



Laser Field Bus Interface

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PREFACE

Ensure you read and understand this guide in its entirety and familiarize yourself with the operating and maintenance instructions before you use the product. IPG strongly recommends that all operators of the product read and pay particular attention to all safety information contained herein prior to operating the product.

This guide should stay with the product to provide you and all future operators, users, and owners of the product with important operating, safety, and other information.

For technical assistance concerning the product, contact IPG Customer Service at 508-373-1157.

Audience

The audience for this guide is system integrators and technicians responsible for installing and operating the product in industrial and non-industrial installations.

Language

English

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1.1 INTRODUCTION

The Laser Field Bus Interface (LFBI) is an optional accessory for IPG Photonics YLR-Series and YLR-U lasers. It is used to control and/or monitor a YLR-Series laser, or a YLR-U laser, using an Ethernet Field Bus from a host computer or Programmable Logic Controller (PLC).

IMPORTANT



The LFBI can only be used with YLR-Series and YLR-U lasers. It cannot be used with other lasers—such as the ELR, GLR, TLR or DLR lasers—that may share the same internal controls as the YLR-Series and YLR-U lasers.

The LFBI is available under three different item numbers, depending on the Field Bus protocol that the LFBI unit supports. Table 1-1 lists each LFBI unit and the Field Bus protocol that it supports.

Table 1-1. Supported Field Bus Protocol for Each LFBI Unit

Item Number	Supported Field Bus Protocol
CEU45010381 D00 XU	EtherCAT
CEU45010381 D01 XU	Ethernet/IP
CEU45010381 D02 XU	PROFINET

Table 1-2 lists the LFBI firmware variants.

Table 1-2. LFBI Firmware Variants

Firmware Variant	Description
SWFP000051XXXXXU	LFBI firmware for use in a Standard Fieldbus configuration
SWFP000051XXAXXU	LFBI firmware for use in a Monitor-Only Fieldbus configuration

To identify which LFBI firmware variant is installed, go to the LFBI's Product Support web page (see Section 2.5.5). The firmware variant appears in the first part of each of the component name's title (Dictionary, Init table, FPGA image), as shown in bold in the following example:

SWFP000051XXXXXU_IPGP694_YLR_Fieldbus_Init_1.1.0.txt

1.1.1 Operating Modes of the LFBI

The LFBI supports two operating modes: **Fieldbus Mode** and **Monitor-Only Mode**. You can select either mode by selecting the Fieldbus Mode checkbox or the Monitor-Only Mode checkbox from the Control Screen in the LFBI Web Interface. Refer to Section 2.5.1 on page 39 for more information about the Control Screen and the LFBI Web Interface.

1.1.1.1 Fieldbus Mode

In **Fieldbus Mode** the LFBI routes the Fieldbus master's laser control commands via the LFBI's I/O and RS-232 serial ports to the laser. This is *always* the power-up default mode, regardless of whether SWFP000051XXXXXU, or SWFP000051XXAXXU, is the installed firmware variant. **Fieldbus Mode** should be used for production processing.

When **Fieldbus Mode** is deselected, the laser control commands are activated on the Control page of the LFBI Web Interface and Fieldbus master's control of the laser is deactivated. This allows for manual control of the laser for testing and calibration (see Section 2.5.4 on page 47 for details on calibration).

NOTE: Laser status and other laser parameters that are being read by the Fieldbus master are not affected by the setting of the **Fieldbus Mode** checkbox.

1.1.1.2 Monitor-Only Mode

In **Monitor-Only Mode** the only command that you can execute from the Control Screen is the **Reset Error** command. For all other purposes, the LFBI operates "passively" and assumes that the control signals on its I/O ports are NOT physically wired to the laser and thus are not available for its use.

When **Monitor-Only Mode** is deselected, the LFBI assumes that the control signals on its I/O ports are physically wired to the laser and thus available for its use. In addition to the **Reset Error** command, the full complement of laser control commands on the Control page of the LFBI Web Interface is activated.

NOTE: You will not be able to use any of the laser control commands on the Control page if you deselect **Monitor-Only Mode** while the Monitor-Only Variant of the LFBI firmware (SWFP000051XXAXXU) is installed on the LFBI. In this case there are no actual signals going to the laser from the LFBI, and the laser may return incorrect laser status.

1.1.2 Block Diagram of the LFBI in Field Bus Mode

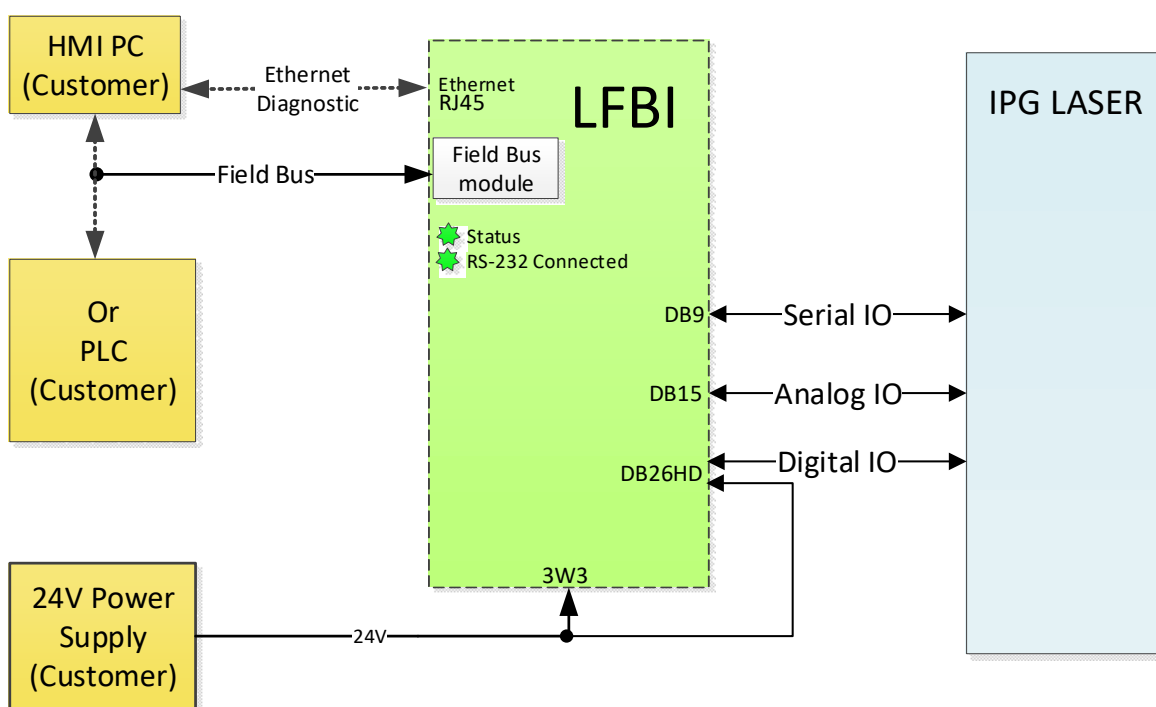


Figure 1-1. Block Diagram of the LFBI in Field Bus Mode

1.1.3 Block Diagram of the LFBI in Monitor-Only Mode

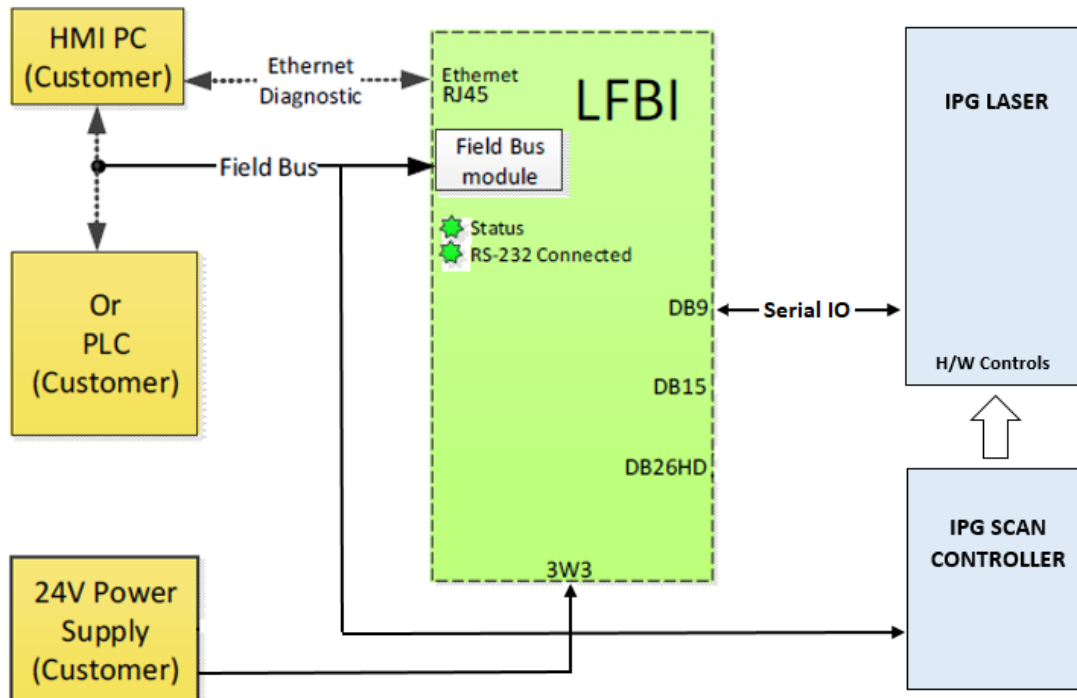


Figure 1-2. Block Diagram of the LFBI in Monitor-Only Mode

1.1.4 Panel Views of the LFBI

1.1.4.1 Front Panel View

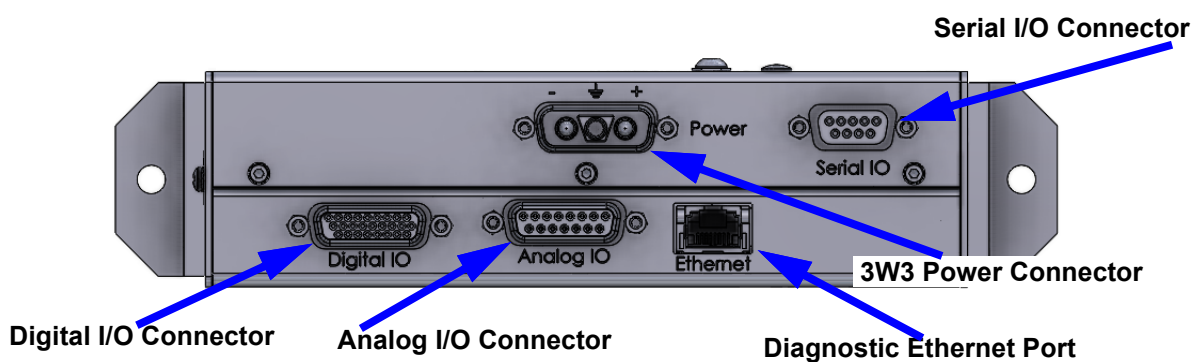


Figure 1-3. Front Panel View of the LFBI

1.1.4.2 Rear Panel View

The rear panel of the LFBI includes mounting holes and a spring clip for DIN-rail mounting of the LFBI. Refer to Section 2.1 on page 24 for information on mounting the LFBI.

