NPL Series of Nanosecond Pulsed Lasers

User Guide

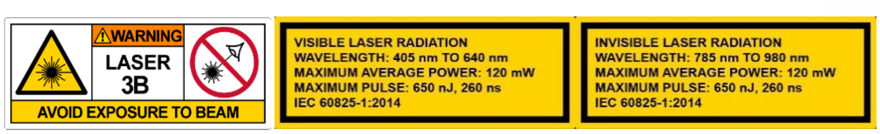


Table of Contents

Chapter 1 Introduction

1.1. Parts List

Inspect the shipping container for damage. If the shipping container appears damaged, retain it until all contents have been inspected and the unit has been mechanically and electrically tested. Verify receipt of all items:

1. Laser Head
2. +15 V Power Supply with Location-Specific Plug
3. 2 mm Flat Head Screwdriver (Item #s Ending in B or C)
4. Set of Keys for the Key Switch
5. Interlock Pin (Installed)
6. Two ECM225 Clamps
7. Quick Start Guide

1.2. Description

The NPL series of pulsed diode lasers are designed to provide a convenient, turn-key source of nanosecond pulse trains. Model options are summarized in the table below and include different typical emission wavelengths, output powers, repetition frequency range, and fixed or adjustable pulse widths.

<table>
<tr><th>Item #</th><th>Typical Center Wavelength</th><th>Pulse Width</th><th>Peak Output Power</th><th>Internal Trigger</th><th>Max Rep. Rate</th></tr>
<tr><td>NPL64A</td><td>640 nm ± 10 nm</td><td>10 ns</td><td>13 mW</td><td>No</td><td>10 MHz</td></tr>
<tr><td>NPL41B</td><td>405 nm ± 10 nm</td><td>6 ns to 38 ns</td><td>38 mW</td><td rowspan="8">Yes</td><td rowspan="8">10 MHz</td></tr>
<tr><td>NPL45B</td><td>450 nm ± 10 nm</td><td>5 ns to 39 ns</td><td>75 mW</td></tr>
<tr><td>NPL49B</td><td>488 nm ± 10 nm</td><td>6 ns to 39 ns</td><td>50 mW</td></tr>
<tr><td>NPL52B</td><td>520 nm ± 10 nm</td><td>5 ns to 39 ns</td><td>30 mW</td></tr>
<tr><td>NPL64B</td><td>640 nm ± 10 nm</td><td>5 ns to 39 ns</td><td>50 mW</td></tr>
<tr><td>NPL79B</td><td>785 nm ± 10 nm</td><td>6 ns to 39 ns</td><td>88 mW</td></tr>
<tr><td>NPL82B</td><td>820 nm ± 10 nm</td><td>6 ns to 39 ns</td><td>88 mW</td></tr>
<tr><td>NPL98B</td><td>980 nm ± 10 nm</td><td>6 ns to 39 ns</td><td>38 mW</td></tr>
<tr><td>NPL41C</td><td>405 nm ± 10 nm</td><td rowspan="5">6 ns to 129 ns</td><td>1000 mW</td><td rowspan="5">No</td><td rowspan="5">50 kHz</td></tr>
<tr><td>NPL45C</td><td>450 nm ± 10 nm</td><td>1600 mW</td></tr>
<tr><td>NPL52C</td><td>520 nm ± 10 nm</td><td>1500 mW</td></tr>
<tr><td>NPL64C</td><td>640 nm ± 10 nm</td><td>1000 mW</td></tr>
<tr><td>NPL81C</td><td>808 nm ± 10 nm</td><td>1500 mW</td></tr>
</table>

Models with item numbers ending in A provide fixed-duration 10 ns pulses in response to a user-supplied trigger input. Models with item numbers ending in B offer variable pulse width control and internal oscillators that trigger the laser pulses at 1 MHz, 5 MHz, or 10 MHz in addition to user-triggered operation. Models ending in C offer higher pulse energies, variable pulse width control, and user trigger input at repetition frequencies up to 50 kHz. The optical output is a free-space beam with an integrated factory set collimated lens. Note that the shutter is permanently attached.

The only differences in the back panels of the A, B, and C versions, shown below, are the pulse width and repetition rate controls. A versions have neither, B versions have both pulse width and repetition rate control, and C versions have only pulse width control. In these images, the shorting device (interlock pin) that ships installed in the Interlock jack has been removed.

Figure 1 Back Panel of NPLxA Lasers

Figure 2 Back Panel of NPLxB Lasers

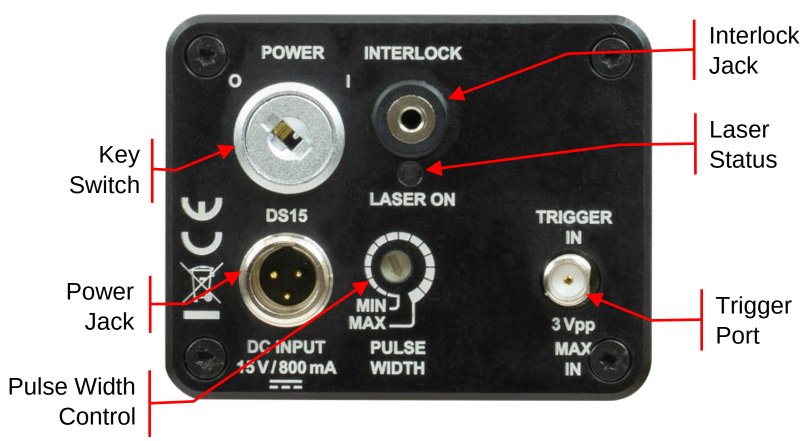


Figure 3 Back Panel of NPLxC Lasers

Chapter 2 Safety

All statements regarding safety of operation and technical data in this instruction manual will only apply when the unit is operated correctly. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. Only with written consent from Thorlabs may changes to single components be carried out or components not supplied by Thorlabs be used.

2.1. Warnings and Cautions

Warning: Laser Radiation - This is a Class 3B laser system. Observe all safety precautions and wear protective eyewear appropriate for this type of device. Align system at lower output power if possible. Do not position device so that is difficult to access the switch and interlock.

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

VISIBLE LASER RADIATION
WAVELENGTH: 405 nm TO 640 nm
MAXIMUM AVERAGE POWER: 120 mW
MAXIMUM PULSE: 650 nJ, 260 ns
IEC 60825-1:2014

INVISIBLE LASER RADIATION
WAVELENGTH: 785 nm TO 980 nm
MAXIMUM AVERAGE POWER: 120 mW
MAXIMUM PULSE: 650 nJ, 260 ns
IEC 60825-1:2014

Caution: ESD Sensitive Component - The components inside this instrument are ESD sensitive. Take all appropriate precautions to discharge personnel and equipment before making any connections to the unit.

Caution: Components not Water Resistant - This instrument should be kept clear of environments where liquid spills or condensing moisture are likely. It is not water resistant. To avoid damage to the instrument, do not expose it to spray, liquids, or solvents.

Caution: Follow Intended Usage Guidelines

Inputs and outputs must only be connected with shielded connection cables.

The safety of any system incorporating the equipment is the responsibility of the assembler of the system. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. Only with written consent from Thorlabs may changes to single components be carried out or components not supplied by Thorlabs be used. There are no user serviceable components inside this device.

2.2. Precautions

The following statement applies to the products covered in this manual, unless otherwise specified herein. The statement for other products will appear in the accompanying documentation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules, and meets all requirements of the Canadian Interference Causing Equipment Standard ICES-003 for digital apparatus. These limits are designed to provide reasonable protection against harmful interference in an industrial installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. Thorlabs is not responsible for any radio television interference caused by modifications of this equipment or the substitution or attachment of connecting cables and equipment other than those specified by Thorlabs. The correction of interference caused by such unauthorized modification, substitution or attachment will be the responsibility of the user. The use of shielded I/O cables is required when connecting this equipment to any and all optional peripheral or host devices. Failure to do so may violate FCC and ICES rules.

This product has been tested and found to comply with the limits according to IEC 61326-1 for using connection cables shorter than 3 meters (9.8 feet).

Chapter 3 Quick Start Guide

1. Mount the laser head as needed using the supplied ECM225 clamps and either imperial or metric screws. After screwing the ECM225 clamps to any convenient base or post, such as one of Thorlabs' TR series optical posts, snap the clamps on to the bottom side of the NPL housing. Firmly tighten the clamps using the locking screws. Figure 4 shows an example of an NPL laser head mounted on an optical table.
2. Orient the laser to ensure the output beam will be safely contained.
3. Connect the power supply cable to the head, and then plug the power supply into mains power.
4. Make sure the shutter has been rotated to the closed position and interlock pin is in place at this time. An external interlock circuit can be added later for more convenient integration of the interlock safety feature.
5. Put on laser safety goggles if your situation requires them.
6. Turn the power switch on using the key switch.
7. The dual color LED indicator (red/blue) will blink until the laser temperature has stabilized. Initial warm up can take 30 - 60 seconds. The indicator will then glow continuously when the laser output is enabled. Note there is a four second delay between the time the indicator glows solid and laser output is enabled. Note also that there will be no optical output unless the laser is triggered. The B versions are triggered either externally or via internal oscillator, and the A and C versions require an external trigger.
8. Ensure the laser is pointing in a safe direction, and then rotate the shutter to the open position. For the B and C versions of the laser, note that adjusting the variable pulse width and/or repetition rate controls will change the average output power.

