

## **Operating instruction for IQ series laser diode module**

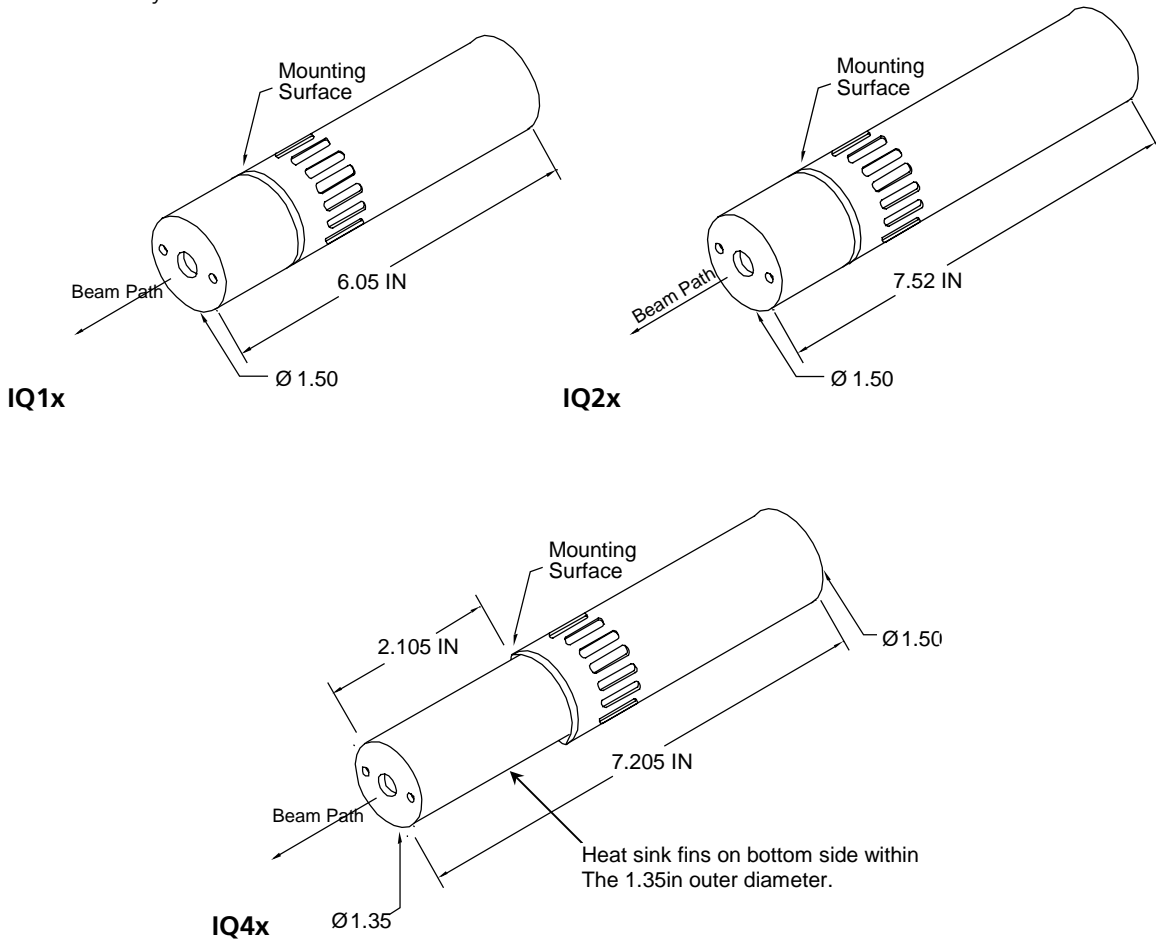
Instructions for IQ1C, IQ2C, IQ4C, IQ1A, IQ2A, IQ4A, IQ1H, IQ2H, and IQ4H

### **Introduction**

The IQ series of laser modules offers the most precise temperature control available from Power Technology, Inc. The IQ series also features quality glass optics and a precision current driver for a wide assortment of laser diodes.

This operating instruction applies to several members of the IQ series: IQ1C, IQ2C, IQ4C, IQ1A, IQ2A, IQ4A, IQ1H, IQ2H and IQ4H. Within the part number, the number 1 represents modules with a laser diode driver, active temperature control, and a simple optical system. The number 2 represents laser modules with the same specifications, with the addition of a more advanced optical system that incorporates a pair of anamorphic prisms for beam circularization. The number 4 represents laser modules that use a 14-pin butterfly or 14-pin dual-in-line laser package and have a fiber optic output. The letter A represents laser modules with 70MHz analog beam modulation, while the letter H represents laser modules with 100MHz TTL beam modulation. The letter C represents laser modules with CW output.