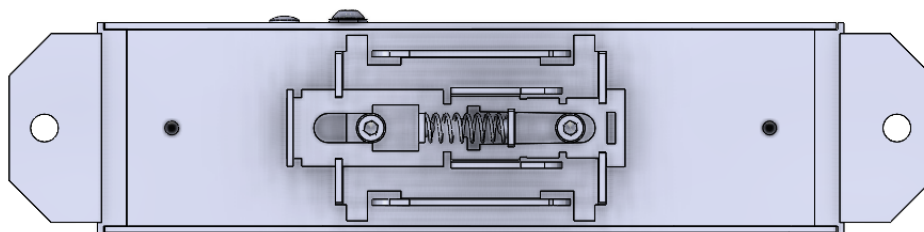


Figure 1-4. Rear Panel View of the LFBI

1.1.4.3 Right Side Panel View

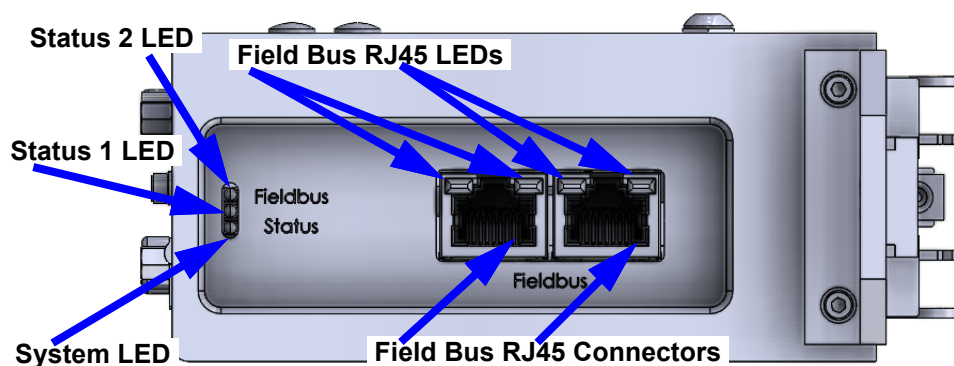


Figure 1-5. Right Side Panel View of the LFBI

1.1.4.4 Top Panel View

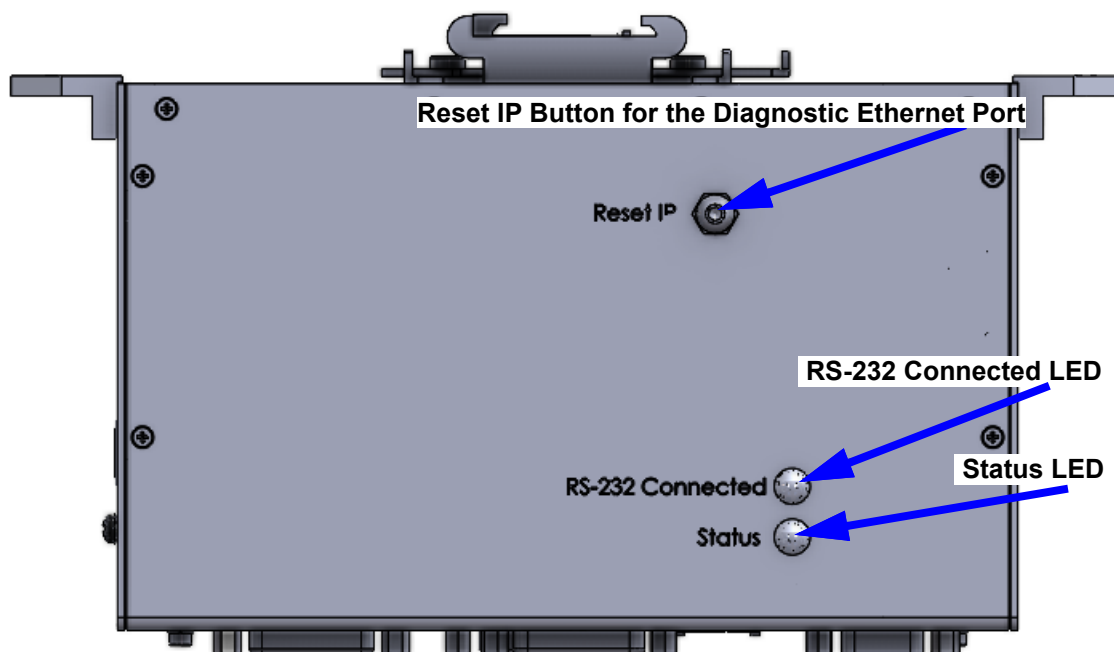


Figure 1-6. Top Panel View of the LFBI with LEDs

The **RS-232 Connected** LED indicates the link state of the LFBI. When the **RS-232 Connected** LED is on (green)—and the **RS-232 Link Up** LED on the Control Screen of the LFBI Web Interface is on (green)—it means that the RS-232 link to laser is up.

When the **Status** LED is green, it indicates that the LFBI is operating properly. (**NOTE:** The **Status** LED indicates the operational state, not the link state, of the LFBI; the **Status** LED can be green even when the RS-232 link is down. The top-cover **Status** LED is not to be confused with the Field Bus **Status 1** LED or the Field Bus **Status 2** LED, which are shown in Figure 2-12 on page 34.)

Refer to Section 2.6 on page 49 for information on using the Reset IP button to reset the IP address of the Diagnostic Ethernet Port to default (10.0.0.20).

1.1.4.5 Left Side Panel View

The left-side panel of the LFBI includes the Functional Earth label and the grounding screw for the LFBI.

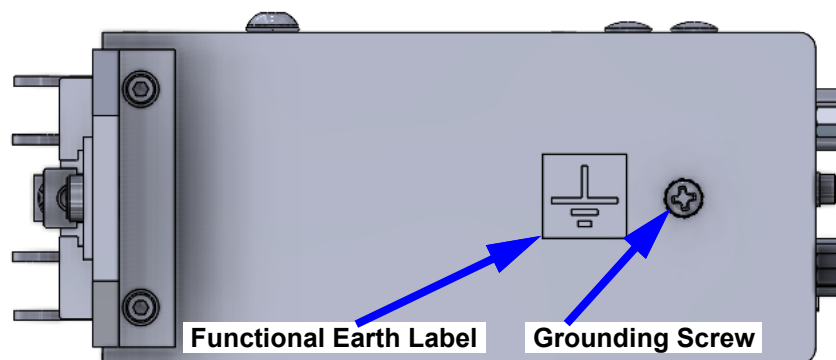


Figure 1-7. Left Side Panel View of the LFBI

1.2 SAFETY INFORMATION AND CONVENTIONS

1.2.1 Safety Keywords and Symbols

To ensure the safe operation and optimal performance of the LFBI, follow all safety messages in this user guide. Safety precautions must be observed during all phases of operation, maintenance, and service.

Operators must adhere to these recommendations and apply sound laser safety practices at all times. Never open the LFBI chassis. There are no user-serviceable parts, equipment, or assemblies associated with this product. Internal service and maintenance should only be performed by qualified IPG personnel.

The following describes the safety keywords and symbols used in safety messages throughout this document.

SAFETY KEYWORDS AND MEANINGS			
DANGER	WARNING	CAUTION	IMPORTANT
The keyword DANGER on a red background indicates a <u>potential personal hazard</u>. It requires a procedure that, if not correctly followed, <i>will</i> result in bodily harm or death to you or others. Do not proceed beyond a message containing this keyword until you completely understand and meet the required conditions.	The keyword WARNING on an orange background indicates a <u>potential personal hazard</u>. It requires a procedure that, if not correctly followed, <i>can</i> result in bodily harm to you or others. Do not proceed beyond a message containing this keyword until you completely understand and meet the required conditions.	The keyword CAUTION on a yellow background indicates a <u>potential personal or product hazard</u>. It requires a procedure that, if not correctly followed, can result in minor personal injury or damage or destruction to the product or components. Do not proceed beyond a message containing this keyword until you completely understand and meet the required conditions.	The keyword IMPORTANT on a blue background indicates <u>pertinent information</u> regarding the operation of the product. Do not overlook this information.

SAFETY SYMBOLS AND MEANINGS			
			
Indicates that the safety message pertains to an electrical hazard.	Indicates that the safety message pertains to a laser hazard.	Indicates that the safety message contains general safety information.	Indicates that the safety message contains pertinent information regarding the operation of the product.

1.2.2 Safety Labels

The following figure shows the locations of the safety labels and the Product Identification Label on the LFBI.

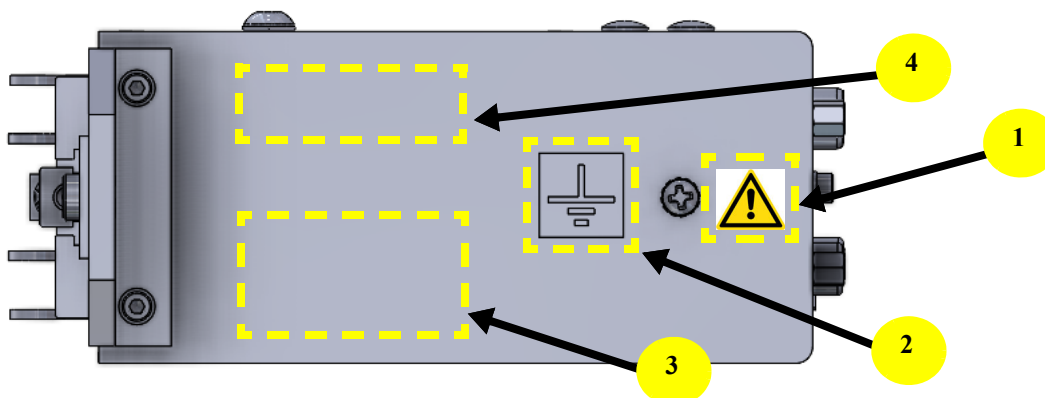
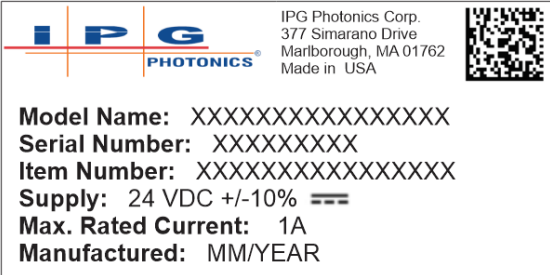
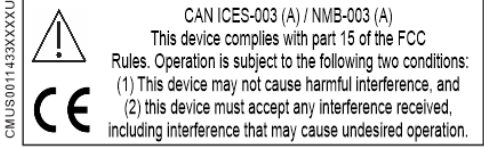


Figure 1-8. Locations of the Safety Labels and the Product Identification Label

Table 1-3. Safety Label Descriptions

Item	Label Name	Description
1	General Safety Label NOTE: Caution - consult accompanying documentation.	 This label is located on the left-side panel of the LFBI.
2	Functional Earth Label NOTE: This symbol is placed at the equipment earthing point and is mandatory for all grounded equipment.	 This label is located on the left-side panel of the LFBI.
3	Product Identification NOTE: This example of a Product Identification label is shown for the purpose of illustration. On an actual LFBI unit, the fields containing X's would show the Model Name, Serial Number, Item Number, and month/year manufactured in the format MM/Year.	 This label is located on the left-side panel of the LFBI.
4	CE Label NOTE: This label is affixed on the rear panel only when applicable; contact IPG Customer Service at 508-373-1157 or email support@ipgphotonics.com .	 This label is located on the left-side panel of the LFBI.

1.2.3 Compliance to Government Requirements

The LFBI is designed to conform to the EMC Directive and the RoHS Directive.

1.3 GENERAL SAFETY INSTRUCTIONS

WARNING



If this device is used in a manner not specified in this document, the protection provided by the instrument may be impaired and the warranty will be voided.

WARNING



When installing, maintaining, or using the LFBI, you will be in the vicinity of a YLR-Series laser or a YLR-U laser. Whenever you are in the vicinity of a laser, you must follow all of the safety recommendations in the user guide for the laser.

1.3.1 Electrical Safety

The LFBI operates on 24V DC input.

You must always earth-ground the LFBI. Refer to Figure 1-7 on page 14 for the earth-ground.

WARNING



Do not operate LFBI in a wet environment.

WARNING



Never open the LFBI chassis. there are no user-serviceable parts, equipment, or assemblies inside the LFBI chassis. Internal service and maintenance should only be performed by qualified IPG personnel.

WARNING



All electrical, Ethernet, and data connections must be connected prior to applying power to the LFBI. In addition and where applicable, all connections must be secured with screws to ensure proper functionality.

WARNING



The external power supply and I/O connections to this product need to be PELV (Protected Extra-Low Voltage) or SELV (Safety Extra-Low Voltage) as defined by IEC 61140.

1.3.2 Environmental Safety

IMPORTANT



Do not dispose of this device with domestic waste. Electronic devices must be disposed of according to the regional directives on electronic and electric waste disposal.

WARNING



Ensure that all Personal Protective Equipment (PPE) is suitable for the output power and wavelength range listed on the laser safety labels that are affixed to the YLR-Series laser.

The equipment is designed for: (1) Indoor Use (non-residential), (2) Operation at less than 2,000 meters altitude, (3) Over Voltage Category I, (4) Pollution Degree 2, and (5) Dry Locations. Refer to the product specification for additional information.

This equipment is not suitable for use in locations where unprotected persons or children may be present. Keep away from sources of shock or vibration.

The operating ambient temperature range for the LFBI is 0-50°C.

The ambient temperature range for storage of the LFBI is -20 to + 70°C.

The LFBI must not operate at temperatures outside the ambient dew-point range associated with relative humidity of 30-90% (non-condensing).

1.4 ADDITIONAL SAFETY INFORMATION

For additional information regarding laser safety, refer to the following:

- **Laser Institute of America (LIA)**
12001 Research Parkway, Suite 210
Orlando, FL 32826
Toll Free: 1.800.345.2737
Telephone: +1.407.380.1553
Fax: +1.407.380.5588
- **American National Standards Institute (ANSI)**
ANSI Z136.1, American National Standard for the Safe Use of Lasers
ANSI Z49.1, Safety in Welding, Cutting, And Allied Processes
(Available through LIA)
- **International Electrotechnical Commission (IEC)**
IEC 60825-1, Safety of Laser Products - Part 1: Equipment Classification and Requirements
(Available through LIA)
- **Center for Devices and Radiological Health (CDRH)**
21 CFR 1040.10: Performance Standards for Light-Emitting Products US
- **US Department of Labor - OSHA**
29 CFR 1910 Subpart I - Personal Protective Equipment
 - 1910.132, General requirements
 - 1910.133, Eye and face protection
- **Laser Safety Equipment**
Laurin Publishing: Laser Safety Equipment and Buyer's Guides

IMPORTANT



IPG recommends that the user of this product investigate any local, state, or country requirements as well as facility or building requirements that might apply to installing or using a laser, laser device, or laser accessory. Ensure that the standards you are using (such as ANSI, IEC, and OSHA) are current.

1.5 CONTENTS OF THE SHIPPING PACKAGE

All shipping packages contain the LFBI unit and the 3W3 power connector, pins, and shell. Each shipping package also contains a Connector Kit that is specific to the YLR-client laser for which the LFBI unit was ordered.

IMPORTANT	
	DO NOT ATTEMPT TO INSTALL OR OPERATE THE LFBI IF ANY DAMAGE TO THE DEVICE IS EVIDENT OR SUSPECTED. Please keep all original packing materials for reference and for storage or transportation. If any items are missing, or if any damage to the unit is evident, immediately contact IPG Customer Service at 508-373-1157 or email support@ipgphotonics.com.