Note the beam shape is asymmetric as is typical of solid-state diode lasers that do not use anamorphic optical components to circularize the beam. Anamorphic elements, such as anamorphic prism pairs, are available from Thorlabs.

Figure 4 Laser Head Mounted Using the Included ECM225 Clamps

Chapter 4 Operation

4.1. Block Diagram

The block diagram in Figure 5 depicts the internal architecture of the laser head, which contains all of the pulser drive electronics, safety interlocks, and trigger circuits, as well as the temperature stabilization system. The dual color LED indicator (red/blue) is designed to be visible through most laser safety glasses. It blinks during the 30 - 60 s warm up and glows continuously while the laser is enabled.

Power is supplied by the included +15 V power supply. For the B versions of the laser, nothing else is required to produce stable trains of nanosecond laser pulses. The A and C versions require only the application of an external trigger. The elements unique to the B versions are noted in Figure 3 by the yellow blocks. The Repetition Rate Control and Oscillators provide internally-generated trigger signals, which make it possible for the B versions to produce stable trains of nanosecond pulses without an external trigger.

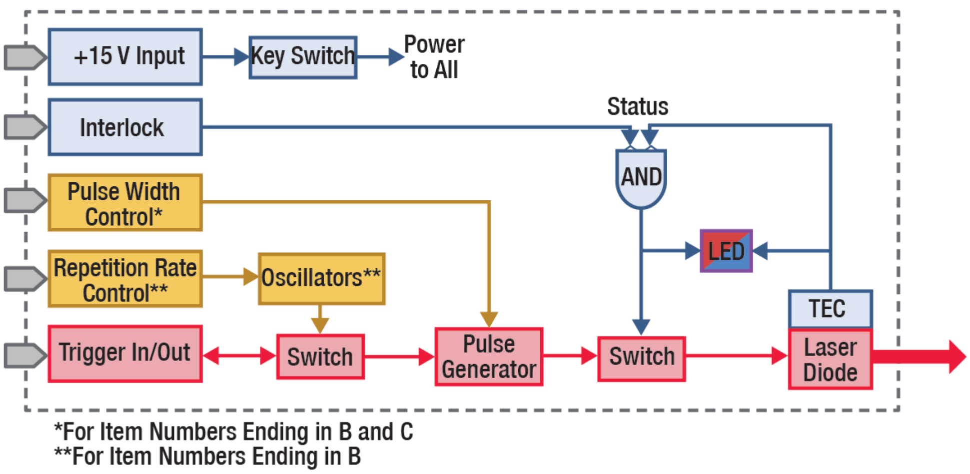


Figure 5 Block Diagram of the NPL Series Laser Head

4.2. Power

Power is supplied by the external, +15 V, wall-mounted DS15 Power Supply included with the unit and shown in the left image of Figure 6. The power supply includes a location-specific plug. The mini-XLR type connector, which uses a latching mechanism to prevent accidental pull-out, plugs into the laser head as shown in the right image of Figure 6.

Figure 6 The DS15 Power Supply (left) connects to the back panel of the laser head (right).

The key switch controls power to all internal components. When the key switch is turned on, the temperature stabilization system is activated. There is a 30 - 60 second warm up, during which time the LED indicator light blinks. When the LED stops blinking, there is an additional four second delay and then laser is enabled. Note there will not be any optical output until the interlock is satisfied, a trigger signal is supplied, and the shutter is opened.

4.3. Interlock Circuit

The laser is equipped with a phono-type interlock jack located on the back panel. To enable the laser source, a short circuit must be applied across the terminals of the interlock connector. The shorting device (interlock pin) installed in all units shipped from Thorlabs performs this function. Leave the shorting device installed unless using an external safety circuit or other type of remotely controlled switch to enable laser output.

Making use of the Interlock feature requires the appropriate 2.5 mm phono-type plug, which is shown in the left diagram of Figure 7 and is readily available through most electronics retailers. The plug should be wired to the external safety circuit or switch and then plugged into the back panel's interlock jack in place of the shorting device. The electrical specifications of the interlock jack are listed in the following table, and the circuit schematic describing how the interlock jack is connected inside the laser head is shown in the right diagram of Figure 7.

Parameter	Specification
Interlock Switch Requirements	Must be Normally Open Dry Contacts, Apply no External Voltages to the Interlock Input
Type of Mating Connector	2.5 mm Mono Phono Jack
Open Circuit Voltage	5 VDC (Center Pin is at 5 VDC, Ring is Ground)

The user's safety circuit must be attached to the phono plug and wired such that the ring and center pin are shorted when it is safe to enable the laser. The laser will be enabled when connection is closed. If it changes to an open state, the laser source will turn off.

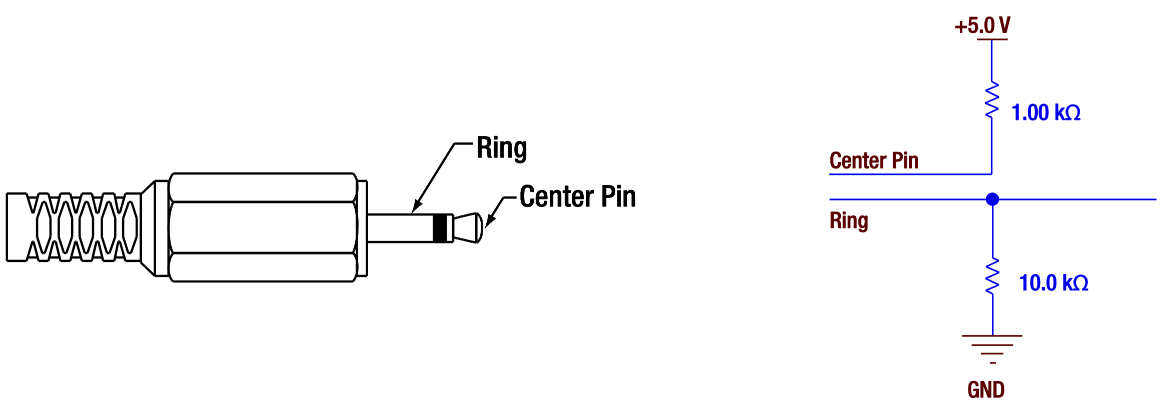


Figure 7 The interlock circuitry internal to the laser head (right) applies a 5 VDC bias across the ring and center pin of the phono-type plug (left). An external circuit that shorts the ring and center pin enables the laser.

4.4. Pulse Widths and Repetition Rates

The models of the NPL series with item numbers ending in A and C require a user trigger input to the SMA connector on the back panel. The A version supports rates up to 10 MHz. The C version supports rates up to 50 kHz. The slowest supported edge transition time for the trigger signal is 1 ms. See the specifications in Chapter 5 for correct voltage levels.

The models of the NPL series with item numbers ending in B offer additional controls for varying repetition rate using internal oscillators as well as selecting a user trigger. Use the included 2 mm flathead screwdriver to operate these controls. The photograph in Figure 8 shows three oscillator settings: A, B, and C. These positions provide repetition frequencies of 1 MHz, 5 MHz, and 10 MHz, respectively. Position D allows the user to apply an external signal to trigger the laser pulses. This control can be seen immediately to the right of the pulse width control in the photo and can be adjusted with the same small screwdriver.

The models of the NPL series with item numbers ending in B and C offer controls for varying the pulse width. Use the included 2 mm flathead screwdriver to operate this control as shown in Figure 8. The range of pulse widths for each model are listed in the specifications table in Section 5.1. The pulse width control directly programs the pulse generator and has 16 positions, which allows the pulse width to be adjusted in approximately 15 equal increments. Plots of typical pulses and a plot of pulse width as a function of control setting are included in Section 5.5.2.

Figure 8 Use the included 2 mm flathead screwdriver to adjust the pulse width and repetition rate controls.

4.5. Trigger Port

The Trigger In/Out port has dual function. If the internal oscillators are used (on B models), then the Trigger port provides an output signal that is synchronized with the pulse generation. In the user-triggered mode, the SMA port allows external trigger signals to drive the pulse generator. See the Specifications table in Chapter 5 for the correct signal levels and port impedances.

4.6. Optical Output

The optical output is finally enabled by opening the safety shutter. This is done by rotating the flap through 180°. Magnets will hold the flap either in the open or closed position. Note that the shutter is permanently attached.