IQ series laser modules can be configured with a variety of laser diodes at various output powers and operating wavelengths. Products with IR outputs or with output powers above 5mW are not intended for surveying, leveling, and alignment applications. Visible units with output powers below 5mW are CDRH-certified as laser systems.



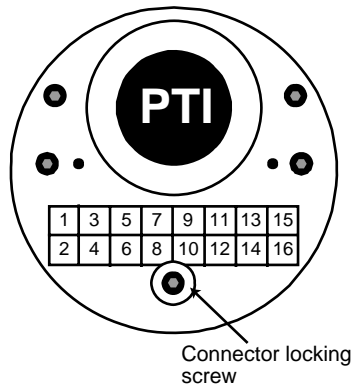
**Installation**

Do not mount the laser in a thermal insulating material, such as foam plastic. Heat can have adverse effects on laser diodes. Such effects include decreased output power and large shifts in wavelengths. For best heat dissipation, use a metal mounting fixture such as Power Technology, Inc.'s MB6 mounting bracket. A heat sink is always recommended for operating temperatures above 25°C.

Operating voltages for IQ series modules are 5 to 12VDC, with most diodes operating optimally at 5VDC. However, IQ modules that incorporate certain diodes (e.g., 405nm 5mW) must operate from 6VDC, while others (e.g., 405nm 60mW, 375nm 10mW, 445nm 50mW) must operate from 7VDC.

If the label attached to the laser module reads, "Complies with 21CFR 1040.10 and 1040.11," a permanently installed switch at the power source will be required to retain the modules certification as a laser system. This certification is void if the unit is enclosed or otherwise inaccessible, if the labels are modified or removed, or if the system is permanently connected (e.g., soldered) directly to the power source without the required switch. Modifying the laser will void the CDRH certification. If the distance between the laser head and the power source switch exceeds two meters, an emissions indicator must be mounted near the switch.

A 16-pin header connector is present on all IQ series modules and accommodates the DC supply voltage and monitoring connections. Pin one (1) is marked on the back of the unit with a red dot. Connections are listed below.



A power only cable is provided with IQ series modules. For an additional cost, a Premium Wiring Harness (pt. no. 903546675) which contains all necessary wires for monitoring. When an LDCU is purchased, a DB9 connector is installed to allow a direct connection to the power supply.

Pin	Wire Color	Description
1	Red	Vin, +5V to +12V
2	Red	Vin, +5V to +12V
3		For future use
4	Gray	PDMON, Photodiode monitor
5		For future use
6		For future use
7	Blue	LDIMON, Laser diode current monitor
8		For future use
9	White	TMPMON, Laser diode temperature monitor
10		For future use
11	Yellow	ERROR!, Error signal
12		For future use
13	Coax	Modulation signal (+)
14	Coax/Green	Modulation signal (-) & Monitoring ground for PDMON, LDIMON, TMPMON
15	Black	Power ground
16	Black	Power ground



To monitor laser diode current, read the voltage between the blue wire and green wire. This reading will be in mV with 1mV=1mA.

To monitor laser diode temperature, read the voltage between the white wire and green wire. This reading will be in V. Use the chart below to calculate laser diode temperature. Please note that the temperature control pot is used to set the desired temperature. There will be a short delay between adjusting the pot and monitoring a change in the laser diode temperature.

A photodiode monitor is provided for *relative* power readings. Measurements are made between the Gray and Green wires. Readings are intended for DC level measurements and are not suitable for usage when the laser is modulating at high speeds (IQxA and IQxH Models only). The output of the PD monitor ranges from 0.3VDC and 3VDC depending on the laser diode installed.

**ANALOG MODULATION USERS:** Analog modulation requires an input voltage on the BNC connector. A control voltage of 1VDC will yield a 100% power output. A control voltage of 0VDC will yield a 0% output. The relationship between voltage and output power is not linear.

**TTL MODULATION USERS:** TTL modulation requires an input voltage on the BNC connector. A control voltage of 5VDC will yield a 0% power output. A control voltage of 0VDC will yield 100% output. The laser is either ON or OFF depending on the control voltage. The IQ1H, IQ2H, and IQ4H are easily connected to either a function or pulse generator.