1.5.1 Contents of the Shipping Package for YLR-Series Lasers

- The LFBI unit¹
- *Laser Field Bus Interface User Guide* (DOCOXUGMPLEN0005)
- Connector Kit for the YLR-Series Lasers (CEU00004164XXXXU), which includes the following items:
 - 3W3 power connector kit (CEU00004240XXXXU)
 - Digital DB26HDM Cable (CEU00004207XXXXU)
 - Analog DB15M Cable (CEU00004208XXXXU)
 - RS-232 DB9M Cable (CEU00004209XXXXU)

1.5.2 Contents of the Shipping Package for YLR-U Lasers

- The LFBI unit¹
- *Laser Field Bus Interface User Guide* (DOCOXUGMPLEN0005)
- Connector Kit for the YLR-U Lasers (CEU00004165XXXXU)
 - 3W3 power connector kit (CEU00004240XXXXU)
 - DB26HDM/DB15M-to-DB25F Cable (CEU00004205XXXXU)
 - DB9M-to-DB9F Serial Cable (CEKBXXX0000446PX)

IMPORTANT	
	The Ethernet cables for Diagnostic Ethernet and Field Bus are NOT included in the shipping package; they are supplied by the customer.

1. The LFBI unit is available under three different Item Numbers (CEU45010381**D00**XU, CEU45010381**D01**XU, and CEU45010381**D02**XU) depending on the Field Bus protocol running on the unit. Refer to Table 1-1 on page 10 for a description of the Field Bus protocol running on each Field Bus unit.

1.6 MANUFACTURER INFORMATION

IPG products are designed, engineered, and manufactured by IPG Photonics Corporation. All products are tested and comply with the published specifications prior to shipping. Most issues and questions regarding the safety, setup, operation, and maintenance of the product can be resolved by carefully reading this User Guide. If additional assistance is required, please contact IPG Customer Service at 508-373-1157 or email support@ipgphotonics.com.

1.7 CERTIFICATION

IPG Photonics certifies that your system is thoroughly tested and inspected and meets published specifications prior to shipping. Upon receiving your device, check the packaging and parts for any possible damage that might have occurred in transit. If there is damage, contact IPG Photonics immediately.

IMPORTANT



It is the responsibility of the purchaser/end-user to bring the end system into compliance with all applicable regulations.

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USING THE LASER FIELD BUS INTERFACE

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2.1 MOUNTING THE DEVICE

The LFBI unit can be mounted horizontally or vertically on the DIN rail or with a mounting flange.

The DIN-rail mount comes center mounted, but it may be adjusted higher or lower by inserting the screws in the upper or lower set of holes instead of the center holes.

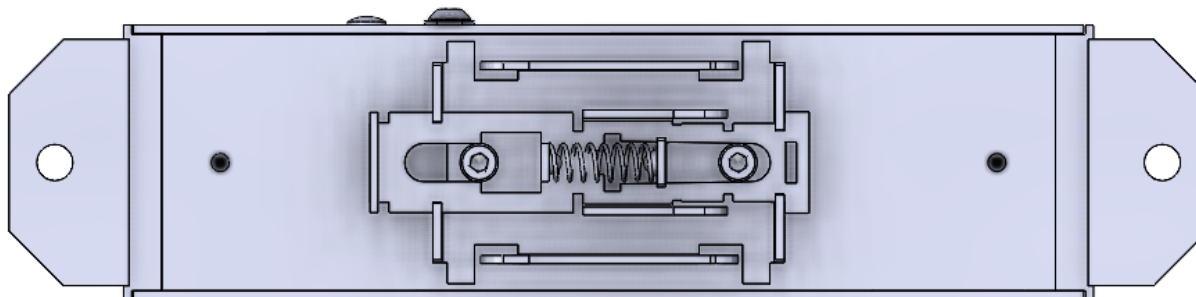


Figure 2-1. DIN Rail Mounts on the LFBI

The mounting tabs on either side of the LFBI may be removed to reduce the footprint of the unit. Remove the mounting bracket and replace it using four 8mm M2.5 x 0.45 screws. (**NOTE:** The screw *length* is 8mm, and the thread pitch is 0.45.)

CAUTION



When mounted, the LFBI must be secured from moving on the DIN rail, especially if it is in a vertical orientation. End blocks or end stops can be used to prevent the LFBI from sliding down the rail.

The LFBI can be removed from the DIN rail by retracting the spring-loaded latch. Hold the LFBI unit securely when removing it from the DIN rail.

2.2 CONNECTING POWER TO THE LFBI

Power is supplied to the LFBI by a customer-supplied 3W3 power cable. The connector kit for the 3W3 power cable is supplied in the shipping package.

NOTE: You must wire your own 3W3 power cable for the LFBI. The maximum length of the 3W3 power cable is 5 meters (16 feet).

IMPORTANT



The safety of any system incorporating the LFBI is the responsibility of the assembler of the system.

The following figure shows the pin connections for the 3W3 connector and contacts.

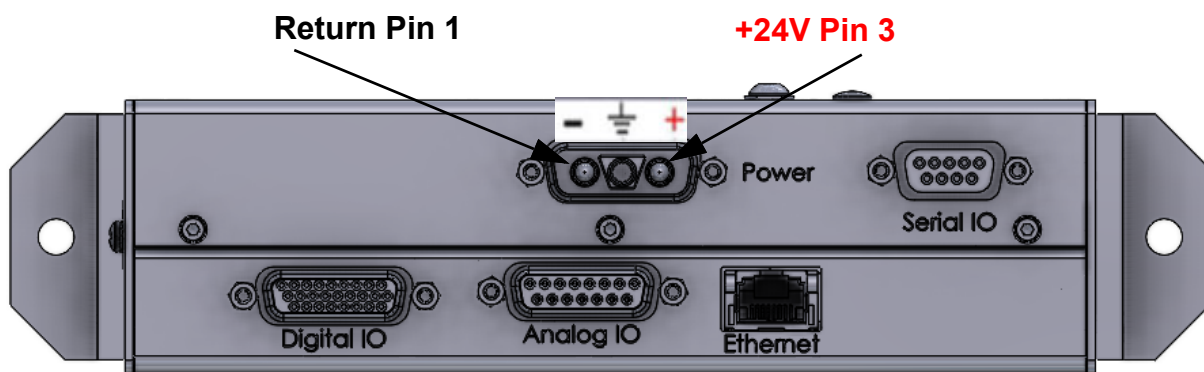


Figure 2-2. Pin Connections for the 3W3 Connector and Contacts

The following figures show the rear (solder side) and the front of the 3W3 connector.

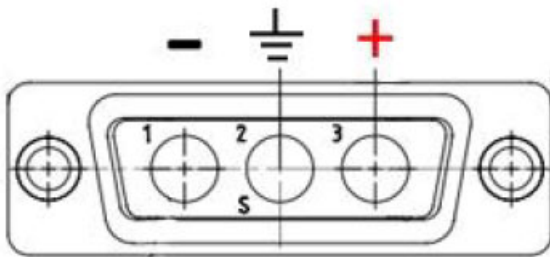


Figure 2-3. Rear Side of the 3W3 Connector

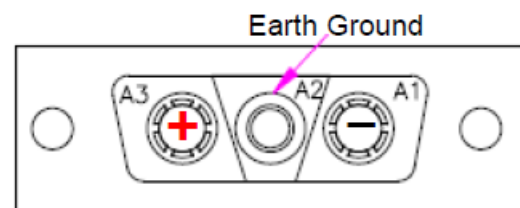


Figure 2-4. Front Side of the 3W3 Connector

The following table shows the name and function of each of the three pins on the 3W3 connector and the maximum current for Pin 3.

Table 2-1. Name and Function of Each Pin on the 3W3 Power Connector

PIN	NAME	FUNCTION	CURRENT, MAXIMUM AMPS
1	-GROUND	Return for 24 Volts	N/A
2	CASEGND	Earth Ground	N/A
3	+ 24Volts DC	+24 VDC +/-10%	1 Amp Maximum

IMPORTANT



To meet the requirements of the 4A fuse in the LFBI, a shielded cable with a minimum of 20 AWG 75°C wire must be used. The drain of the shield must be secured to the D-sub connector shell.

CAUTION



Do not connect -GROUND to CASEGND. Doing so can damage the LFBI unit.

IMPORTANT



IPG recommends connecting a low-impedance wire or braid that is as short as practical from the Functional Earth screw to Earth ground.

2.3 CONNECTING THE LFBI TO THE LASER

The following section describes how to connect the LFBI to a YLR-Series laser.

Section 2.3.2 on page 30 describes how to connect the LFBI to a YLR-U laser.

2.3.1 Connecting the LFBI to a YLR-Series Laser

The LFBI communicates with the YLR-Series laser using the digital cable, analog cable, and RS-232 (serial) cable that are supplied in the Connector Kit (p/n CEU00004164XXXXU). The three cables connect to the YLR-Series laser via the Harting 24-pin Interface Connector.

The following sections provide the pin assignments for the RS-232 (serial), digital, analog, and 24-pin Harting I/O connections to the YLR-Series laser.

2.3.1.1 Pin Assignments for Serial I/O

The following figure shows the pin numbering of the DB9 female connector on the RS-232 (serial) data cable.

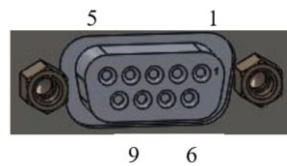


Figure 2-5. Pin Numbering of the DB9 Female Connector on the RS-232 (Serial) Data Cable

The maximum intended input on the RS-232 connector is $\pm 12\text{V}$ nominal.

The following table shows the pin assignments for the DB9 female connector on the RS-232 (serial) data cable (p/n CEU00004209XXXXU).

Table 2-2. Pin Assignments for the DB9 Female Connector on the RS-232 (Serial) Data Cable

SOCKET	DESCRIPTION
1	Reserved—Do not connect
2	Receive Data Output
3	Transmit Data Input
4	Reserved—Do not connect
5	Ground
6	Reserved—Do not connect
7	Reserved—Do not connect
8	Reserved—Do not connect
9	Reserved—Do not connect

2.3.1.2 Pin Assignments for Digital I/O

The following table shows the pin assignments for the DB26HD female connector on the digital data cable (p/n CEU00004207XXXXU).

Table 2-3. Pin Assignments for the DB26HD Female Connector on the Digital Data Cable^a

DSUB	ID	I/O	DSUB	ID	I/O	DSUB	ID	I/O
1	+V Logic	+24V logic	10	GND Customer	Logic Return	18	DI4	Input
2	DO0	Output	11	GND Customer	Logic Return	24	GND Customer	Logic Return
3	DO1	Output	14	DI0	Input	25	GND Customer	Logic Return
4	DO2	Output	15	DI1	Input	26	GND Customer	Logic Return
5	DO3	Output	17	DI3	Input			

a. The following pins are not used on the digital data cable (p/n CEU00004207XXXXU): 6, 7, 8, 9, 12, 13, 16, 19, 20, 21, 22, and 23.

- Four 24VDC-capable configurable digital inputs are available.
- Four 24VDC-capable programmable digital outputs are available.
- In order for pins 1 and 24 to function, +24V and return must be supplied to them.

2.3.1.3 Pin Assignments for Analog I/O

The following table shows the pin assignments for the DB15 female connector on the analog data cable (p/n CEU00004208XXXXU).

NOTE: As shown in the following table, pins 1, 2, and 11 are used on the DB15 Female Connector for both the YLR lasers and the YLR-U lasers. Pin 13 is only used for the YLR-U lasers. Pins 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, and 15 are reserved.

Table 2-4. Pin Assignments for the DB15 Female Connector on the Analog Data Cable

DSUB	ID	I/O
1 ^a	AO	Output
2 ^a	GND Customer	Return
11 ^a	AIO	Input
13 ^b	AI1	Input

a. Used for YLR lasers and YLR-U lasers

b. Used only for YLR-U lasers

- The analog inputs and outputs have scale factors to adjust I/O to exactly 10V full scale.
- Two programmable analog inputs are available for 0 - 10V input (laser outputs).
- Four user-configurable analog outputs are available for 0 to 10V. One of the four outputs is capable of $\pm 10V$.

2.3.1.4 Connections from the LFBI to the YLR Client Laser

The pin connections from the LFBI to the 24-pin Harting Interface Connector on the YLR client laser will vary according to the firmware that is installed on the LFBI.

NOTE: Refer to the Support Screen to find the firmware type that is installed on the LFBI. To display the Support Screen, click on the **Support** tab from any screen in the LFBI Web Interface. Figure 2-23 on page 48 shows an example of the Support Screen.

Figure 2-6 (below) shows the pin connections to a YLR client laser for an LFBI that is running the Standard firmware.

Figure 2-7 on page 30 shows the pin connections to a YLR client laser for an LFBI that is running the Monitor-Only firmware.

NOTE: The 24-pin Harting Connector with pins and shell (p/n P30-007268) can be ordered separately. For more information, contact IPG Customer Service at 508-373-1157 or support@ipgphotonics.com.