Chapter 5 Specifications

5.1. Optical Specifications

Item #		NPL64A	NPL41B	NPL45B	NPL49B	NPL52B
Center Wavelength (Typical)		640 nm ± 10 nm	405 nm ± 10 nm	450 nm ± 10 nm	488 nm ± 10 nm	520 nm ± 10 nm
Pulse Width (FWHM)	**Min**	10 ns ± 1 ns [1]	6 ns ± 1 ns	5 ns ± 1 ns	6 ns ± 1 ns	5 ns ± 1 ns
	Max		38 ns ± 3 ns [2]	39 ns ± 3 ns [2]	39 ns ± 3 ns [2]	39 ns ± 3 ns [2]
Internal Trigger		No	Yes (1, 5, or 10 MHz)			
Max Trigger Frequency [3]		10 MHz				
Pulse Energy, Max		0.12 nJ	1.5 nJ	3.0 nJ	2.0 nJ	1.2 nJ
Average Power, Max		1.2 mW	15 mW	30 mW	20 mW	12 mW
Peak Power, Max		13 mW	38 mW	75 mW	50 mW	30 mW
Beam Pointing Accuracy [4]		≤3°				
Beam Divergence ($1/e^2$), Typical		1.5 mrad (Major Axis) 0.5 mrad (Minor Axis)	0.5 mrad (Major Axis) 0.3 mrad (Minor Axis)	0.5 mrad (Major Axis) 0.25 mrad (Minor Axis)	0.5 mrad (Major Axis) 0.3 mrad (Minor Axis)	1.5 mrad (Major Axis) 0.5 mrad (Minor Axis)
Beam Full Width ($1/e^2$) at 5.0 m		5.3 mm (Major Axis) 2.1 mm (Minor Axis)	2.5 mm (Major Axis) 1.7 mm (Minor Axis)	3.3 mm (Major Axis) 1.6 mm (Minor Axis)	3.0 mm (Major Axis) 1.8 mm (Minor Axis)	3.2 mm (Major Axis) 2.0 mm (Minor Axis)
Collimating Lens		C340TMD-B	C610TME-A			

Item #		NPL64B	NPL79B	NPL82B	NPL98B
Center Wavelength (Typ.)		640 nm ± 10 nm	785 nm ± 10 nm	820 nm ± 10 nm	980 nm ± 10 nm
Pulse Width (FWHM)	**Min**	5 ns ± 1 ns	6 ns ± 1 ns	6 ns ± 1 ns	6 ns ± 1 ns
	Max	39 ± 3 ns [2]	39 ns ± 3 ns [2]	39 ns ± 3 ns [2]	39 ns ± 3 ns [2]
Internal Trigger		Yes (1, 5, or 10 MHz)			
Max Trigger Frequency [3]		10 MHz			
Pulse Energy, Max		2.0 nJ	3.5 nJ	3.5 nJ	1.5 nJ
Average Power, Max		20 mW	35 mW	35 mW	15 mW
Peak Power, Max		50 mW	88 mW	88 mW	38 mW
Beam Pointing Accuracy [4]		≤3°			
Beam Divergence ($1/e^2$), Typical	**Major**	1.5 mrad	0.3 mrad	0.5 mrad	0.5 mrad
	Minor	0.5 mrad	0.15 mrad	0.6 mrad	0.5 mrad
Beam Full Width ($1/e^2$) at 5.0 m		4.8 mm (Major Axis) 2.7 mm (Minor Axis)	3.8 mm (Major Axis) 3.3 mm (Minor Axis)	2.9 mm (Major Axis) 1.4 mm (Minor Axis)	2.6 mm (Major Axis) 1.3 mm (Minor Axis)
Collimating Lens		C610TME-B		A375TM-B	

[1] *Pulse widths are of fixed duration. Please see Section 5.5.1 for a plot of a typical pulse.*
[2] *Pulse widths are adjustable over 16 discrete settings, from the minimum to the maximum specified widths. Please see Section 5.5.2 for plots of typical pulses as well as a plot of typical pulse width vs. the pulse width control setting.*
[3] *The maximum supported edge transition time is 1 ms.*
[4] *Relative to a beam axis normal to the plane of the front panel.*

Item #	NPL41C	NPL45C	NPL52C	NPL64C	NPL81C
Center Wavelength, Typical	405 nm ± 10 nm	450 nm ± 10 nm	520 nm ± 10 nm	640 nm ± 10 nm	808 nm ± 10 nm
Pulse Width (FWHM)	6 ns ± 1 ns (Min Setting) 129 ns ± 5 ns (Max Setting)[2]				
Internal Trigger	No				
User Trigger Frequency (Max)[3]	50 kHz				
Pulse Energy, Max	128 nJ	204 nJ	186 nJ	126 nJ	186 nJ
Average Power, Max	6.4 mW	10.2 mW	9.3 mW	6.3 mW	9.3 mW
Peak Power, Max	1000 mW	1600 mW	1500 mW	1000 mW	1500 mW
Beam Pointing Accuracy[4]	≤3°				
Beam Divergence ($1/e^2$), Typical	4.9 mrad (Major Axis) 0.2 mrad (Minor Axis)	2.4 mrad (Major Axis) 0.14 mrad (Minor Axis)	3.7 mrad (Major Axis) 0.6 mrad (Minor Axis)	10.2 mrad (Major Axis) 0.5 mrad (Minor Axis)	9.5 mrad (Major Axis) 0.85 mrad (Minor Axis)
Beam Full Width ($1/e^2$) at 5.0 m	21 mm (Major Axis) 1.0 mm (Minor Axis)	19.2 mm (Major Axis) 1.3 mm (Minor Axis)	16.5 mm (Major Axis) 1.9 mm (Minor Axis)	43 mm (Major Axis) 1.2 mm (Minor Axis)	49 mm (Major Axis) 1.3 mm (Minor Axis)
Collimating Lens	C610TME-A			C610TME-B	A397TM-B

5.2. Trigger Specifications

Parameter		Specification
Coupling		AC Coupled
Max Input Frequency[5]	**Item #s Ending in A or B**	10 MHz
	Item #s Ending in C	50 kHz
Input Voltage		200 mV_{pp} to 2 V_{pp}
Input Impedance		5 kΩ
Output Voltage[6]		900 mV (Hi-Z Load) 600 mV (50 Ω Load)
Max Jitter[7]		20 ps RMS 100 ps Peak-to-Peak
Delay[8]	**From External Trigger Input to Optical Output**	35 ns ± 5 ns
	From Internal Trigger Output to Optical Output[6]	28 ns ± 5 ns

[5] The maximum supported edge transition time is 1 ms.
[6] Only for item numbers ending in B.
[7] Applies to external triggering (all item numbers) and internal triggering (only item numbers ending in B).
[8] Trigger delay is measured between the SMA connector and the optical output at the lens.

5.3. Power, Environmental, and Physical Specifications

Parameter	Specification
DC Input Voltage Range to Laser Head	14 V to 16 V
DC Input Current to Laser Head	800 mA Max
AC Input Frequency Range to DS15 Power Supply	50 Hz - 60 Hz
AC Input Voltage to DS15 Power Supply	100 V to 240 V
Operating Temp Range	10 °C to 40 °C
Storage Temp Range	0 °C to 50 °C
Humidity Range (RH)	5% to 85%
Maximum Dimensions without ECM225 Clamps	139.6 mm x 61.5 mm x 48.7 mm (5.49" x 2.42" x 1.92")
Maximum Dimensions with ECM225 Clamps	139.6 mm x 61.5 mm x 54.7 mm (5.49" x 2.42" x 2.15")

5.4. Typical Pulse Width vs. Control Setting

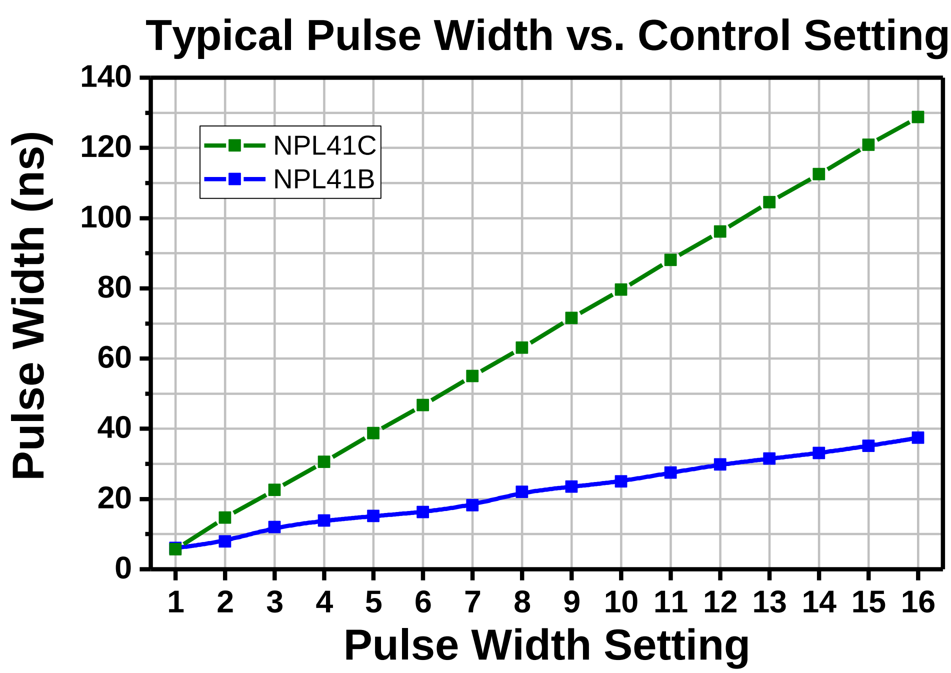


***Figure 9** Typical pulse widths for the NPL41C and NPL41B. Pulse width has 16 different settings, and actual pulse widths will vary from laser to laser. The NPL64A model does not have pulse width control.*

