Operating Instructions: for ILC Nanosecond Pulsed Laser Module

Introduction

The ILC laser diode pulse driver is intended to replace the original IL and ILC pulsers whose components have become mostly obsolete. The physical size, laser diode packages, electrical connections, and functional performance are designed as close approximations of the original module. The ILC uses discrete analog and TTL logic controlled circuits to minimize timing delays, and user-accessible potentiometers are provided for fast adjustment and calibration. The module supports the original 8-32 and 10-32 laser diode packages and can also be configured for newer TO-can laser diode packages.

The ILC pulsed laser driver is rated for laser diodes from 1 to 70 amps with output pulses from 10 to 300 nanoseconds, depending on the installed laser diode and configuration. Standard production families are offered with adjustable pulse-width ranges of 40 to 200 ns or 10 to 40 ns. The module supports wavelengths from 375 nm to 2000 nm and pulse output powers up to 200 W.

Figure 1. Primary Connector Pinout

Pin	Wire Color	Name	Function
1	Brown	Rate	Optional internal control
2	White	Power	Supply voltage positive
3	Blue	Enable	Internal oscillator trigger source, high = ON
4	Black	Ground	Supply voltage negative

Figure 1: J1 primary connector pinout and signal identification for power, ground, enable, and optional rate control.

Figure 2. Back Panel Layout

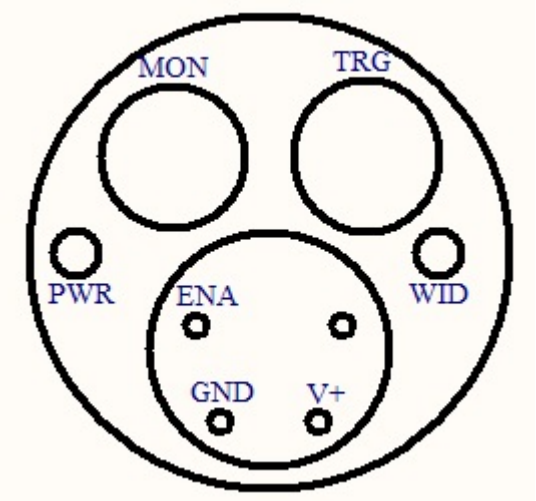

Figure 2: Back panel layout showing external trigger input, laser diode current monitor output, and user pulse-width and pulse-amplitude adjustments.

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Figure 3. Outline Drawing

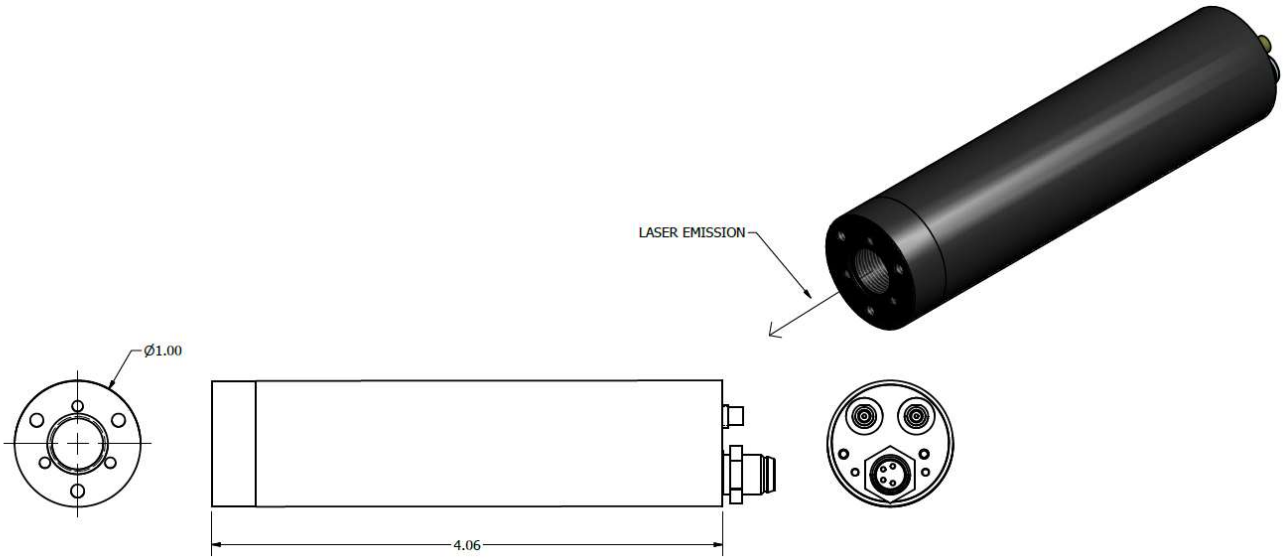


Figure 3: The ILC pulser laser module with a nominal overall length of 4.06 inches. The normal body diameter is approximately 1.00 inch, and the product specification also defines a large-diameter version at 1.248 inches nominal. Beam position is centered within ±0.01 inch.