► Connections to the YLR Client Laser from an LFBI with Standard Firmware Installed

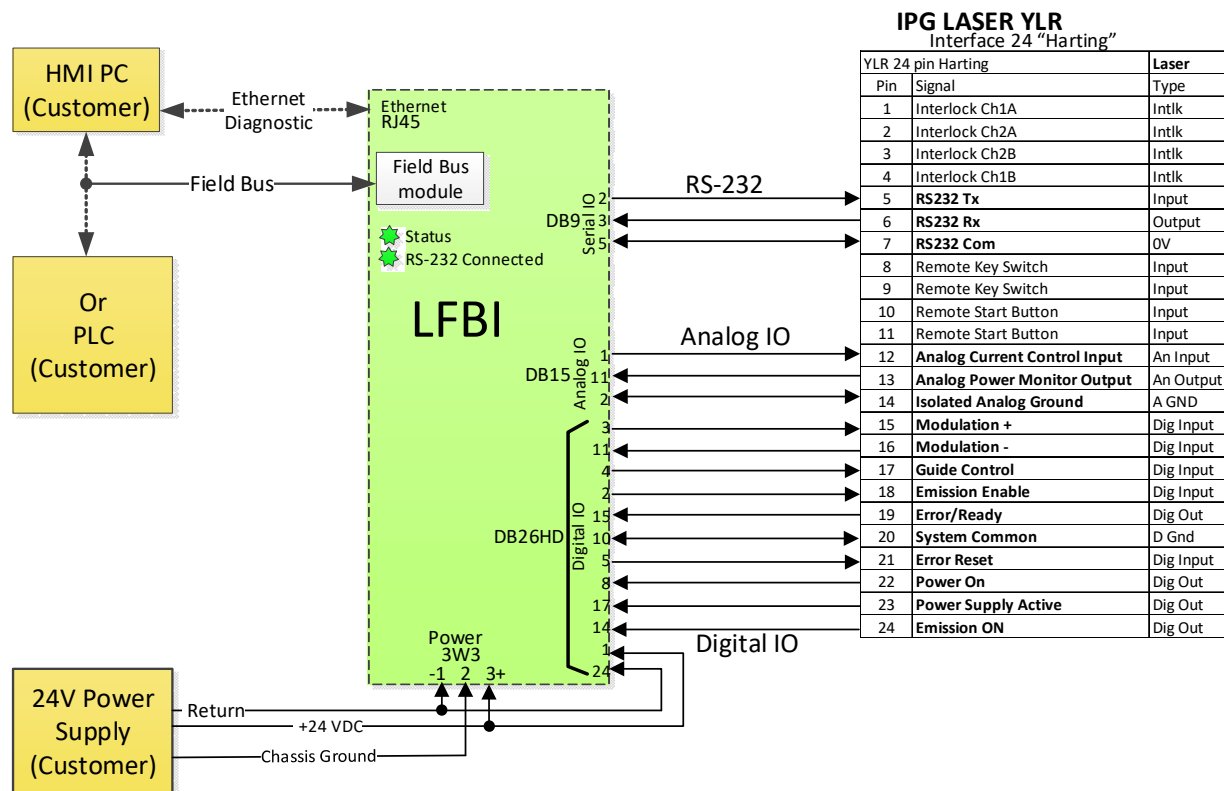


Figure 2-6. Connections to the YLR Client Laser from an LFBI with Standard Firmware Installed

► Connections to the YLR Client Laser from an LFBI with Monitor-Only Firmware Installed

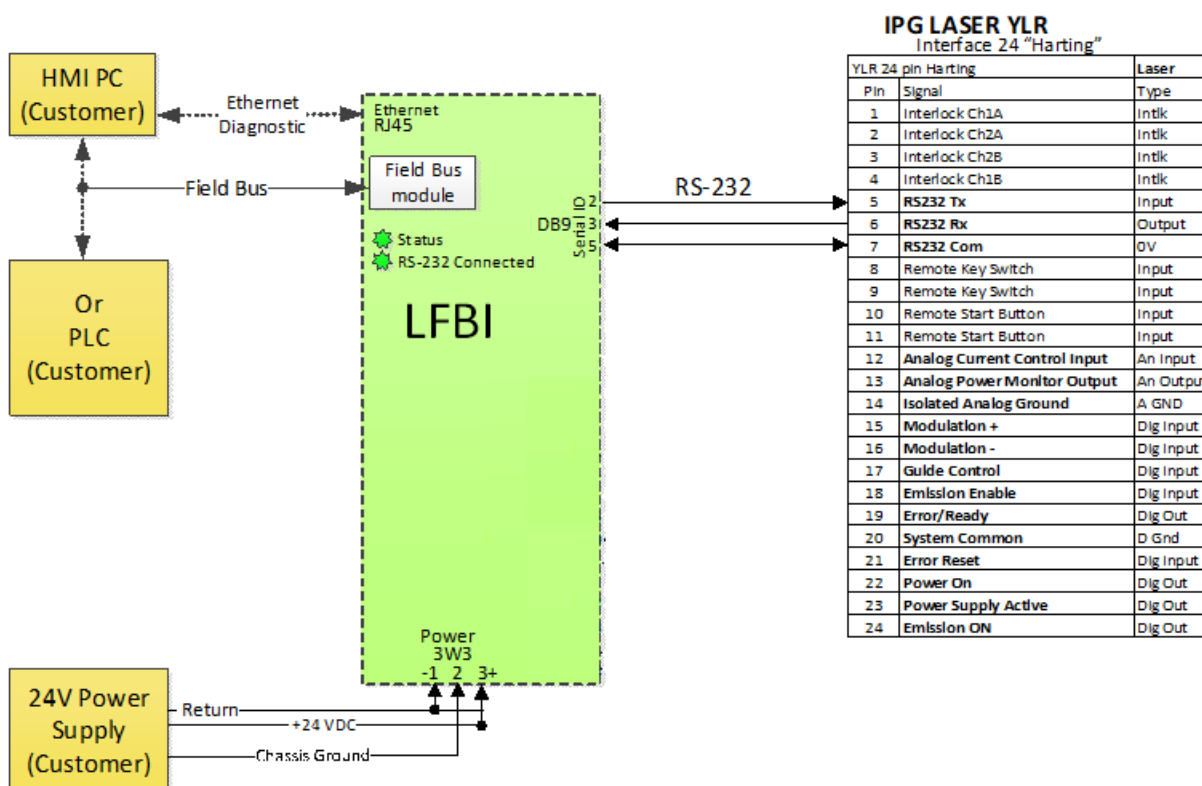


Figure 2-7. Connections to the YLR Client Laser from an LFBI with Monitor-Only Firmware Installed

2.3.2 Connecting the LFBI to a YLR-U Laser

The LFBI communicates with YLR-U lasers via the analog and digital I/O cable (p/n CEU00004205XXXXU) or the serial I/O cable (p/n CEKBXXX0000446PX) that is supplied in the Connector Kit.

The analog and digital I/O cable connects to the YLR-U laser via the Interface Connector. The serial I/O cable connects to the YLR-U laser via the RS-232 Connector.

You do not need to assemble connectors and attach them to these cables; both the digital cable (p/n CEU00004205XXXXU) and the serial cable are delivered fully assembled in the shipping package.

The following figure shows the digital and serial connectors on a YLR-U Laser.

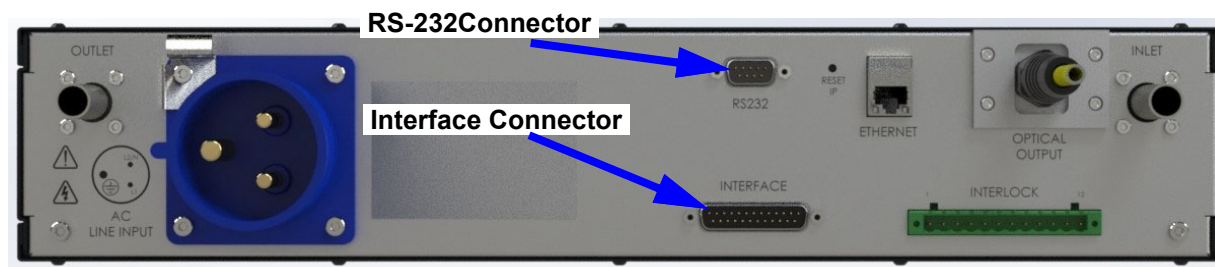


Figure 2-8. Digital and Serial Connectors on the YLR-U Laser

The following figure shows the digital, analog, and serial connectors on the LFBI.

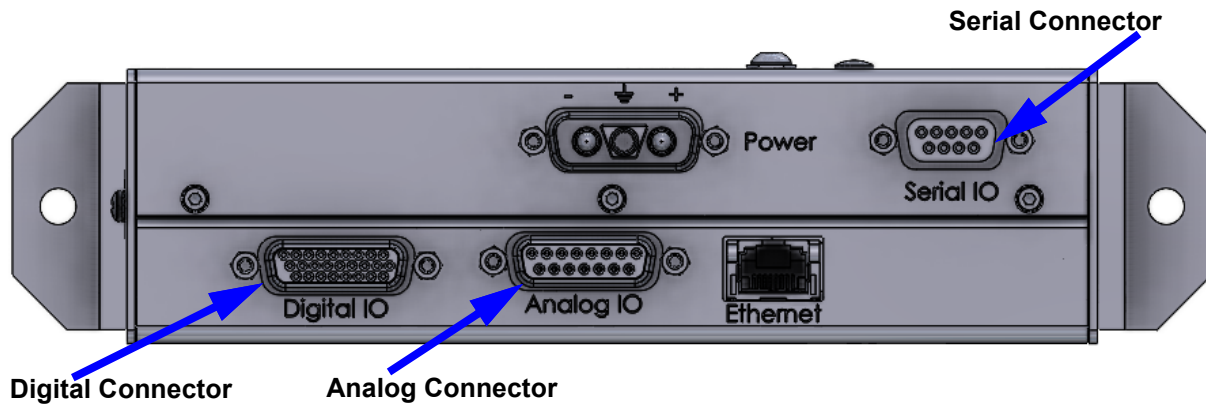


Figure 2-9. Digital and Serial Connectors on the LFBI

The following sections provide the pin assignments for the digital and serial I/O connections to the YLR-U lasers.

2.3.2.1 Pin Assignments for Digital and Analog I/O

The following table shows the pin assignments for the DB26HD female connector on the analog and digital I/O cable (p/n CEU00004205XXXXU).

NOTE: The analog and digital I/O cable (p/n CEU00004205XXXXU) includes Analog I/O pins in addition to Digital I/O pins. Table 2-5 (below) shows the Analog and Digital pins on the this digital data cable.

Table 2-5. YLR-U Pin Assignments for the DB26HD Female Digital IO and DB15 Analog IO Connectors

LFBI PIN #	ID	I/O	DIGITAL/ANALOG
A 1	AO0	Input	Analog
A 11	AI0	Output	Analog
A 2	GND Customer	Signal Return	Analog
A 13	AI1	Output	Analog
D 3	DO1	Input	Digital
D 4	DO2	Input	Digital
D 2	DO0	Input	Digital
D 15	DI1	Output	Digital
D 5	DO3	Input	Digital
D 14	DI0	Output	Digital
D 16	DI2	Output	Digital
D 1	5VDC Customer		Digital
D 24	GND Customer		Digital
D10	GND Customer	Signal Return	Digital
D11	GND Customer	Signal Return	Digital

2.3.2.2 Connections from the LFBI to the YLR-U Client Laser

The pin connections from the LFBI to the Serial IO Male DB9 Interface, and the DB25 Male Interface, on the YLR-U client laser will vary according to the firmware that is installed on the LFBI.

NOTE: Refer to the Support Screen to find the firmware type that is installed on the LFBI. To display the Support Screen, click on the **Support** tab from any screen in the LFBI Web Interface. Figure 2-23 on page 48 shows an example of the Support Screen.

Figure 2-10 (below) shows the pin connections to a YLR-U client laser for an LFBI that is running the Standard firmware.

Figure 2-11 on page 33 shows the pin connections to a YLR-U client laser for an LFBI that is running the Monitor-Only firmware.

► Connections to the YLR Client Laser from an LFBI with Standard Firmware Installed

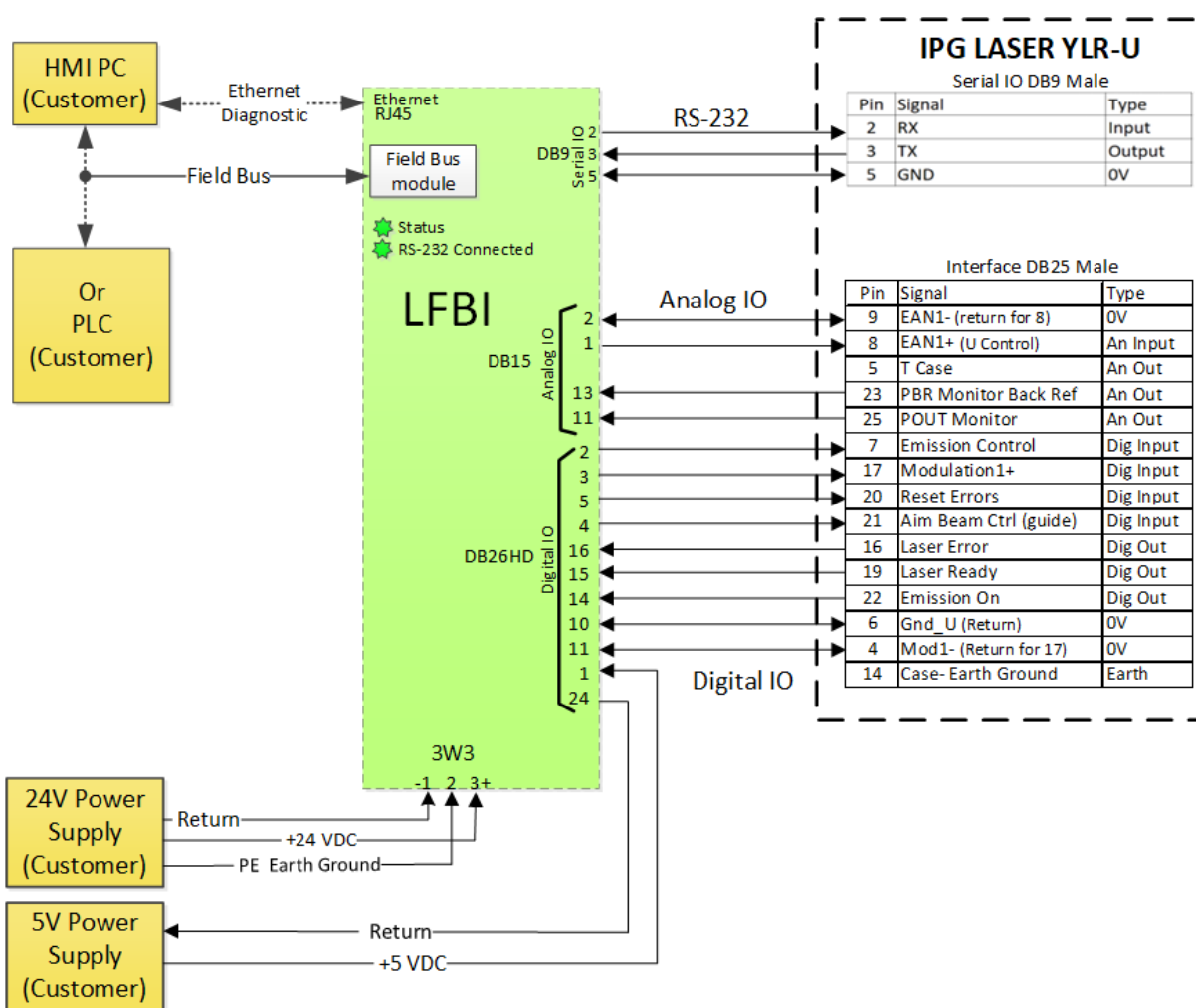


Figure 2-10. Connections to the YLR-U Client Laser from an LFBI with Standard Firmware Installed