5.5. Typical Output Pulse Waveforms

5.5.1. NPL64A

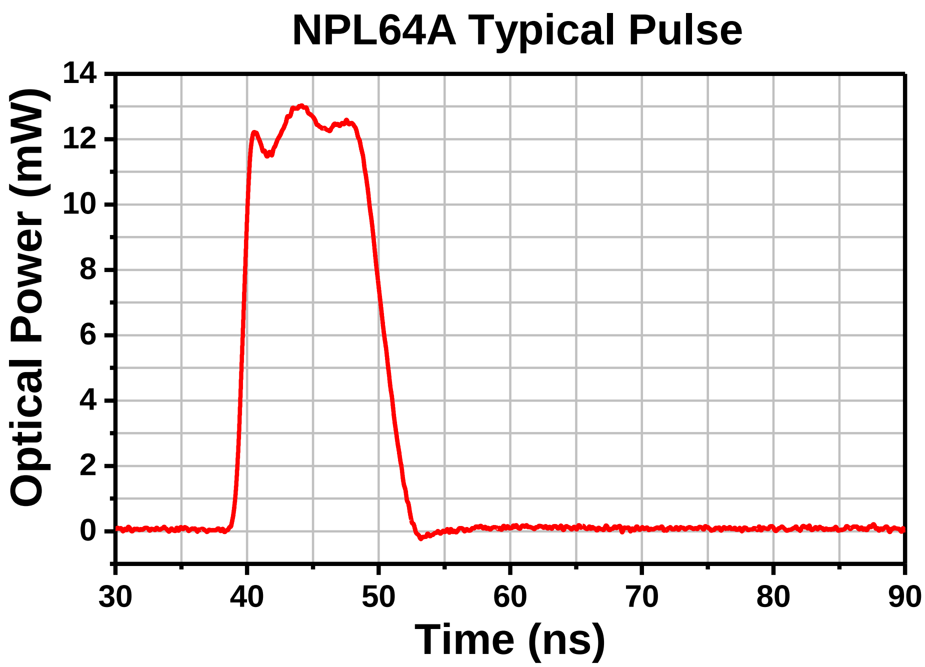


Figure 10 Typical pulse for the NPL64A, which outputs pulses of fixed width. Signal features below zero are artifacts introduced by the detector.

5.5.2. NPL41B

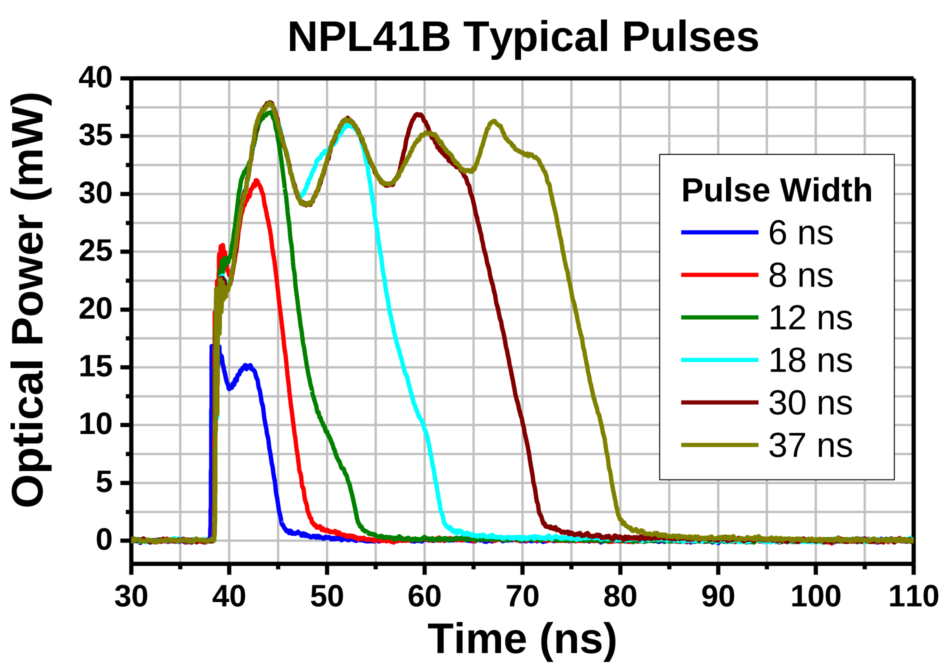


Figure 11 Typical pulses for the NPL41B. The Pulse Width control on the back panel allows the pulse width to be adjusted to one of 16 settings. (See Figure 2)

5.5.3. NPL45B

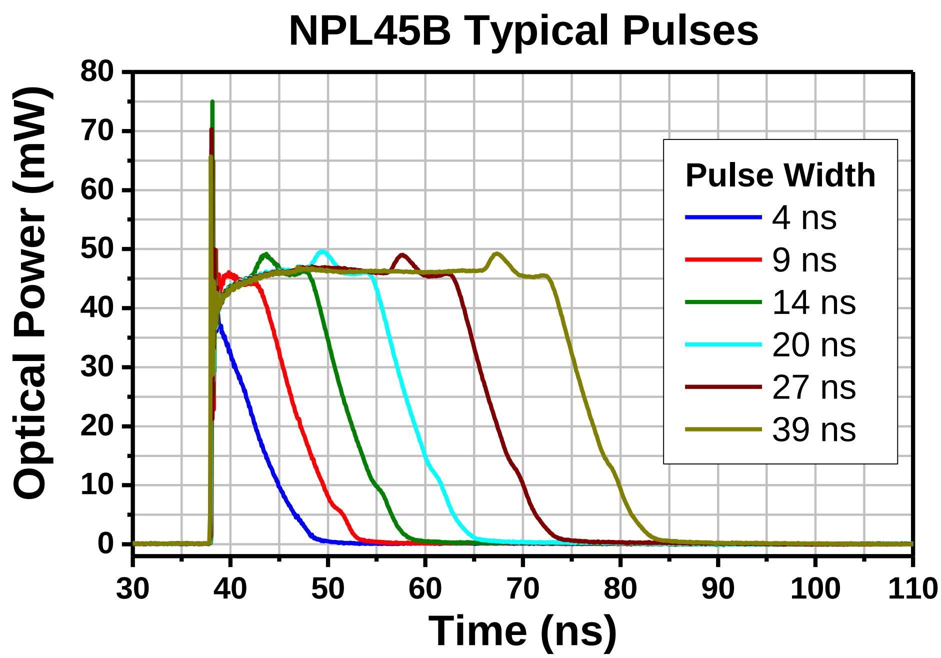


Figure 12 Typical pulses for the NPL45B. The Pulse Width control on the back panel allows the pulse width to be adjusted to one of 16 settings. (See Figure 2)

5.5.4. NPL49B

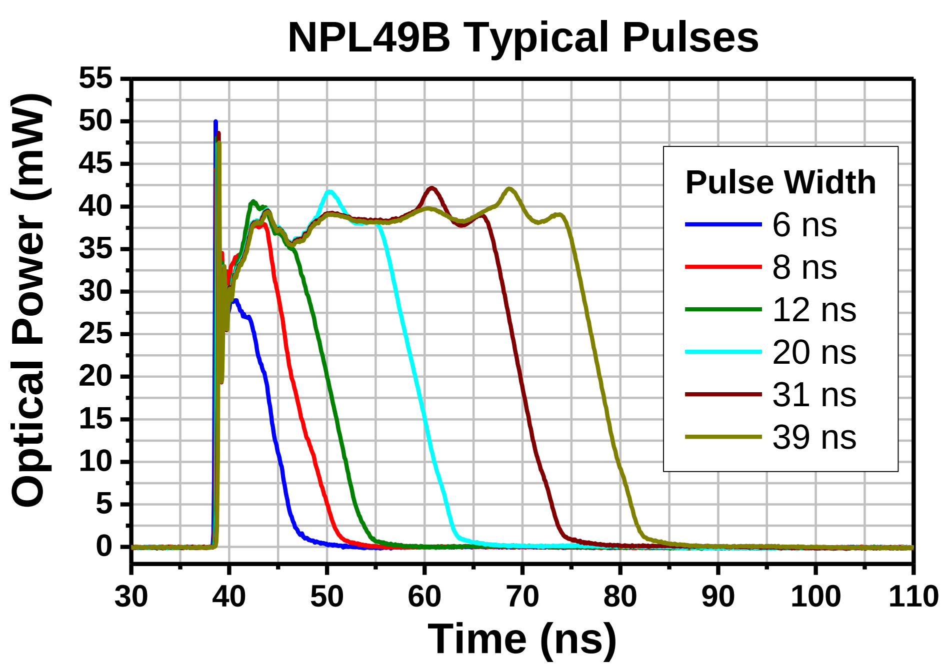


Figure 13 Typical pulses for the NPL49B. The Pulse Width control on the back panel allows the pulse width to be adjusted to one of 16 settings. (See Figure 2)