Installation

Mount the ILC to a thermally conductive surface. Do not mount the module in an insulating clamp or other thermally insulating fixture. The module uses temperature compensation to reduce pulse-power drift with case temperature, but proper thermal mounting is still required for best performance and reliability. Maximum case temperature is 50°C. The operating temperature range is 0°C to 50°C, storage temperature range is -30°C to 70°C, and maximum humidity is 80% RH.

While the module will tolerate from 5 to 26 VDC input depending on configuration, standard product configurations use a 12 VDC supply. Linear-regulated configurations are specified for 8 to 26 VDC input, while internally switched DC-DC configurations are specified for 5 to 24 VDC input when the installed laser diode requires a forward voltage higher than the available supply. Any higher voltages needed for pulsed operation are generated internally within the module. Module supply current is 80 mA minimum, 130 mA typical, and 300 mA maximum.

Before operating the module, align the laser exit with the target sensor or intended optical path and apply the specified operating voltage through the primary connector. Limit the external power supply to 300 mA maximum unless otherwise specified for the individual module. The trigger input is through the SMC trigger connector, and the current monitor is through the SMC monitor connector.

Operating Procedure & Control Description

The ILC has two modes of operation: external trigger mode and free-running internal trigger mode. Mode selection is controlled by the Enable input on Pin 3 of the 4-pin primary connector. This input is internally pulled to ground through a 10 kΩ resistor, so the module defaults to external trigger mode when

the Enable input is left disconnected. When Enable is low or disconnected, the module operates in external trigger mode. When Enable is high, the module operates in internal trigger mode.

External Trigger Mode

In external trigger mode, a low-to-high transition at the trigger-input SMC connector initiates an output pulse. The trigger input is TTL compatible. Signals below 2.3 V are interpreted as low, and signals from 2.7 V to 5 V are interpreted as high. The input is internally AC terminated with a 47 pF capacitor and a 50 ohm resistor to ground, and a 10 kΩ pull-down prevents the input from floating when disconnected. The typical user trigger pulse width is 2 µs. The product specification defines a 1 to 5 µs trigger-input pulse-width range, and the functional description states that the module can respond to trigger pulses as short as 10 ns. Slower pulses are also supported down to DC, where a sustained high level produces a single output pulse.

Internal Trigger Mode

When Enable is pulled high, the module enters internal trigger mode. In this mode, the external trigger input is inactive and the output pulse is generated by the rising edge of an internal square-wave oscillator. The oscillator frequency is set during PTI calibration and may range from 100 Hz to 100 kHz depending on the installed laser diode capability or an optional custom pulse-repetition-rate requirement. To disable pulses in this mode, pull Enable low or disconnect it.

Pulse Repetition Rate Limit Control

The ILC includes internal repetition-rate limit control to prevent operation above the installed laser diode's rated duty cycle and maximum average power. When a valid trigger is received, an internal timer starts. While this timer is active, subsequent triggers are inhibited. After the time interval expires, pulse generation resumes normally. Higher permissible repetition rates are generally associated with shorter pulse widths, lower pulse amplitudes, or a combination of both, as required to remain within the installed diode's average-power limit.

Pulse Width Control

A user-accessible twelve-turn potentiometer, R52, on the back panel adjusts pulse width from the model's specified maximum factory setting down to the minimum the module can generate with the installed laser diode. Standard pulse-width models are configured for 40 to 200 ns adjustment. Short-pulse models are configured for 10 to 40 ns adjustment.

Pulse Amplitude Control

A user-accessible twelve-turn potentiometer, R23, on the back panel adjusts pulse amplitude from the specified maximum output for the ordered model down to the minimum output the module can generate with the installed laser diode. Optical output is adjusted by changing pulse current.

Pulse Current Monitor

The current-monitor SMC connector provides an output proportional to laser diode current. This signal is inverted with respect to the pulse output and goes negative from ground. The monitor output is intended for use with a 50 ohm terminated measurement system. The exact scale factor is module-specific and is documented with the individual unit as [X mV per amp of laser diode current].

Timing Performance

Pulse propagation delay from the trigger active edge to the optical pulse rising edge is specified at 14 ns minimum, 18 ns typical, and 22 ns maximum in the product specification. The functional description notes that actual delay may vary with the installed laser diode and measured performance data is supplied with each module. Pulse rise time is specified at 1 ns minimum, 5 ns typical, and 25 ns maximum. Pulse fall time is specified at 1 ns minimum, 5 ns typical, and 20 ns maximum. Pulse-to-pulse jitter is specified up to 200 ps, and pulse-to-pulse power stability is specified up to 0.5%.