► **Connections to the YLR-U Client Laser from an LFBI with Monitor-Only Firmware Installed**

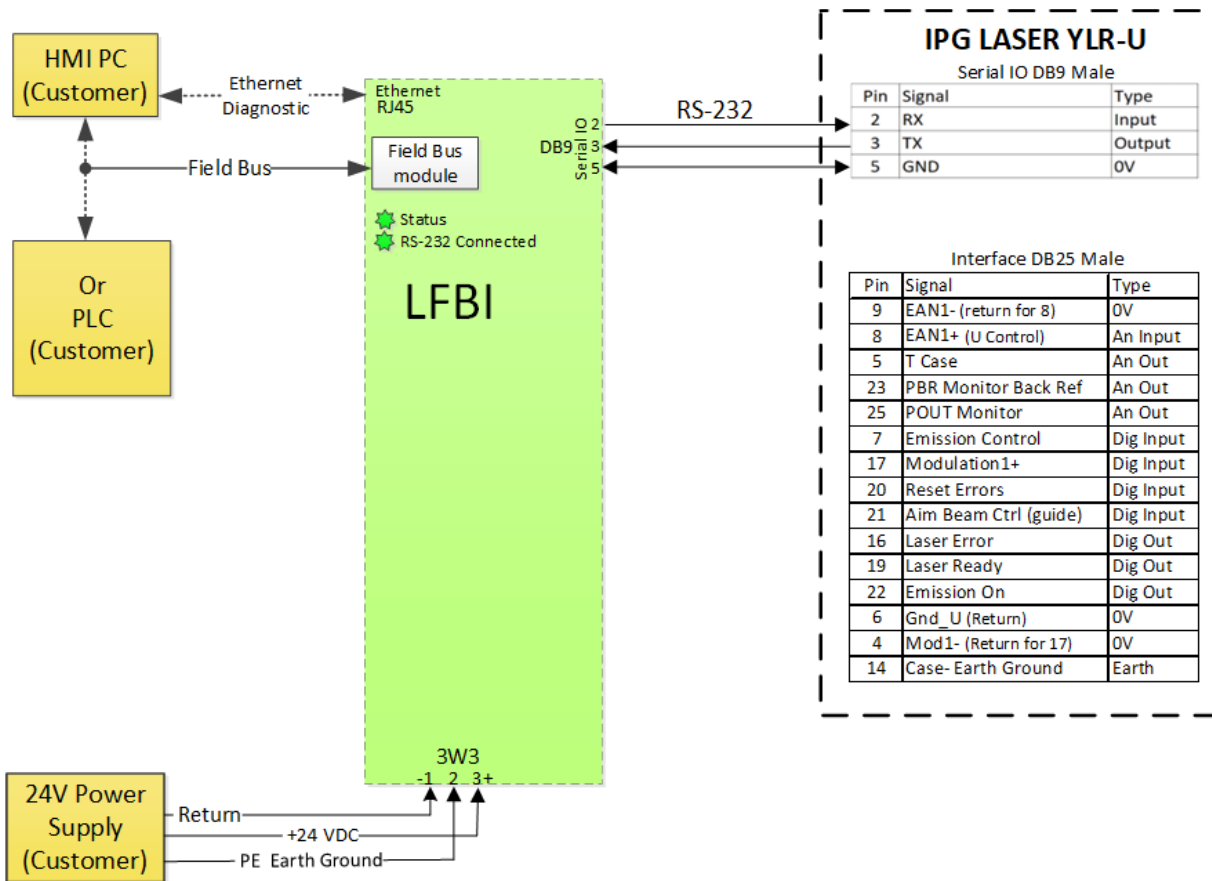


Figure 2-11. Connections to the YLR-U Client Laser from an LFBI with Monitor-Only Firmware Installed

2.4 SUPPORTED FIELD BUS PROTOCOLS

Each LFBI unit supports one of three Field Bus protocols. The Item Number of the LFBI unit indicates the Field Bus protocol that the unit supports:

- **Item Number CEU45010381D00XU** – supports the EtherCAT protocol
- **Item Number CEU45010381D01XU** – supports the Ethernet/IP protocol
- **Item Number CEU45010381D02XU** – supports the PROFINET protocol

This section provides information on each of the three supported protocols and information on the meanings of the LED states for the LEDs on the right-side panel of the LFBI.

Refer to the *IPG YLR-Series Field Bus Interface Specification* (DOCXISCOMXX0002) for information on cyclical messaging between the LFBI and the Field Bus. To access this specification, go to IPG's FTP site (software.ipgphotonics.com) and click on the folders in the following path: **YLR->YLR Laser Fieldbus Interface->Documents**.

The LFBI uses a Hilscher embedded module to provide the protocol interface. The Hilscher embedded module is configured as a protocol handler, and its model number is COMX 51CA-RE.

2.4.1 The System LED

As shown in the following figure, the System LED is below the Status 1 LED on the right-side panel of the LFBI unit. The System LED provides information on power to the LFBI unit and information on the LFBI hardware, operating system, and bootloader. The meanings of the System LED states are the same for all LFBI's, regardless of the Field Bus protocol running on the unit.

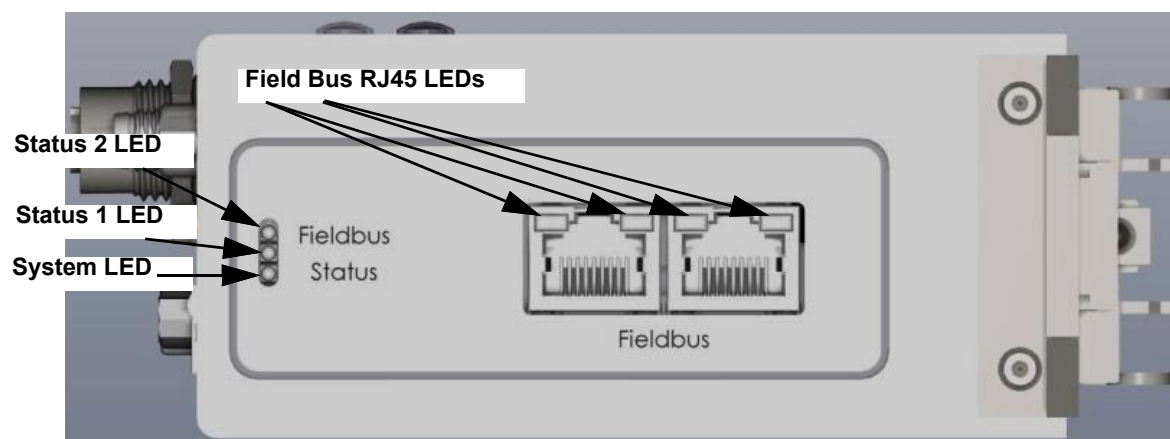


Figure 2-12. LEDs on the Right-side Panel of the LFBI

Table 2-6 describes the states of the System LED for all LFBI units.

Table 2-6. States of the System LED for the EtherCAT Protocol

Color	State	Meaning
	Off	The power supply is off, or there is a hardware defect.
	On	The operating system is running.
	Blinking	The second stage bootloader is waiting for firmware. NOTE: Contact IPG Customer Service if this state occurs.
	On	The second stage bootloader is missing. NOTE: Contact IPG Customer Service if this state occurs.

2.4.2 EtherCAT Protocol

Table 2-7 describes the states of the Status LEDs and the Field Bus RJ45 LEDs for LFBI units that support the EtherCAT protocol (Item Number CEU45010381D00XU).

Table 2-7. States of the Status LEDs for the EtherCAT Protocol

LED	Color	State	Meaning
Status 1 (Run)		Off	No Connection
		On	The Device is operational
		Blinking	Pre-operational state
		Flash	Safe-operational state
Status 2 (Error)		Off	No Error
		Blinking	Invalid Configuration NOTE: Contact IPG Customer Service if this state occurs.
		1 Flash	Local Error NOTE: Contact IPG Customer Service if this state occurs.
		2 Flash	Application watchdog timeout
RJ45		On	Ethernet connection is established
		Flashing	Transmitting and receiving data
		Off	No Connection NOTE: The yellow LED always remains off with this protocol.

2.4.2.1 Notes on Wiring EtherCAT

- Use the left-side RJ45 connector for input to the LFBI and the right-side RJ45 connector for output from the LFBI.
- Use shielded Ethernet cables that meet the requirements of at minimum category 5 (CAT 5) as indicated in EN50173 or ISO/IEC 11801.
- Do not use hubs in an EtherCAT network.
- Use switches only between EtherCAT controller and first EtherCAT receiver device (100 Mbit/s, Full Duplex).
- The cable length between two EtherCAT devices must not exceed 100 meters.
- The order of connection and power-up of devices must match what is specified in the controller.

2.4.2.2 Endianness (Byte Order) and IP Address

The Endianness setting (**Little** or **Big**) can be made on the IO Configuration Screen (see Section 2.5.2 on page 44).

The Endianness setting for the LFBI must match the Endianness setting for the Field Bus Master. The Endianness setting for EtherCAT is typically **Little**.

Endianness changes made with the radio buttons take effect immediately and are automatically saved.

The IP address for the EtherCAT handler is dynamic rather than fixed; there is no option for setting the IP address of an LFBI units that support the EtherCAT protocol (Item Number CEU45010381D00XU).

2.4.2.3 EtherCAT Configuration Files

Two EtherCAT configuration files are available for use by an EtherCAT Fieldbus master when configuring the LFBI. The two files are the following:

- Hilscher COMX 51XX RE ECS V4.2.X IPG YLR Series *[LFBI_firmware_rev].xml*
- Hilscher COMX 51XX RE ECS V4.6.X IPG YLR Series *[LFBI_firmware_rev].xml*

where *[LFBI_firmware_rev]* is the revision level of the LFBI firmware

The V4.2.X variant is generally compatible with most PLC masters. The V4.6.X variant is included for compatibility when configuring the LFBI with Hilscher PLC masters.

To access either file, go to IPG's FTP site (software.ipgphotonics.com) and click on the folders in the following path: **YLR->YLR Laser Fieldbus Interface->Configuration Files->EtherCAT**.

2.4.3 EtherNet/IP Protocol

Table 2-8 describes the states of the Status LEDs and the Field Bus RJ45 LEDs for LFBI units that support the EtherNet/IP protocol (Item Number CEU45010381D01XU).

Table 2-8. States of the Status LEDs for the EtherNet/IP Protocol

LED	Color	State	Meaning
Status 1		Off	No power
		On	Device operational
		Flashing	Standby: Device not configured
		On	Major, non-recoverable fault NOTE: Contact IPG Customer Service if this state occurs.
		Flashing	Minor, recoverable fault
		Flashing	Self-test: Power-up test
Status 2		Off	No Communication to master
		On	Connected: The device has established a network connection
		Flashing	No connection
		On	Duplicate IP: another device has the same IP address
		Flashing	Connection timeout
		Flashing	Self-test: Power-up test
RJ45		On	Ethernet connection is established
		Off	No connection
		Flashing	Transmitting and receiving data

You can use the IO Configuration Screen to change the IP address of the Field Bus ports (see Section 2.5.2.1 on page 44); enter the new IP address in the appropriate field of the IO Configuration Screen and click the **Save** button. After changing the IP address, you must power-cycle the LFBI to make the new IP address take effect.

You can also use the IO Configuration Screen to change the Endianness setting of the LFBI. Endianness changes made with the radio buttons take effect immediately and are automatically saved. (**NOTE:** The Endianness setting of the LFBI is typically **Little**. The Endianness setting for the LFBI must match the Endianness setting for the Field Bus Master.)

2.4.3.1 EtherNet/IP Configuration Files

The EtherNet/IP EDS configuration file can be used by an EtherNet/IP Fieldbus master when configuring the LFBI. The filename of the EtherNet/IP EDS configuration file is the following:

- **HILSCHER COMX 51XX-RE EIS V1.1 IPG YLR Series *[LFBI_firmware_rev]*.EDS**

where *[LFBI_firmware_rev]* is the revision level of the LFBI firmware

To access the file, go to IPG's FTP site (software.ipgphotonics.com) and click on the folders in the following path: **YLR->YLR Laser Fieldbus Interface->Configuration Files->EthernetIP.**

For devices that do not accept an EDS file, the following configuration should be used:

Table 2-9. Configuration for Devices that Do Not Accept an EDS File

PARAMETER	VALUE
Output Assembly Instance	100
Output Assembly Data Type	byte
Output Assembly Length (bytes)	16
O->T (output) Real Time Format	Heartbeat
Input Assembly Instance	101
Input Assembly Data Type	byte
Input Assembly Length (bytes)	16
T->O (input) Real Time Format	Heartbeat
Configuration Assembly Instance	1
Configuration Size (bytes)	0

2.4.4 PROFINET Protocol

Table 2-10 describes the states of the Status LEDs and the Field Bus RJ45 LEDs for LFBI units that support the PROFINET protocol (Item Number CEU45010381D02XU).