5.5.5. NPL52B

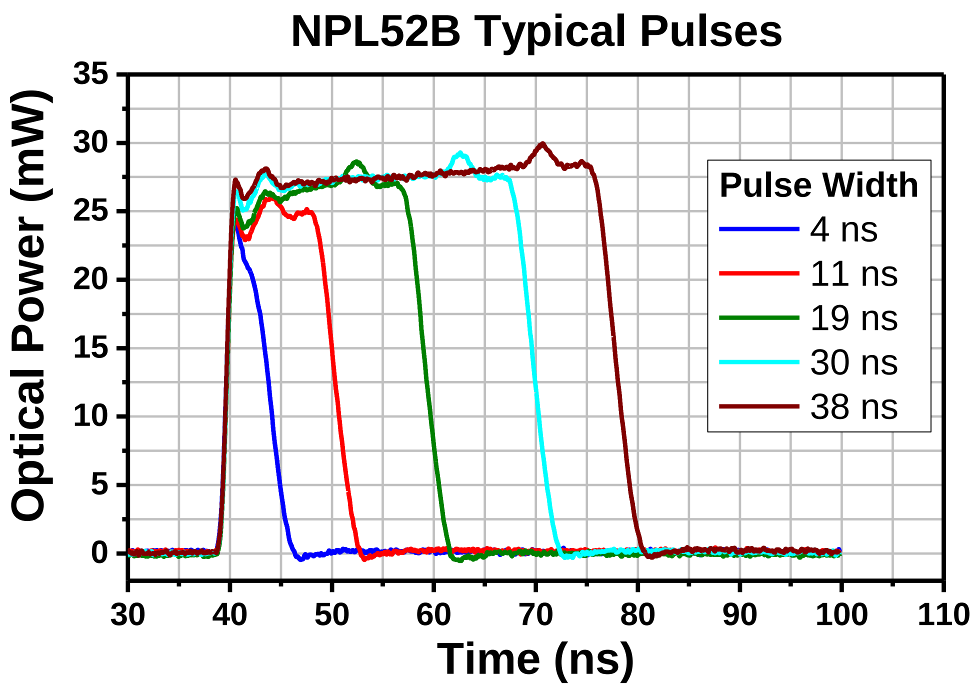


Figure 14 Typical pulses for the NPL52B. The Pulse Width control on the back panel allows the pulse width to be adjusted to one of 16 settings. (See Figure 2)
Signal features below zero are artifacts introduced by the detector.

5.5.6. NPL64B

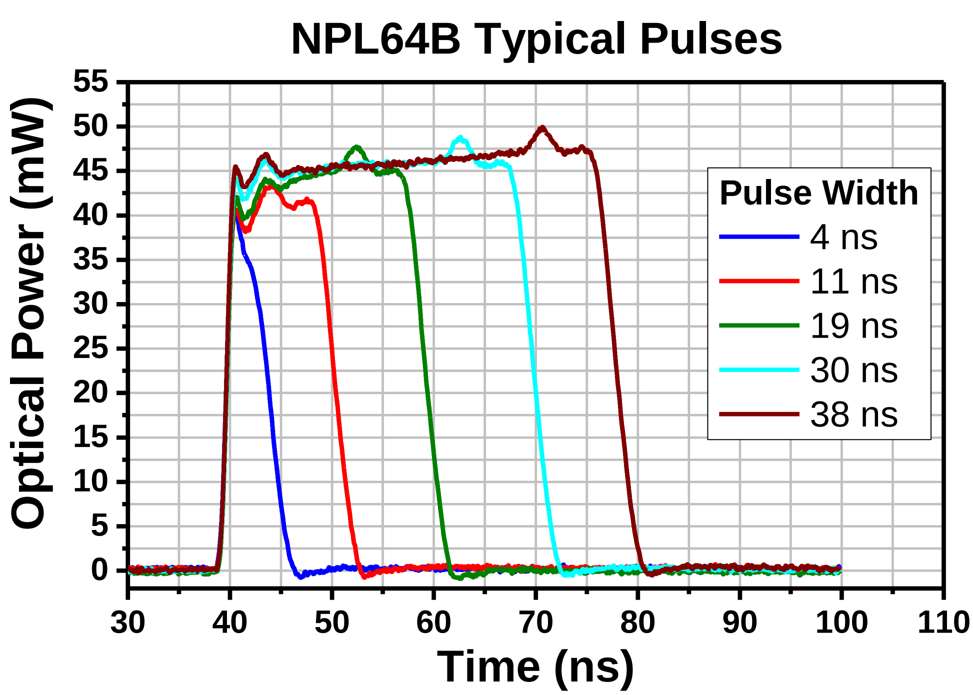


Figure 15 Typical pulses for the NPL64B. The Pulse Width control on the back panel allows the pulse width to be adjusted to one of 16 settings. (See Figure 2)
Signal features below zero are artifacts introduced by the detector.

5.5.7. NPL79B

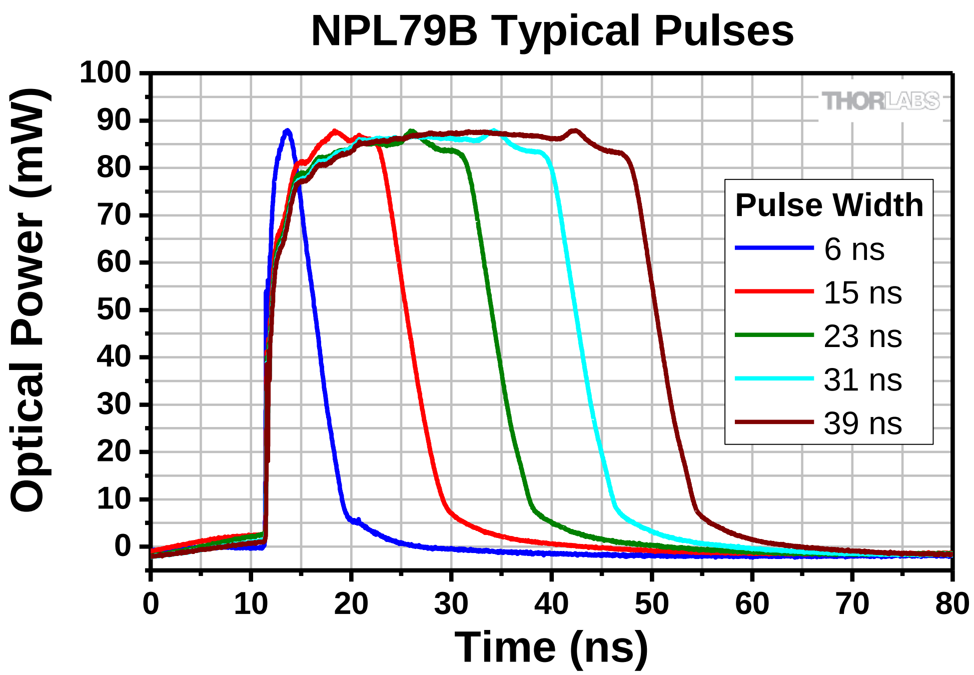


Figure 16 Typical pulses for the NPL79B. The Pulse Width control on the back panel allows the pulse width to be adjusted to one of 16 settings. (See Figure 2)
Signal features below zero are artifacts introduced by the detector.

5.5.8. NPL82B

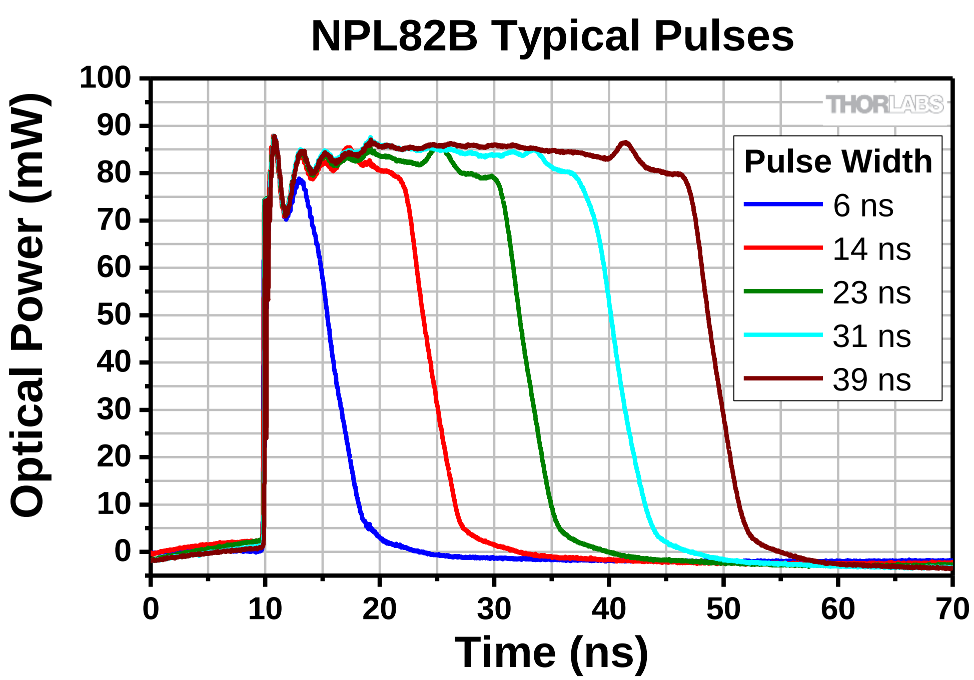


Figure 17 Typical pulses for the NPL82B. The Pulse Width control on the back panel allows the pulse width to be adjusted to one of 16 settings. (See Figure 2)
Signal features below zero are artifacts introduced by the detector.