**Temperature Monitor:** The user may monitor the temperature of the laser diode by measuring the voltage between Pin 9 (white) and Pin 14 (green). That voltage can be compared to the chart below to determine the diode's temperature.

TMPMON	Temp	TMPMON	Temp
0.950996483	-0.003050765	1.983406439	23.99951443
0.988555222	0.997046962	2.028	24.99963102
1.026862732	1.997145503	2.072331362	25.99974836
1.065891044	2.997244855	2.116360728	26.99986646
1.10560988	3.997345018	2.160049906	27.9999853
1.145986745	4.997445987	2.203362406	29.00010489
1.18698702	5.99754776	2.246263529	30.00022523
1.228574089	6.997650336	2.288720439	31.00034631
1.27070946	7.997753711	2.330702222	32.00046813
1.313352918	8.997857883	2.372179931	33.00059068
1.356462679	9.99796285	2.41312662	34.00071398
1.39999556	10.99806861	2.45351736	35.000838
1.44390716	11.99817516	2.493329247	36.00096275
1.488152041	12.99828249	2.532541399	37.00108824
1.532683927	13.99839061	2.571134938	38.00121444
1.5774559	14.99849952	2.609092965	39.00134137
1.622420602	15.9986092	2.646400526	40.001469
1.667530436	16.99871966	2.683044569	41.00159739
1.71273777	17.99883089	2.71901389	42.00172648
1.757995134	18.9989429	2.754299082	43.00185628
1.803255416	19.99905568	2.788892466	44.00198678
1.848472054	20.99916922	2.822788029	45.002118
1.893599212	21.99928353	2.855981348	46.00224992
1.938591962	22.9993986	2.888469518	47.00238255

**Error Pin 11 (yellow)** is an inhibit circuit that allows for remote on/off control of a laser. This circuit is controlled via an open collector signal that can be monitored or controlled from the yellow wire. The open collector circuit design for the error requires that a ground (0 volt) signal be applied to the pin lead to send an error signal that prompts the laser to turn **off**. With no signal on the yellow wire (floating), the laser will



operate normally. **Voltage should never be applied to the yellow wire**, as this will damage the power supply. When monitoring the yellow wire, remember that "ERROR!" is an active low signal. A low reading signifies that an error is being applied to the laser (no light output), while a high reading (~4.7V) indicates that the power supply is free to operate (will generate light output).

The inhibit can be activated in three ways:

1. The temperature on the laser diode is outside of the set range.
2. Insufficient voltage is being applied to the power supply.
3. An external signal (ground) is applied to the yellow wire.

## Operating Procedure & Control Description

IQ series modules do not have any user adjustable controls. The user may adjust the focus or collimation of the output beam on IQ1x models by using the supplied spanner wrench to increase or decrease the distance between the diode and the optic. IQ2x and IQ4x series modules do not offer adjustable optics.

## Maintenance & Service

This laser module contains no user serviceable parts. Depending on environmental conditions, the optics may require occasional cleaning. Clean, compressed air is recommended to blow the optics clean. If compressed air fails, clean lens carefully with alcohol and a lint-free cloth or cotton swab.

## Warranty and Repair Return Policy

Opening the IQ laser will void the warranty.

No return of merchandise will be accepted by PTI without an RMA (Return Material Authorization) number, issued by the factory and prominently displayed on the return package. No return shipments will be accepted "Collect" or "COD". On warranty returns, PTI will pay for shipping charges on the return of merchandise to the customer.

When contacting the factory for an RMA number, please have the following information available: model number, serial number(s), and a description of the problem.

## Laser Safety

Class 3b and 4 lasers are not intended for use in surveying, leveling, alignment, or medical applications.

**Caution:** Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.













**Caution:** The use of optical instruments with this product will increase eye hazard.

Do not shine laser in the direction of other people or at reflective surfaces that might cause exposure to the human eye. Do not mount the laser at eye level.

Modifications that affect any aspect of the product's performance or intended functions will require re-certification and re-identification of the product in accordance with the provisions of 21CFR 1040.10 and 1040.11. A copy of 21CFR 1040.10 and 1040.11 can be downloaded from our Web site at [www.powertechnology.com/safety.htm](http://www.powertechnology.com/safety.htm).