Table 2-10. States of the Status LEDs for the PROFINET Protocol

LED	Color	State	Meaning
Status 1		Off	No error
		On	Watchdog timeout NOTE: Contact IPG Customer Service if this state occurs.
		Flashing	DCP signal service initiated
Status 2		Off	No error
		On	No configuration or no connection NOTE: Contact IPG Customer Service if this state persists.
		Flashing	No data exchange
RJ45		On	Ethernet connection is established
		Off	No connection
		Flashing	Transmitting and receiving data

You can use the IO Configuration Screen to change the IP address of the Field Bus ports (see Section 2.5.2.2 on page 45); enter the new IP address in the appropriate field of the IO Configuration Screen and click the **Save** button. After changing the IP address, you must power-cycle the LFBI to make the new IP address take effect.

You can also use the IO Configuration Screen to change the Endianness setting of the LFBI. Endianness changes made with the radio buttons take effect immediately and are automatically saved. (**NOTE:** The Endianness setting for an LFBI running PROFINET is typically **Big**. The Endianness setting for the LFBI must match the Endianness setting for the Field Bus Master.)

2.4.4.1 PROFINET Configuration File

The PROFINET configuration file can be used by a PROFINET Fieldbus master when configuring the LFBI. The filename of the PROFINETS configuration file is the following:

- **GSDML-V2.33-HILSCHER-COMX 51XX-RE PNS IPG YLR Series *_LFBI_firmware_rev_*-20220217.xml**
where *_LFBI_firmware_rev_* is the revision level of the LFBI firmware

To access the file, go to IPG's FTP site (software.ipgphotonics.com) and click on the folders in the following path: **YLR->YLR Laser Fieldbus Interface->Configuration Files->Profinet.**

2.5 USING THE LFBI WEB INTERFACE

You can use the LFBI Web Interface to control the LFBI, monitor and control the YLR-client laser, or put the YLR-client laser under the control of the Field Bus Master.

To access the LFBI Web Interface, browse to the IP address of the LFBI from the host computer of the LFBI.

The supported browsers for the LFBI Web Interface are Edge, Chrome, and Firefox. The use of unsupported browser versions may result in refresh issues or reduced functionality.

NOTE: In this user guide, the “ND” field appears at the top of each screen in the LFBI Web Interface. It is used as a placeholder for the LFBI Serial Number, which would appear in that location if the LFBI Web Interface were being run on an actual LFBI.

IMPORTANT



Each screen in the LFBI Web Interface includes a **login** button and a **logout** button. The **login** and **logout** buttons are for internal use by IPG personnel.

2.5.1 The Control Screen

The Control Screen is the first screen that displays when you browse to the IP address of the LFBI. You can also display the Control Screen by clicking the **Control** tab from any screen of the LFBI Web Interface.

The Control Screen contains control commands for the client laser, status LEDs for the client laser, and checkboxes for selecting the operating mode of the LFBI.

Figure 2-13 shows an example of the Control Screen with **FieldBus Mode** selected.

ND

Fieldbus Laser Controller

Control Settings IO Config Calibration Support login logout

Module Operation

FieldBus mode:	☒
Monitor Only:	☐
Power Setpoint (%):	50.0
Power Setting (%):	12.26%
Power Output:	12.26%
Back Reflection:	~-~%
Case Temperature:	23.4°C
Modulation Frequency (kHz):	10.00
Modulation Duty Cycle (%):	25
Emission:	On Off
Modulation:	On Off
Guide Beam:	On Off
Reset Errors:	On Off

Emission On:	☒	Back Reflection High:	☐
Modulation On:	☒	Case Temperature High:	☐
Guide Beam On:	☒	Case Temperature Low:	☐
Main Power On:	☒	Interlock 1 Open:	☐
Power Key On:	☒	Interlock 2 Open:	☐
Laser Ready:	☒	Fiber Interlock Open:	☐
Laser Error:	☐	Critical Error:	☐
RS-232 Link Up:	☒		

Figure 2-13. Example of the Control Screen

The following settings of the Control Screen are in the “on” state when their LEDs are red: **Laser Error**, **Back Reflection High**, **Case Temperature High**, **Case Temperature Low**, **Interlock 1 Open**, **Interlock 2 Open**, **Fiber Interlock Open**, and **Critical Error**.

The following settings of the Control Screen are in the “on” state when their LEDs are green: **Emission On**, **Modulation On**, **Guide Beam On**, **Main Power On**, **Power Key On**, **Laser Ready**, and **RS-232 Link Up**.

When an LED is gray, it means that the setting is “off” or that a status is in its “off” state.

The following sections show the Control Screen as it appears in each operating mode and describe the Control screen features that are available in each operating mode.

2.5.1.1 The Control Screen with Fieldbus Mode Selected

When **Fieldbus Mode** is selected, laser control commands are handled by the Fieldbus master and the LFBI Control page's laser control options are disabled (display-only). This mode is for use in production processing. Figure 2-14 shows the Control Screen with **Fieldbus Mode** selected, **Monitor-Only** deselected, and the Standard Firmware Variant (SWFP000051XXXXXU) installed on the LFBI. .

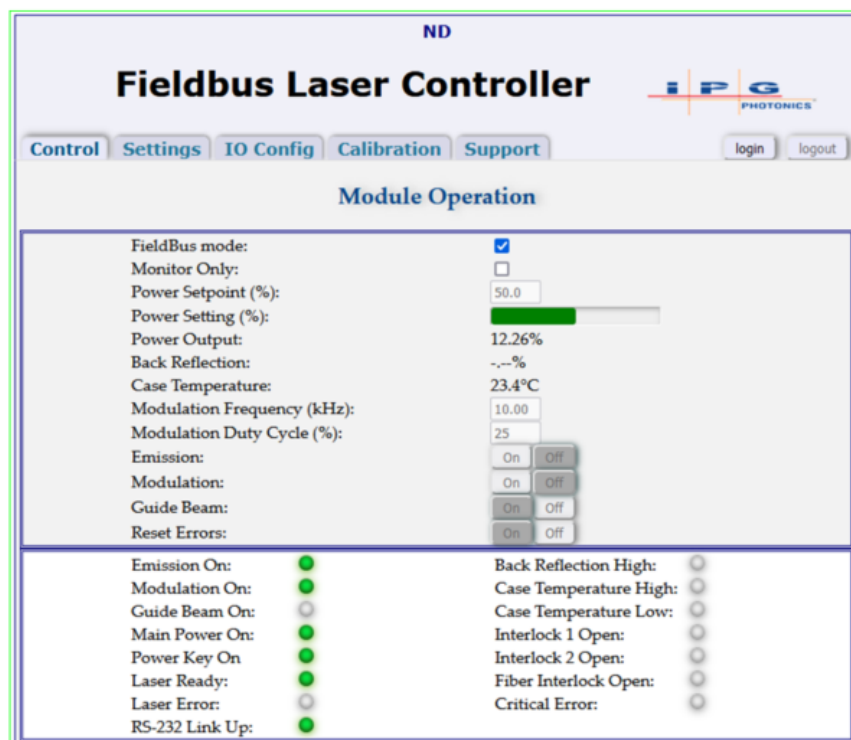


Figure 2-14. Control Screen with Fieldbus Mode Selected

Figure 2-15 shows the Control screen with both **FieldBus mode** and **Monitor Only** selected. With both of these modes selected, the LFBI functions the same as in **Monitor-Only Mode** with one difference: the **Reset Errors** button on the Control Screen of the LFBI Web Interface is display-only and cannot be used to send a command to reset errors on the client laser.

The screenshot displays the 'Fieldbus Laser Controller' web interface. At the top, there is a navigation bar with tabs for 'Control', 'Settings', 'IO Config', 'Calibration', and 'Support'. The 'Control' tab is currently selected. Below the navigation bar, there is a 'login' and 'logout' button. The main section is titled 'Module Operation' and contains a list of parameters and their values, along with control buttons.

Parameter	Value / Control
FieldBus mode:	☒
Monitor Only:	☒
Power Setpoint (%):	50.00%
Power Setting (%):	50.00%
Power Output:	50.00%
Back Reflection:	~.~%
Case Temperature:	23.4°C
Modulation Frequency (kHz):	~.~
Modulation Duty Cycle (%):	~.~
Emission:	On Off
Modulation:	On Off
Guide Beam:	On Off
Reset Errors:	On Off
Emission On:	☒
Modulation On:	☒
Guide Beam On:	☐
Main Power On:	☒
Power Key On:	☒
Laser Ready:	☒
Laser Error:	☐
RS-232 Link Up:	☒
Back Reflection High:	☐
Case Temperature High:	☐
Case Temperature Low:	☐
Interlock 1 Open:	☐
Interlock 2 Open:	☐
Fiber Interlock Open:	☐
Critical Error:	☐

Figure 2-15. Control Screen with Both FieldBus Mode and Monitor-Only Mode Selected

2.5.1.2 The Control Screen with Fieldbus Mode Deselected

When **FieldBus mode** is de-selected, laser control commands are handled by the LFBI Control page's laser control options and the Fieldbus master's control commands are disabled to allow manual control of the laser for testing and calibration. Figure 2-16 shows the Control screen with **FieldBus mode** and **Monitor Only** deselected.

The screenshot displays the 'Fieldbus Laser Controller' interface. At the top, there's a navigation bar with tabs: Control, Settings, IO Config, Calibration, and Support. The 'Control' tab is active. Below the navigation bar, there's a 'Module Operation' section. This section contains a list of control parameters and their current values or settings. The parameters are:

- FieldBus mode: ☐ (deselected)
- Monitor Only: ☐ (deselected)
- Power Setpoint (%): 50.0
- Power Setting (%): 50.0 (with a green progress bar)
- Power Output: 12.36%
- Back Reflection: ~,~%
- Case Temperature: 23.4°C
- Modulation Frequency (kHz): 10.00
- Modulation Duty Cycle (%): 25
- Emission: On (selected), Off (deselected)
- Modulation: On (selected), Off (deselected)
- Guide Beam: On (selected), Off (deselected)
- Reset Errors: On (selected), Off (deselected)

Below the control parameters, there's a status section with two columns of indicators:

- Emission On: ☒
- Modulation On: ☒
- Guide Beam On: ☒
- Main Power On: ☒
- Power Key On: ☒
- Laser Ready: ☒
- Laser Error: ☐
- RS-232 Link Up: ☒
- Back Reflection High: ☐
- Case Temperature High: ☐
- Case Temperature Low: ☐
- Interlock 1 Open: ☐
- Interlock 2 Open: ☐
- Fiber Interlock Open: ☐
- Critical Error: ☐

Figure 2-16. Control Screen with Both FieldBus Mode and Monitor-Only Mode Deselected

Figure 2-17 shows the Control screen with **Monitor Only** selected and **FieldBus mode** de-selected. This means that the LFBI is in **Monitor-Only Mode**. In Monitor-Only mode, the **Reset Errors** command is the only command that can be used on the Control Screen.

The screenshot displays the 'Fieldbus Laser Controller' web interface. At the top, there's a navigation bar with tabs: Control, Settings, IO Config, Calibration, and Support. The 'Control' tab is active. Below the navigation bar, the 'Module Operation' section is visible. It contains a list of parameters and their current values or controls:

- FieldBus mode: ☐ (de-selected)
- Monitor Only: ☒ (selected)
- Power Setpoint (%):
- Power Setting (%):
- Power Output: 50.00%
- Back Reflection: ~.~%
- Case Temperature: 23.4°C
- Modulation Frequency (kHz):
- Modulation Duty Cycle (%):
- Emission: On Off
- Modulation: On Off
- Guide Beam: On Off
- Reset Errors: On Off

Below these parameters, there's a status section with two columns of indicators:

- Emission On: ☒
- Modulation On: ☒
- Guide Beam On: ☐
- Main Power On: ☒
- Power Key On: ☒
- Laser Ready: ☒
- Laser Error: ☐
- RS-232 Link Up: ☒
- Back Reflection High: ☐
- Case Temperature High: ☐
- Case Temperature Low: ☐
- Interlock 1 Open: ☐
- Interlock 2 Open: ☐
- Fiber Interlock Open: ☐
- Critical Error: ☐

Figure 2-17. Control Screen of the LFBI Web Interface in Monitor-Only Mode

2.5.1.3 Differences Between the Monitor-Only and Standard Firmware Variants

The key difference between the Monitor-Only and Standard firmware variants is the scope of LFBI laser control allowed.

The Monitor-Only variant (SWFP000051XXAXXU) assumes that the laser is being controlled by another Fieldbus device in the system's Fieldbus configuration. To avoid conflicts with the Fieldbus device that is actively controlling the laser, this firmware variant restricts the LFBI's laser control so that it only has access to the laser's RESET command. The Monitor-Only firmware variant is also constrained to communicating with the laser over its RS-232 serial link. It does not send laser commands or receive laser status over the LFBI's Digital and Analog I/O ports.

The Standard variant (SWFP000051XXXXXU) assumes that the laser is being controlled by the LFBI module itself, and utilizes both its RS-232 serial link and the LFBI's Digital and Analog I/O ports to control and monitor the laser.

NOTE: On power-up, and whenever the state of the **Monitor-Only** checkbox is changed, both LFBI firmware variants will configure the laser via its RS-232 port for external control.

2.5.2 The IO Config Screen of the LFBI Web Interface

To display the IO Config Screen, click the **IO Config** link from any screen in the LFBI Web Interface.