5.5.9. NPL98B

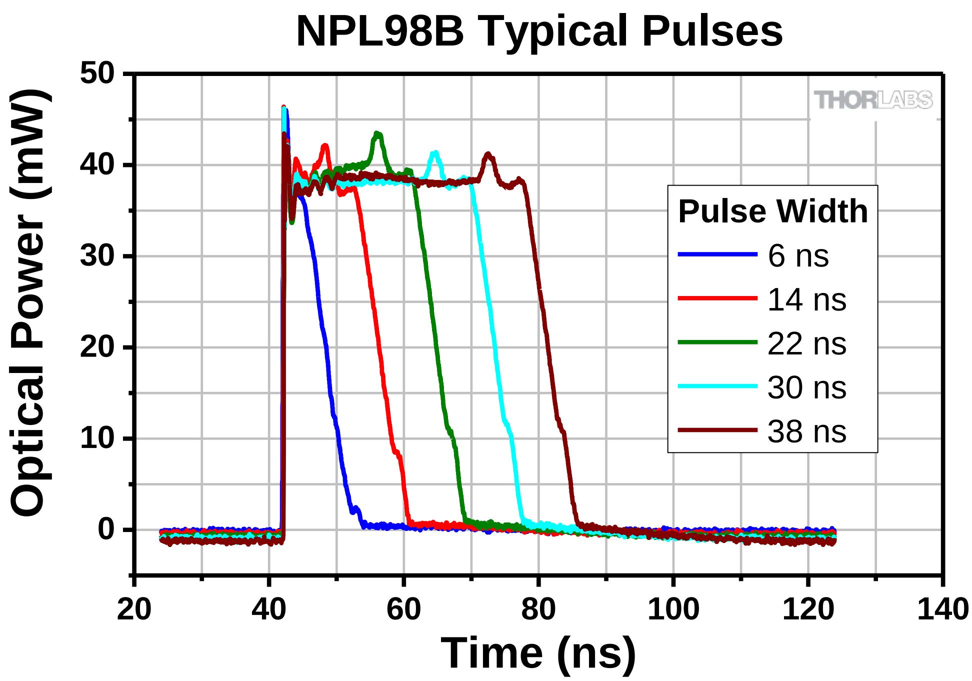


Figure 18 Typical pulses for the NPL98B. The Pulse Width control on the back panel allows the pulse width to be adjusted to one of 16 settings. (See Figure 2)
Signal features below zero are artifacts introduced by the detector.

5.5.10. NPL41C

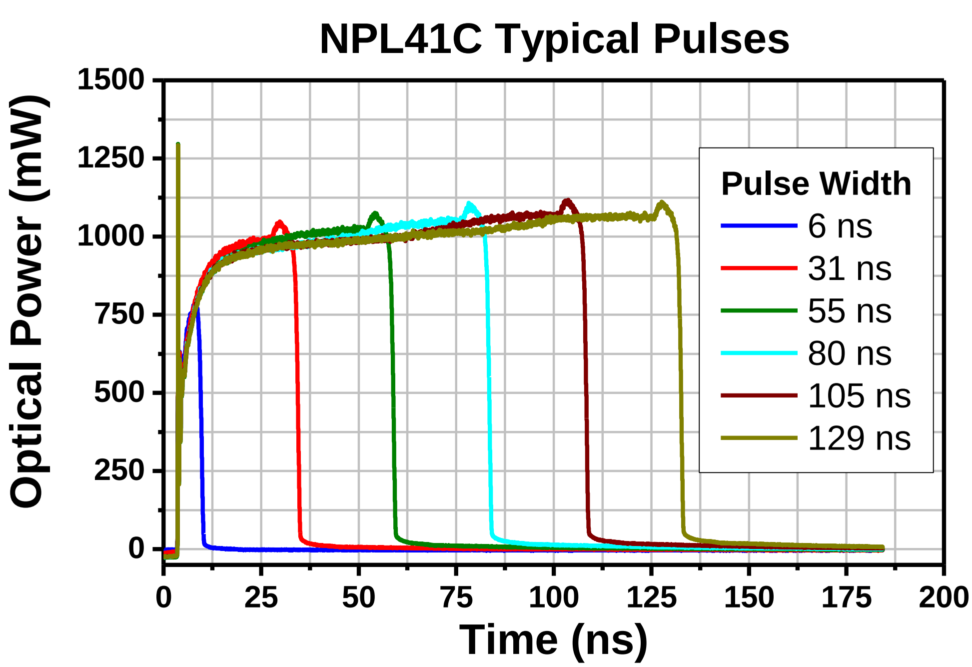


Figure 19 Typical pulses for the NPL41C. The Pulse Width control on the back panel allows the pulse width to be adjusted to one of 16 settings. (See Figure 3)

5.5.11. NPL45C

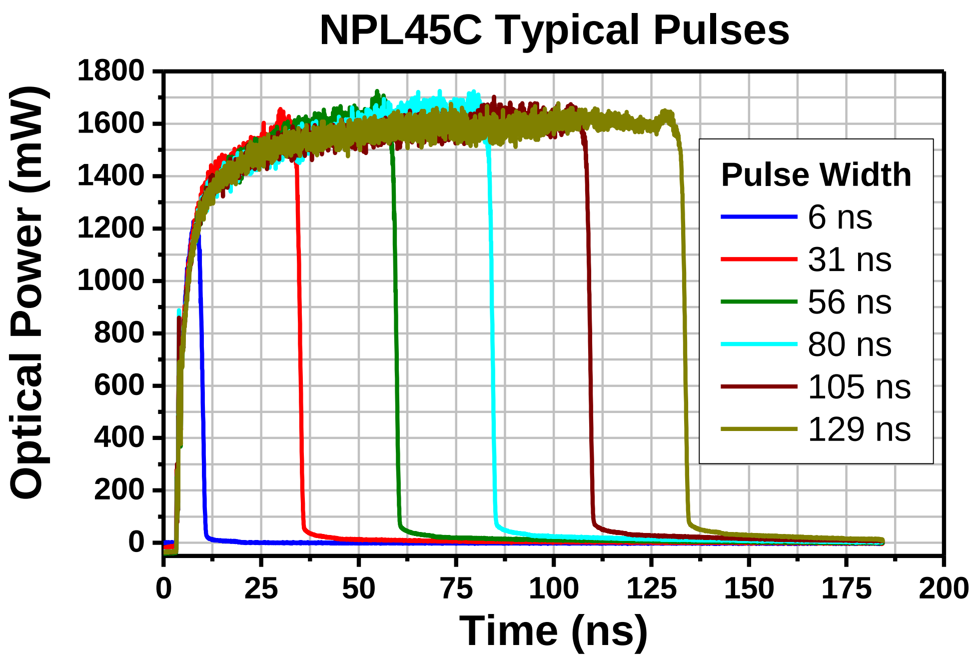


Figure 20 Typical pulses for the NPL45C. The Pulse Width control on the back panel allows the pulse width to be adjusted to one of 16 settings. (See Figure 3)

5.5.12. NPL52C

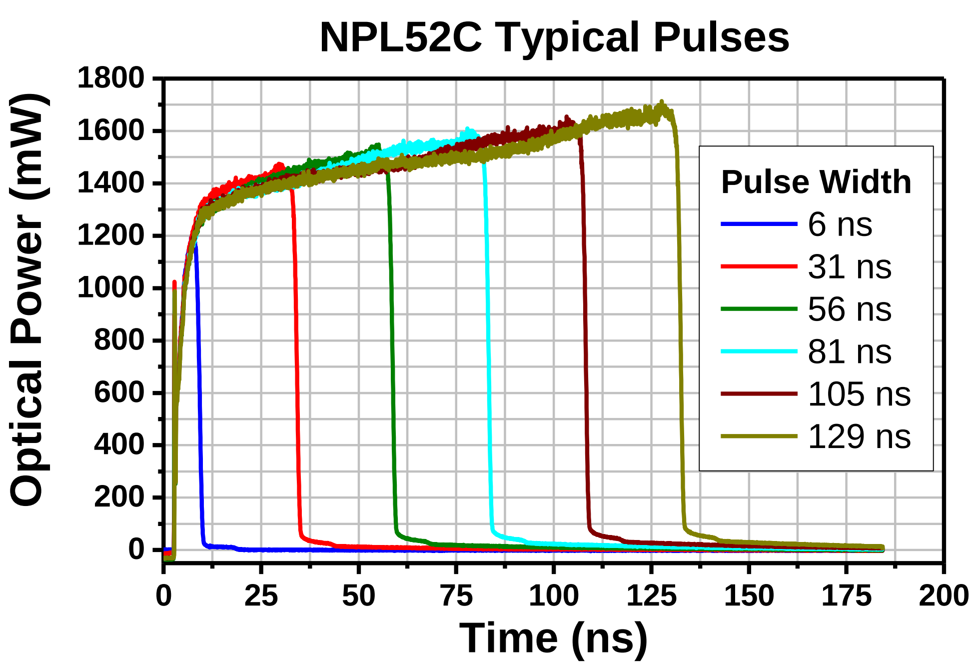


Figure 21 Typical pulses for the NPL52C. The Pulse Width control on the back panel allows the pulse width to be adjusted to one of 16 settings. (See Figure 3)