The product labels shown below can typically be found near the output optics.

<p align="center"><b>Class 1 Laser:</b> Class 1 Laser Product</p> <p><input type="checkbox"/> <b>Component</b></p> <div style="border: 1px solid black; padding: 5px;"> <p><b>MAX Power:</b> mW <b>Wavelength:</b> nm</p> <p>AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE</p> <p>Model No: Serial No: Mfg Date:</p> <p>DOES NOT comply with 21 CFR 1040.10 and 1040.11 IEC60825-1 AM2:2001.</p> <p>CLASS 1 LASER PRODUCT</p> <p align="right"> <b>Power Technology</b> Incorporated Alexander, AR USA</p> </div> <p><input type="checkbox"/> <b>System</b></p> <div style="border: 1px solid black; padding: 5px;"> <p><b>MAX Power:</b> mW <b>Wavelength:</b> nm</p> <p>AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE</p> <p>Model No: Serial No: Mfg Date:</p> <p>Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated 7/2001.</p> <p>CLASS 1 LASER PRODUCT</p> <p align="right"> <b>Power Technology</b> Incorporated Alexander, AR USA</p> </div> <p align="center">One of the above labels is attached to the laser head.</p>	<p align="center"><b>Class 1M Laser:</b> Laser Radiation, Do not view directly with optical instruments</p> <p><input type="checkbox"/> <b>Component</b></p> <div style="border: 1px solid black; padding: 5px;"> <p><b>MAX Power:</b> mW <b>Wavelength:</b> nm</p> <p>AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE</p> <p>Model No: Serial No: Mfg Date:</p> <p>DOES NOT comply with 21 CFR 1040.10 and 1040.11 IEC60825-1 AM2:2001.</p> <p>LASER RADIATION DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS CLASS 1M LASER PRODUCT</p> <p align="right"> <b>Power Technology</b> Incorporated Alexander, AR USA</p> </div> <p><input type="checkbox"/> <b>System</b></p> <div style="border: 1px solid black; padding: 5px;"> <p><b>MAX Power:</b> mW <b>Wavelength:</b> nm</p> <p>AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE</p> <p>Model No: Serial No: Mfg Date:</p> <p>Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated 7/2001.</p> <p>LASER RADIATION DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS CLASS 1M LASER PRODUCT</p> <p align="right"> <b>Power Technology</b> Incorporated Alexander, AR USA</p> </div> <p align="center">One of the above labels is attached to the laser head.</p>	<p align="center"><b>Class 2 Laser:</b> Laser Radiation, Do not stare into beam</p> <p><input type="checkbox"/> <b>Component</b></p> <div style="border: 1px solid black; padding: 5px;"> <p><b>MAX Power:</b> mW <b>Wavelength:</b> nm</p> <p>AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE</p> <p>Model No: Serial No: Mfg Date:</p> <p>DOES NOT comply with 21 CFR 1040.10 and 1040.11 IEC60825-1 AM2:2001.</p> <p>LASER RADIATION DO NOT STARE INTO BEAM CLASS 2 LASER PRODUCT</p> <p align="right"> <b>Power Technology</b> Incorporated Alexander, AR USA</p> </div> <p><input type="checkbox"/> <b>System</b></p> <div style="border: 1px solid black; padding: 5px;"> <p><b>MAX Power:</b> mW <b>Wavelength:</b> nm</p> <p>AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE</p> <p>Model No: Serial No: Mfg Date:</p> <p>Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated 7/2001.</p> <p>LASER RADIATION DO NOT STARE INTO BEAM CLASS 2 LASER PRODUCT</p> <p align="right"> <b>Power Technology</b> Incorporated Alexander, AR USA</p> </div> <p align="center">One of the above labels is attached to the laser head.</p>