Temperature Compensation

A temperature-compensation circuit adds or removes pulse current as necessary to help maintain pulse amplitude over the operating temperature range. Warm-up time is specified up to 10 seconds.

Standard Product Configurations

The ILC pulser product line is standardized by adjustable pulse-width range and factory-set repetition rate. Standard pulse-width models use a 40 to 200 ns adjustable range and are factory set at 1 kHz. Short pulse-width models use a 10 to 40 ns adjustable range and are factory set at 5 kHz. All standard models use a 12 VDC supply and glass optics, and all standard models are focused at 5 ft before shipment. Fiber-coupled models are available with high-power multimode fiber as the F1 option.

Maintenance & Service

This laser product 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 the lens carefully with alcohol and a lint free rag or cotton swab.

Warranty and Repair Return Policy

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 return of merchandise to the customer.

When contacting the factory for an RMA number, please have the following information available: model number, serial numbers, 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.

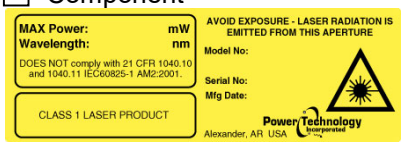
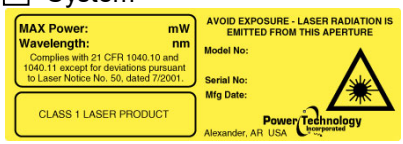
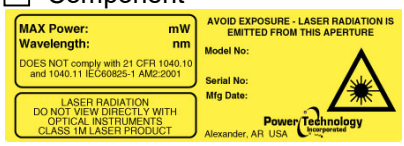
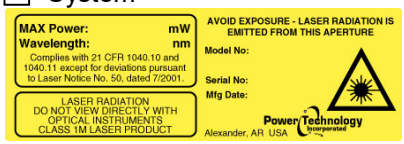
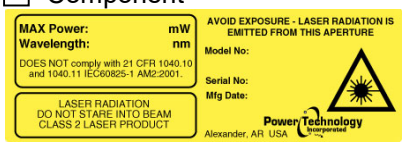
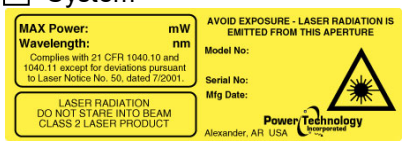
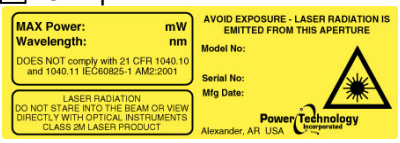
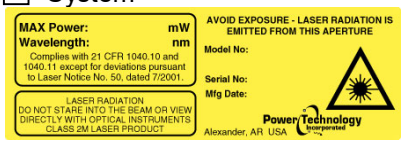
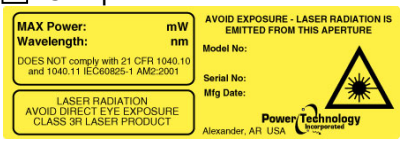
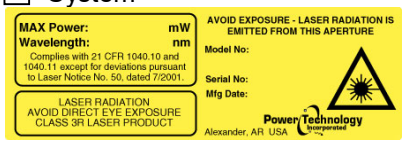
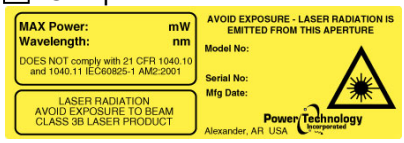
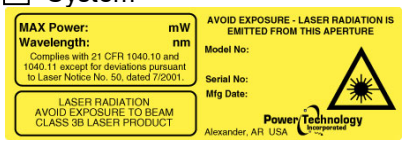
Caution: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

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 www.powertechnology.com.

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

Class 1 Laser: Class 1 Laser Product ☐ Component  ☐ System  One of the above labels is attached to the laser head.	Class 1M Laser: Laser Radiation, Do not view directly with optical instruments ☐ Component  ☐ System  One of the above labels is attached to the laser head.	Class 2 Laser: Laser Radiation, Do not stare into beam ☐ Component  ☐ System  One of the above labels is attached to the laser head.
Class 2M Laser: Laser Radiation, Do not stare into the beam or view directly with optical instruments ☐ Component  ☐ System  One of the above labels is attached to the laser head.	Class 3R Laser: Laser Radiation, Avoid direct eye exposure ☐ Component  ☐ System  One of the above labels is attached to the laser head.	Class 3B Laser: Laser Radiation, Avoid exposure to beam ☐ Component  ☐ System  One of the above labels is attached to the laser head.

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