5.5.13. NPL64C

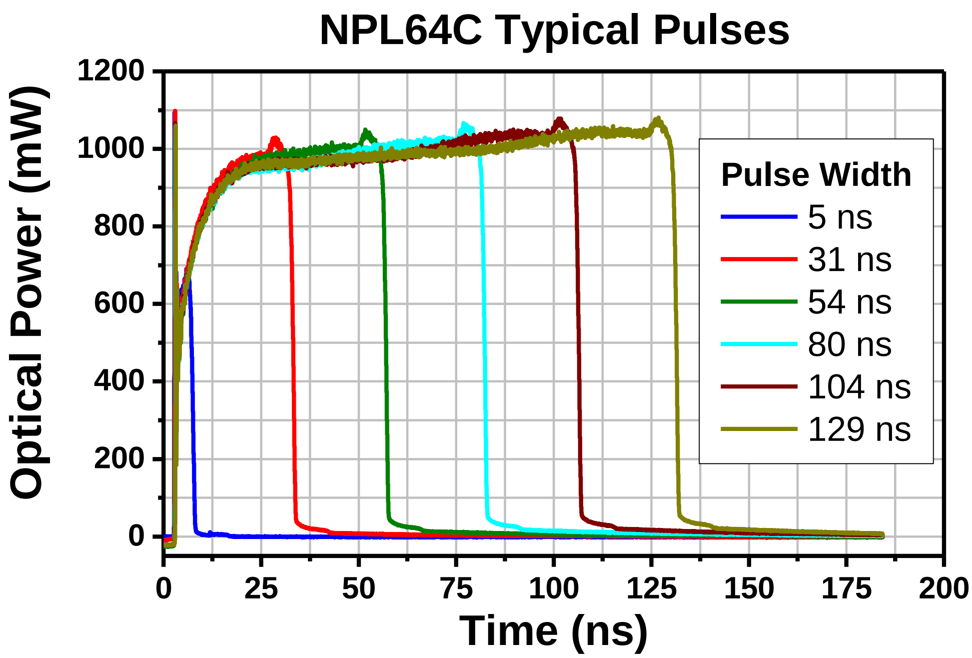


Figure 22 Typical pulses for the NPL64C. The Pulse Width control on the back panel allows the pulse width to be adjusted to one of 16 settings. (See Figure 3)

5.5.14. NPL81C

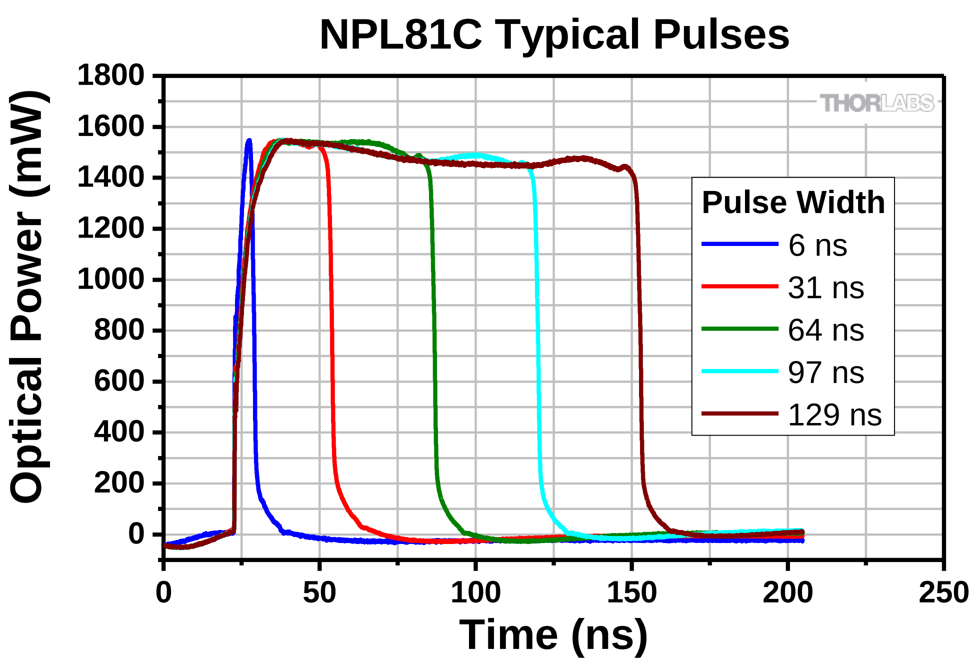


Figure 23 Typical pulses for the NPL81C. The Pulse Width control on the back panel allows the pulse width to be adjusted to one of 16 settings. (See Figure 3)
Signal features below zero are artifacts introduced by the detector.