<p align="center"><b>Class 2M Laser:</b> Laser Radiation, Do not stare into the beam or view directly with optical instruments</p> <p><input type="checkbox"/> <b>Component</b></p> <div style="border: 1px solid black; padding: 5px;"> <p><b>MAX Power:</b> mW <b>Wavelength:</b> nm</p> <p>AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE</p> <p>Model No: Serial No: Mfg Date:</p> <p>DOES NOT comply with 21 CFR 1040.10 and 1040.11 IEC60825-1 AM2:2001.</p> <p>LASER RADIATION DO NOT STARE INTO THE BEAM OR VIEW DIRECTLY WITH OPTICAL INSTRUMENTS CLASS 2M LASER PRODUCT</p> <p align="right"> <b>Power Technology</b> Incorporated Alexander, AR USA</p> </div> <p><input type="checkbox"/> <b>System</b></p> <div style="border: 1px solid black; padding: 5px;"> <p><b>MAX Power:</b> mW <b>Wavelength:</b> nm</p> <p>AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE</p> <p>Model No: Serial No: Mfg Date:</p> <p>Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated 7/2001.</p> <p>LASER RADIATION DO NOT STARE INTO THE BEAM OR VIEW DIRECTLY WITH OPTICAL INSTRUMENTS CLASS 2M LASER PRODUCT</p> <p align="right"> <b>Power Technology</b> Incorporated Alexander, AR USA</p> </div> <p align="center">One of the above labels is attached to the laser head.</p>	<p align="center"><b>Class 3R Laser:</b> Laser Radiation, Avoid direct eye exposure</p> <p><input type="checkbox"/> <b>Component</b></p> <div style="border: 1px solid black; padding: 5px;"> <p><b>MAX Power:</b> mW <b>Wavelength:</b> nm</p> <p>AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE</p> <p>Model No: Serial No: Mfg Date:</p> <p>DOES NOT comply with 21 CFR 1040.10 and 1040.11 IEC60825-1 AM2:2001.</p> <p>LASER RADIATION AVOID DIRECT EYE EXPOSURE CLASS 3R LASER PRODUCT</p> <p align="right"> <b>Power Technology</b> Incorporated Alexander, AR USA</p> </div> <p><input type="checkbox"/> <b>System</b></p> <div style="border: 1px solid black; padding: 5px;"> <p><b>MAX Power:</b> mW <b>Wavelength:</b> nm</p> <p>AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE</p> <p>Model No: Serial No: Mfg Date:</p> <p>Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated 7/2001.</p> <p>LASER RADIATION AVOID DIRECT EYE EXPOSURE CLASS 3R LASER PRODUCT</p> <p align="right"> <b>Power Technology</b> Incorporated Alexander, AR USA</p> </div> <p align="center">One of the above labels is attached to the laser head.</p>	<p align="center"><b>Class 3B Laser:</b> Laser Radiation, Avoid exposure to beam</p> <p><input type="checkbox"/> <b>Component</b></p> <div style="border: 1px solid black; padding: 5px;"> <p><b>MAX Power:</b> mW <b>Wavelength:</b> nm</p> <p>AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE</p> <p>Model No: Serial No: Mfg Date:</p> <p>DOES NOT comply with 21 CFR 1040.10 and 1040.11 IEC60825-1 AM2:2001.</p> <p>LASER RADIATION AVOID EXPOSURE TO BEAM CLASS 3B LASER PRODUCT</p> <p align="right"> <b>Power Technology</b> Incorporated Alexander, AR USA</p> </div> <p><input type="checkbox"/> <b>System</b></p> <div style="border: 1px solid black; padding: 5px;"> <p><b>MAX Power:</b> mW <b>Wavelength:</b> nm</p> <p>AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE</p> <p>Model No: Serial No: Mfg Date:</p> <p>Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated 7/2001.</p> <p>LASER RADIATION AVOID EXPOSURE TO BEAM CLASS 3B LASER PRODUCT</p> <p align="right"> <b>Power Technology</b> Incorporated Alexander, AR USA</p> </div> <p align="center">One of the above labels is attached to the laser head.</p>



**Class 4 Laser:**  
Laser radiation, Avoid eye or skin exposure to direct or scattered radiation

**Component**

**MAX Power:** mW  
**Wavelength:** nm


AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE

Model No:  
Serial No:  
Mfg Date:

DOES NOT comply with 21 CFR 1040.10 and 1040.11 IEC60825-1 AM2:2001

LASER RADIATION  
AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION  
CLASS 4 LASER PRODUCT

**Power Technology**  
Incorporated  
Alexander, AR USA



**System**

**MAX Power:** mW  
**Wavelength:** nm


AVOID EXPOSURE - LASER RADIATION IS EMITTED FROM THIS APERTURE

Model No:  
Serial No:  
Mfg Date:

Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated 7/2001.

LASER RADIATION  
AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION  
CLASS 4 LASER PRODUCT

**Power Technology**  
Incorporated  
Alexander, AR USA



One of the above labels is attached to the laser head.