You can use the IO Config Screen to specify the Endianness setting for all LFBI units and the IP Address, Subnet Mask, and Default Gateway for LFBI units running the Ethernet/IP protocol or the PROFINET protocol.

IMPORTANT	
	The Endianness setting that you specify in the IO Config Screen must match the Endianness setting of the Field Bus Master.

Figure 2-18 (below) shows an example of the IO Config Screen for LFBI units running the Ethernet/IP protocol.

Figure 2-20 on page 45 shows an example of the IO Config Screen for LFBI units running the PROFINET protocol.

Figure 2-20 on page 45 shows an example of the IO Config Screen for LFBI units running the EtherCAT protocol.

2.5.2.1 The IO Config Screen for LFBI Units Running the Ethernet/IP Protocol

The following figure contains an example of the IO Config Screen for an LFBI unit running the Ethernet/IP protocol.

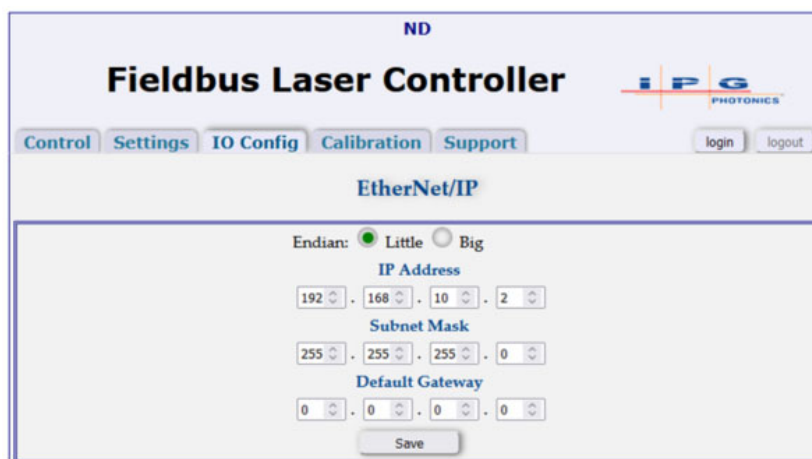


Figure 2-18. IO Config Screen for LFBI Units Running the Ethernet/IP Protocol

To specify the Endianness setting for the LFBI, click the **Little** or **Big** radio button on the IO Config Screen. Endianness changes made with the radio buttons take effect immediately and are automatically saved.

You can specify the Network Settings (IP Address of the Field Bus ports, Subnet Mask, or Default Gateway) by entering values in the appropriate fields of the IO Config Screen.

To save your settings, click the **Save** button in the IO Config Screen.

NOTE: The IP address of the Field Bus ports is *not* to be confused with the IP Address of the Diagnostic Ethernet port. Refer to Section 2.5.3 ("The Network Settings Screen of the LFBI Web Interface") on page 46 for information on setting the IP address of the Diagnostic Ethernet port.

2.5.2.2 The IO Config Screen for LFBI Units Running the PROFINET Protocol

The following figure contains an example of the IO Config Screen for an LFBI unit running the PROFINET protocol.

The screenshot shows the 'Fieldbus Laser Controller' web interface. At the top, there's a navigation bar with tabs: 'Control', 'Settings', 'IO Config' (selected), 'Calibration', and 'Support'. To the right of the tabs are 'login' and 'logout' buttons. Below the navigation bar, the title 'PROFINET' is displayed. The main configuration area includes:

- Endian:** Two radio buttons, 'Little' (selected) and 'Big'.
- IP Address:** Four input fields with values 192, 168, 10, and 2.
- Subnet Mask:** Four input fields with values 255, 255, 255, and 0.
- Default Gateway:** Four input fields with values 0, 0, 0, and 0.
- A 'Save' button at the bottom of the configuration area.

Figure 2-19. IO Config Screen for LFBI Units Running the PROFINET Protocol

To specify the Endianness setting for the LFBI, click the **Little** or **Big** radio button on the IO Config Screen. Endianness changes made with the radio buttons take effect immediately and are automatically saved.

You can specify the Network Settings (IP Address of the Field Bus ports, Subnet Mask, or Default Gateway) by entering values in the appropriate fields of the IO Config Screen.

To save your settings, click the **Save** button in the IO Config Screen.

NOTE: The IP address of the Field Bus ports is *not* to be confused with the IP Address of the Diagnostic Ethernet port. Refer to Section 2.5.3 ("The Network Settings Screen of the LFBI Web Interface") on page 46 for information on setting the IP address of the Diagnostic Ethernet port.

2.5.2.3 The IO Config Screen for LFBI Units Running the EtherCAT Protocol

The following figure contains an example of the IO Config Screen for an LFBI unit running the EtherCAT protocol.

The screenshot shows the 'Fieldbus Laser Controller' web interface. At the top, there's a navigation bar with tabs: 'Control', 'Settings', 'IO Config' (selected), 'Calibration', and 'Support'. To the right of the tabs are 'login' and 'logout' buttons. Below the navigation bar, the title 'EtherCAT' is displayed. The main configuration area includes:

- Endian:** Two radio buttons, 'Little' (selected) and 'Big'.

Figure 2-20. IO Config Screen for LFBI Units Running the EtherCAT Protocol

To specify the Endianness setting for the LFBI, click the **Little** or **Big** radio button on the IO Config Screen. Endianness changes made with the radio buttons take effect immediately and are automatically saved.

2.5.3 The Network Settings Screen of the LFBI Web Interface

To display the Network Settings Screen, click the **Settings** link from any screen in the LFBI Web Interface. Figure 2-21 shows an example of an Network Settings Screen.

You can use the Network Settings Screen to specify the network settings of the LFBI, including the Local Hostname of the LFBI, and whether the LFBI uses DHCP. (You specify the latter by selecting or de-selecting the **DHCP** check box on the Network Settings Screen.

You can specify the Network Settings (IP Address of the Diagnostic Ethernet port, Subnet Mask, or Default Gateway) by entering values in the appropriate fields of the Network Settings Screen.

To save your settings, click the **Save** button in the Network Settings Screen.

NOTE: The default IP Address of the Diagnostic Ethernet port of the LFBI is 10.0.0.20. It is recommended that you use this IP address unless you need to change it. Refer to Section 2.6 ("RESET THE DIAGNOSTIC PORT IP ADDRESS") on page 49 to reset the IP Address of the Diagnostic Ethernet port to its default.

NOTE: The IP Address of the Diagnostic Ethernet port is *not* to be confused with the IP Address of the Field Bus ports. Refer to Section 2.5.2 ("The IO Config Screen of the LFBI Web Interface") on page 44 to set the IP Address of the Field Bus ports.



The screenshot shows the 'Fieldbus Laser Controller' web interface. At the top, there is a navigation bar with tabs: 'Control', 'Settings' (which is highlighted), 'IO Config', 'Calibration', and 'Support'. To the right of the tabs are 'login' and 'logout' buttons. Below the navigation bar, the title 'Network Settings' is centered. The main content area contains four input fields: 'TCP/IP address' with the value '10.0.0.20', 'Network mask' with the value '255.255.255.0', 'Default gateway' with the value '10.0.0.1', and 'Local hostname' which is empty. Below these fields is a checkbox labeled 'DHCP' which is currently unchecked. At the bottom center of the form is a 'Save' button.

Figure 2-21. Example of a Network Settings Screen

2.5.4 The Calibration Screen of the LFBI Web Interface

To display the Calibration Screen, click the **Calibration** link from any screen in the LFBI Web Interface. Figure 2-22 shows an example of a Calibration Screen.

You can use the Calibration Screen to automatically calibrate the power monitor voltage, at 100% power, for the laser client and to manually calibrate the maximum back reflection monitor voltage for the laser client. For YLR-U lasers you can use the Calibration Screen to enable the display of the Back Reflection Percentage in the **Back Reflection** field on the Control Screen.

Figure 2-22. Example of a Calibration Screen

The LFBI must be in Manual mode for you to use any of the features of the Calibration Screen. Refer to Section 2.5.1.2 ("The Control Screen with Fieldbus Mode Deselected") on page 42 to put the LFBI into Manual mode.

To run the Power Monitor Voltage calibration, click the **Start Calibration** button. The **Power Monitor Voltage @ 100% Power** field will automatically be updated upon completion of the Power Monitor Voltage calibration.

To manually calibrate the maximum back reflection monitor voltage, enter a numeric value for the voltage in the **Back Reflection Monitor Voltage Max** field.

If the laser client is a YLR-U laser, you can select the **Show BR %** check box to enable the display of the Back Reflection Percentage in the **Back Reflection** field on the Control Screen.

NOTE: You should only select the **Show BR %** check box if the client laser is a YLR-U laser. YLR lasers have no capability for displaying the Back Reflection percentage. If the **Show BR %** check box is *not* selected, the **Back Reflection Monitor Voltage Max** field is grayed out and the **Back Reflection %** field on the Control Screen shows as "- . - -".

NOTE: The LFBI Power Monitor Calibration and Back Reflection monitoring capabilities are not available to YLR laser systems configured as **Monitor-Only**. In **Monitor-Only** mode it is assumed that the LFBI does not have any I/O signals connected to the laser. (These signals would be required to utilize the LFBI Power Monitor Calibration and Back Reflection monitoring capabilities.)

2.5.5 The Support Screen of the LFBI Web Interface

To display the Support Screen, click the **Support** link from any screen in the LFBI Web Interface. Figure 2-23 shows an example of the Support Screen.

The Support Screen displays Product Support information for the LFBI unit. When communicating with IPG Customer Service, you may need to send them the Event Log and the current Dictionary values for the LFBI. You can send them this information by clicking on the **Download** buttons the lower-right corner of the Support Screen.

ND

Fieldbus Laser Controller

Control Settings IO Config Calibration Support login logout

Product Support

Package:	
Dictionary:	SWFP000051XXXXXU_IPGP694_YLR_Fieldbus_Dict_1.1.0.txt
Init table:	SWFP000051XXXXXU_IPGP694_YLR_Fieldbus_Init_1.1.0.txt
FPGA image:	SWFP000051XXXXXU_IPGP694_YLR_Fieldbus_FPGA_120628_1.1.0.rbf
Application:	1.1.0.140093
Bootloader:	5.2.*.52853
MAC Address:	801F123F96A3
Serial Number:	ND
Model Number:	CEU45010381D00XU
Part Number:	SWFP00069400000U

Download and Send to Tech Support

Event Log
Download

Current DICT values
Download

Figure 2-23. Example of a Support Screen

2.6 RESET THE DIAGNOSTIC PORT IP ADDRESS

You can reset the IP address of the Diagnostic Ethernet port of the LFBI to the default of 10.0.0.254 by using the **Reset IP** button on the top cover of the LFBI.

Do the following to reset the IP address of the Diagnostic Ethernet port to the default:

1. Using a 2.5mm hex wrench, remove the button head screw from the top cover of the LFBI unit.
2. With power supplied to the LFBI unit, press and hold the button in the tapped hole for 10 seconds. (**NOTE:** You can use a small screwdriver or plastic or wooden dowel to press down the button.)
3. Replace the button head screw on the top cover of the LFBI unit.
4. Power cycle the LFBI unit.

The IP address of the Diagnostic Ethernet port is now reset to 10.0.0.254.

NOTE: The IP Address of the Diagnostic Ethernet port is *not* to be confused with the IP Address of the Field Bus ports. Refer to Section 2.5.2 ("The IO Config Screen of the LFBI Web Interface") on page 44 to set the IP Address of the Field Bus ports.

IMPORTANT



You must ensure that the host computer is in the correct domain to communicate with the LFBI unit.

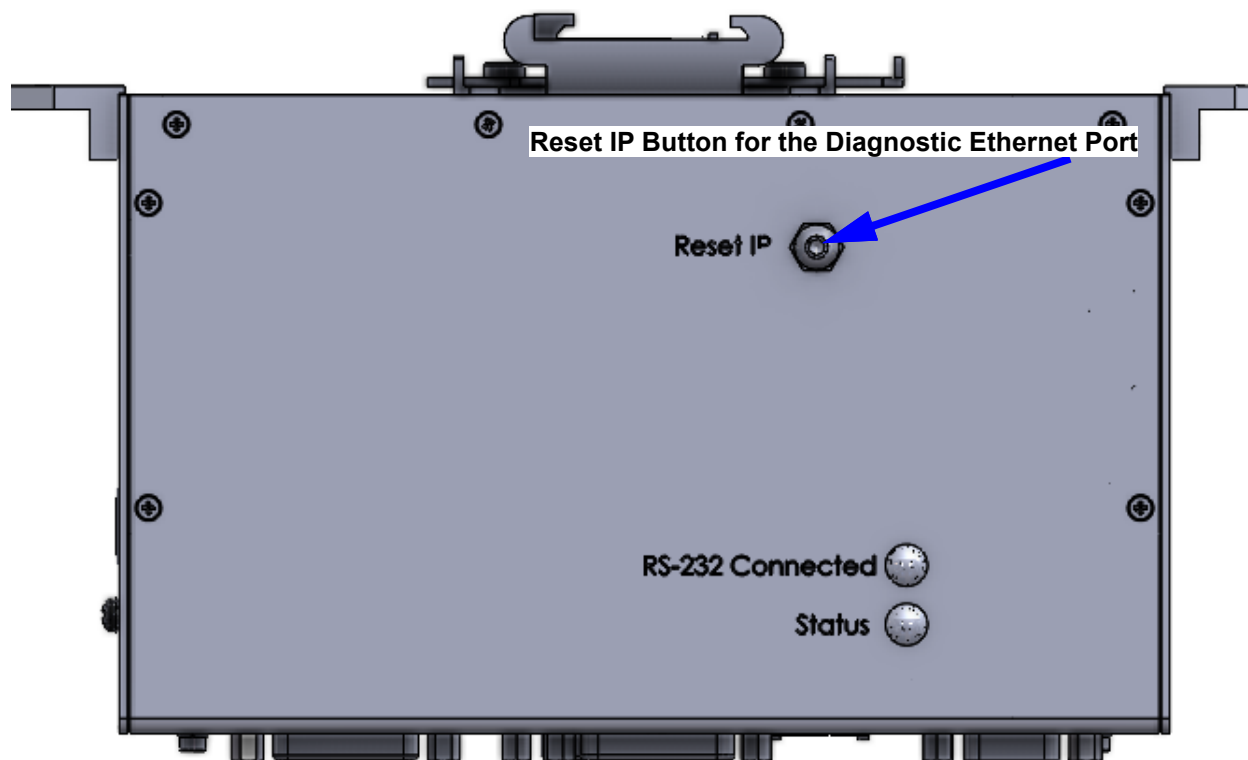


Figure 2-24. Button Head Screw Covering the IP Reset Button

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SPECIFICATIONS AND DRAWINGS

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3.1 SPECIFICATIONS

3.1.1 General Characteristics

Table 3-1. General Characteristics

Characteristic	Symbol	Minimum	Typical	Maximum	Unit
Operating Ambient Temperature Range	T°	0	-	50	°C
Ambient Humidity Range (non-condensing)	Φ	0	-	90	%
Storage Temperature	T ^S	-20	20	70	°C
Weight	W	0.8	0.8	0.8	kg

