS TO WARRANTY.**

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