3.1.2 Power Characteristics

Table 3-2. Power Characteristics

Characteristic	Symbol	Minimum	Typical	Maximum	Unit
Input Voltage	V _{in}	21.6	24	26.4	VDC
Input Current	I _{in}	-	0.2	1	Amp
Internal Fuse on Circuit Board	F ₁	Fast Blow 4A 125V			
		2.7 x 2.7 x 6.1			mm

3.1.3 Electronics Connections

3.1.3.1 Connectors

Table 3-3. Connectors

Connector	Type	Description
DC Power Inlet	3W3 Plug 2 Pins/1 Socket Molex 1731070057 FCT F3W3PC-K120	3W3 Receptacle 2 Sockets/1 pin Molex 1731070058 FCT F3W3SC-K121
Serial I/O	DB9 Receptacle	DB9 Plug
Digital I/O	DB26HD Receptacle	DB26HD Plug
Analog I/O	DB15 Receptacle	DB15 Plug
Field Bus	RJ-45 Port	RJ-45 Plug Ethernet Cable
Diagnostic Ethernet	RJ-45 Port	RJ-45 Plug Ethernet Cable

3.1.3.2 Maximum Cable Lengths

Table 3-4. Maximum Cable Lengths

Cable	Type	Maximum Length	IPG Cable Length Included
Field Bus	RJ45-RJ45	23m (75 ft)	N/A
Diagnostic Ethernet	RJ45-RJ45	23m (75 ft)	N/A
Serial I/O	DB 9	5m (16 ft)	1m
Digital I/O ^a	DB 26HD	5m (16 ft)	1m
Analog I/O ^a	DB 15	5m (16 ft)	1m
Power	DB 3W3	5m (16 ft)	N/A (connector only included)

a. A portion of this cable has two wires for power that are 118 inches long.

3.1.4 LED Status Indicators

The LED status indicators are at various locations on the exterior of the LFBI.

Table 3-5. LED Status Indicators

Location	Function
“RS-232 Connected” LED on the top cover	On when the LFBI and the target laser are communicating
“Status” LED on the top cover	On when the LFBI is operating properly
Left LED (green) on the Diagnostic Ethernet Port	On when the LFBI power is on
Right LED (yellow) on the Diagnostic Ethernet Port	On when the LFBI is communicating with the host computer
LEDs on the Field Bus RJ45 Connectors	Link and Active LEDs as described in Section 2.4 ("SUPPORTED FIELD BUS PROTOCOLS")
3 LEDs to the left of the Field Bus Connectors	Shows the Field Bus Status as described in Section 2.4 ("SUPPORTED FIELD BUS PROTOCOLS")

3.2 DRAWINGS

The overall dimensions of the LFBI are **220mm x 110mm x 50mm (8.66" x 4.31" x 1.96")** with the mounting tabs installed. With the mounting tabs removed, the overall dimensions are **178mm x 110mm x 50mm (7.0" x 4.31" x 1.96")**.

Figure 3-1 shows the top-panel dimensions of the LFBI.

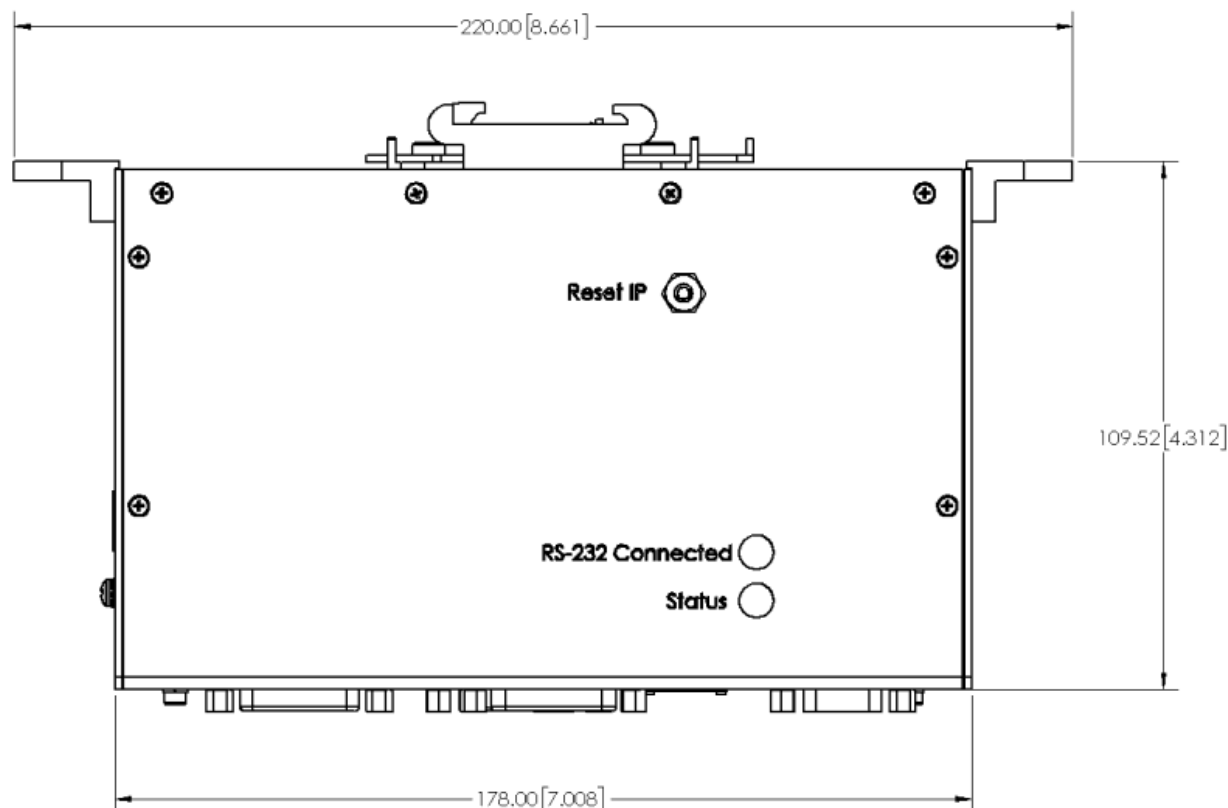


Figure 3-1. Top-panel Dimensions of the LFBI

Figure 3-2 shows the front-panel dimensions of the LFBI.

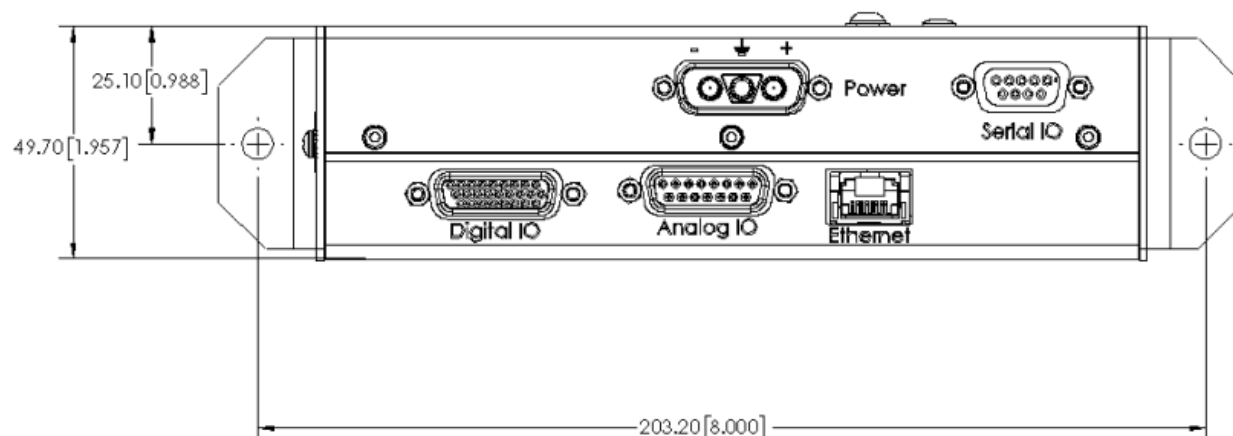


Figure 3-2. Front-panel Dimensions of the LFBI

Figure 3-3 shows the rear-panel dimensions of the LFBI.

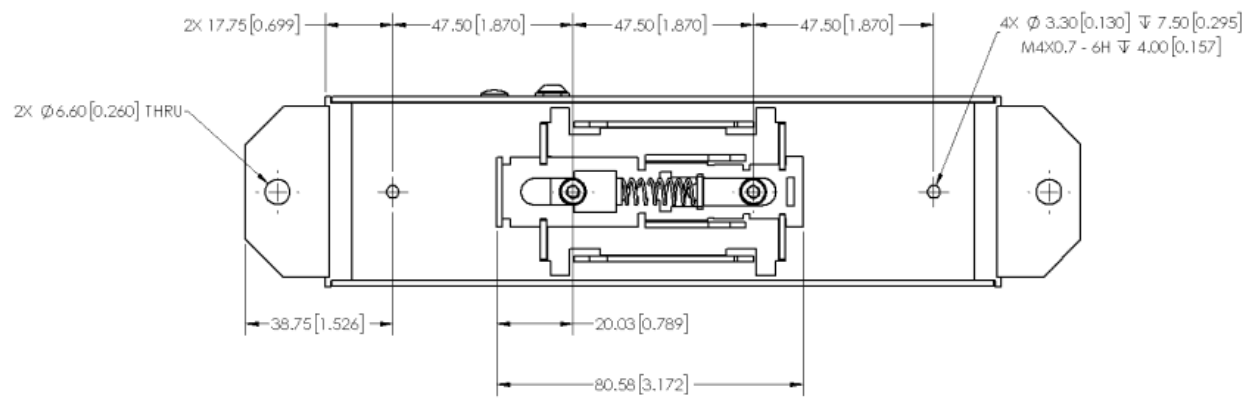


Figure 3-3. Rear-panel Dimensions of the LFBI

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A.1 WARRANTY

A.1.1 Limited Express Product Warranties

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PRODUCT RETURNS

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B.1 RETURNS TO THE UNITED STATES

Most questions regarding the safety, setup, operation, and maintenance of the product can be resolved by carefully reading this User Guide. If you have questions regarding the safety, setup, operation or maintenance of your IPG product, please contact our Customer Service department.

If you cannot resolve the issues through the use of this User Guide or over the telephone with our technical support group, you may need to return the product to IPG.

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To obtain an RMA, contact Customer Service: +1 508-373-1157 or support@ipgphotonics.com.

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IPG Photonics Corporation
377 Simarano Drive
Marlborough, MA 01752
Attn: Product Returns

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GLOSSARY

°C	Degrees centigrade or Celsius
AIO	Analog Input/Output
Amp	Amperes
ANSI	American National Standards Institute
AO	Analog Output
CDRH	Center for Devices and Radiological Health (U.S. Government)
CFR	Code of Federal Regulation (U.S. Government)
cm	Centimeters = 10^{-2} meters
DC	Direct current
DHCP	Dynamic Host Configuration Protocol
DIN-rail	Deutsches Institut für Normung rail (a standardized means for mounting electrical equipment)
DLR	Diode Laser Rackmount
DO	Digital Output
ELR	Erbium Laser Rackmount
EMC	Electromagnetic Compatibility
Endianness	The order or sequence of bytes in a word of digital data in computer memory
EULA	End-user License Agreement
GLR	Green Laser Rackmount
GND	Ground
GPL	GNU General Public License
HMI	Human Machine Interface
I/O	Input/Output
IEC	International Electrotechnical Commission
IP	Internet protocol
ISO	International Standards Organization
kg	Kilograms
LED	Light emitting diode

LFBI	Laser Field Bus Interface
LGPL	GNU Lesser General Public License
LIA	Laser Institute of America
Mbit	Megabit (10^6 bits)
mm	Millimeter = 10^{-3} meters
MS	Microsoft Corporation
OSHA	US Occupational Health and Safety Administration
PC	Personal Computer
PELV	Protected Extra-Low Voltage
PLC	Programmable Logic Controller
PPE	Personal Protective Equipment
REV	Revision (of user guide)
RMA	Return Merchandise Authorization
RoHS	Restriction of Hazardous Substances
SELV	Safety Extra-Low Voltage
TCP	Transmission control protocol
TLR	Thulium Laser Rackmount
VDC	Volts Direct Current
YLR-U	Ytterbium Laser Rackmount - Ultra-Compact
YLR	Ytterbium Laser Rackmount

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