Chapter 6 Mechanical Drawings

6.1. NPL64A

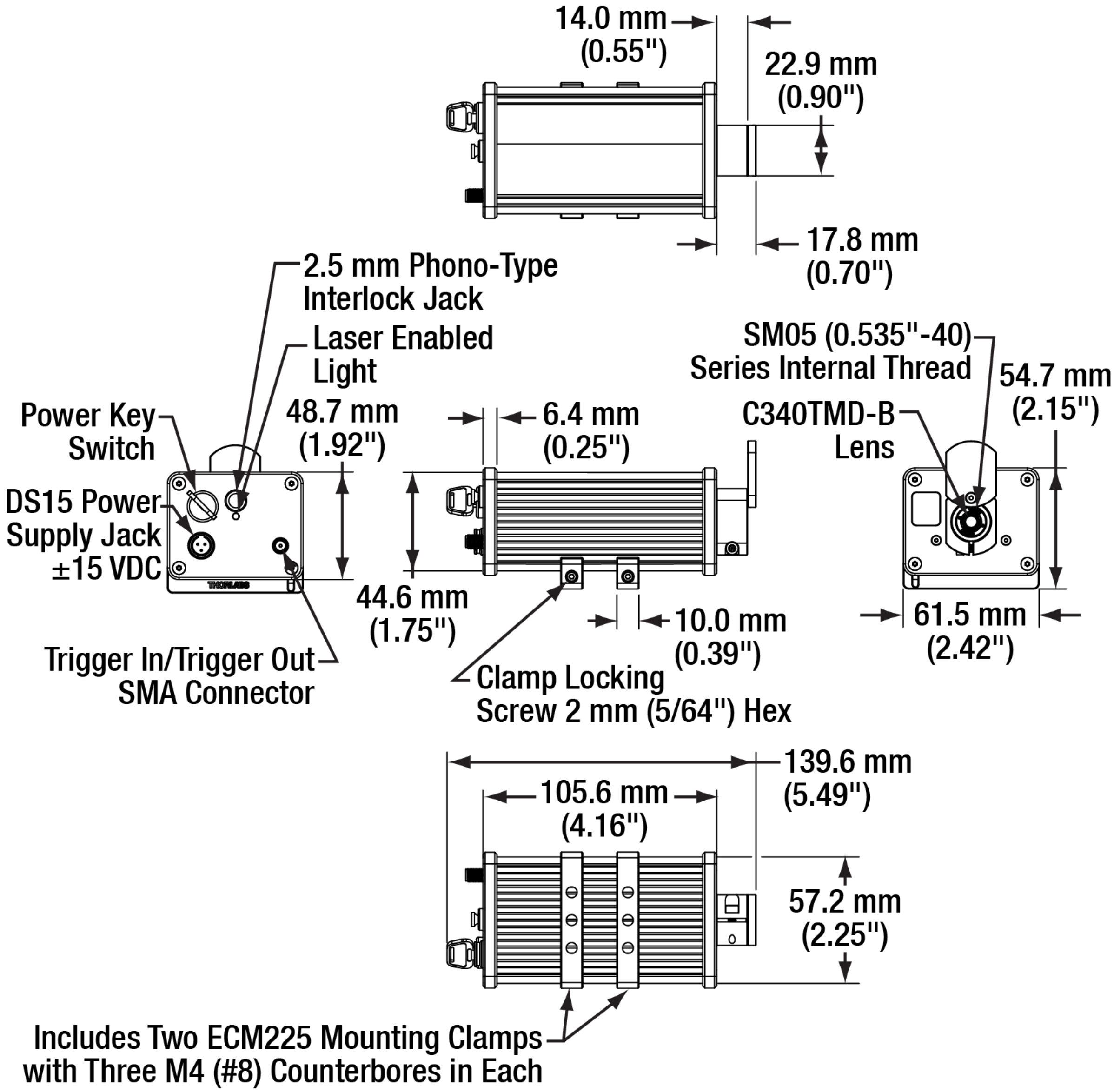


Figure 24 Mechanical Drawing of the NPL64A

6.2. NPL41B, NPL45B, NPL49B, NPL52B, NPL64B, NPL79B, NPL82B, and NPL98B

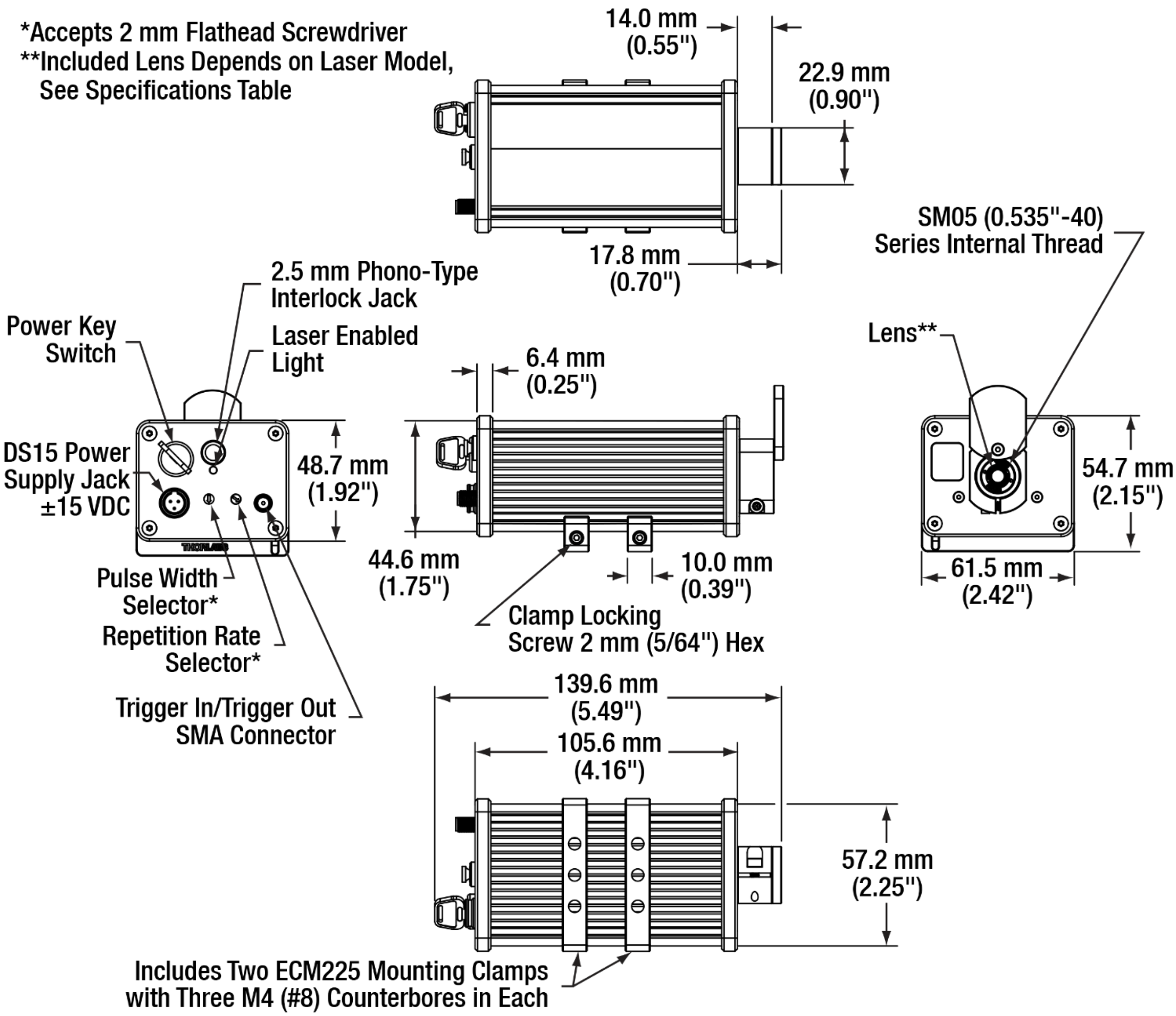


Figure 25 Mechanical Drawing for Item Numbers Ending in B

6.3. NPL41C, NPL45C, NPL52C, NPL64C, and NPL81C

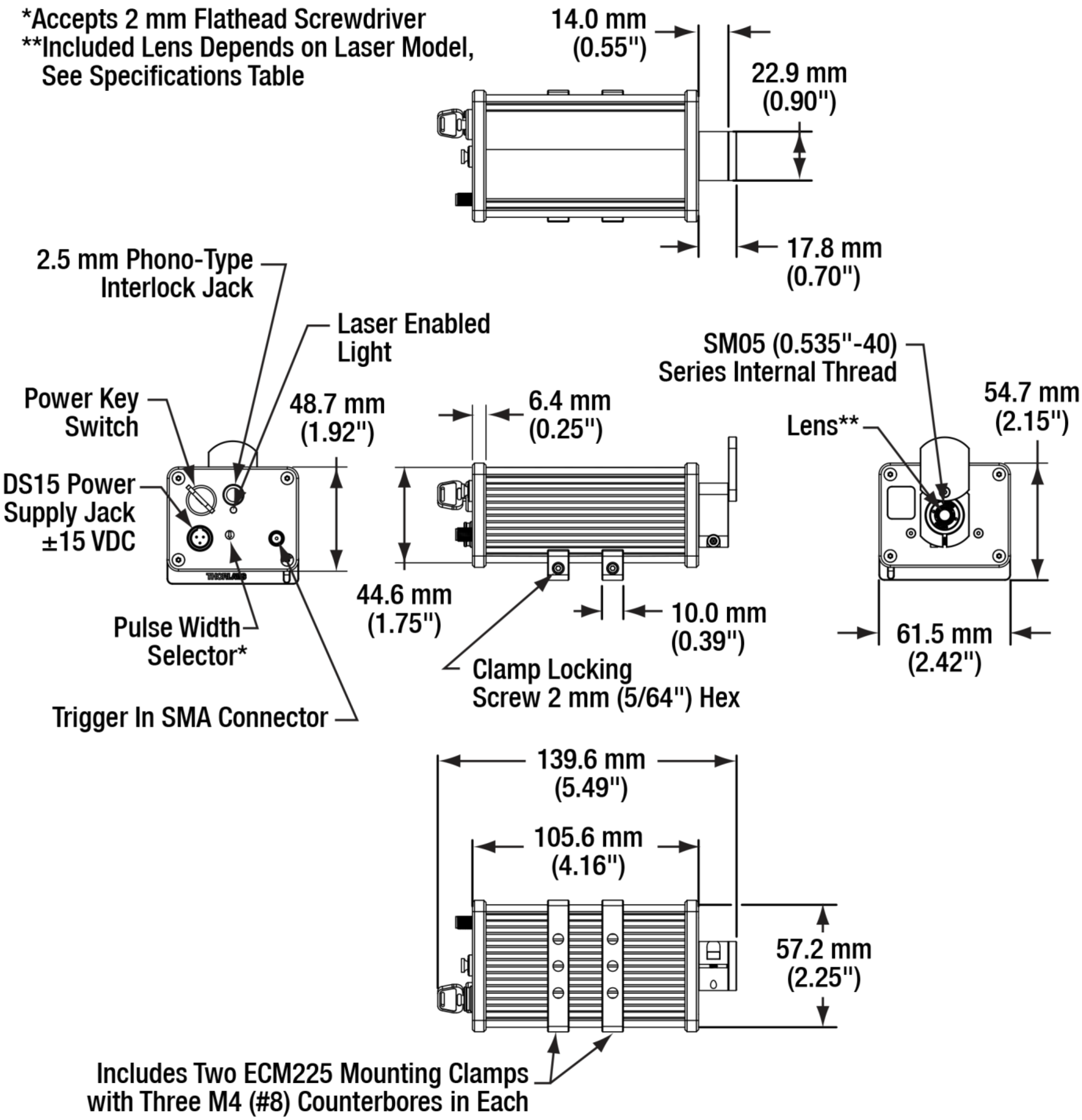


Figure 26 Mechanical Drawing for Item Numbers Ending in C

Chapter 7 Maintenance, Repair, and Fuses

7.1. Maintenance

The NPL laser should not require regular maintenance. If necessary, the housing can be cleaned using a soft cloth moistened with a mild glass cleaner. Do not use acetone, chemical solvents, or harsh cleaning solutions, and do not spray cleaning solutions directly onto the unit. See Section 7.2 for advice on cleaning the lens.

The NPL does not contain any user-serviceable components. If malfunctions occur, please contact Thorlabs' technical support (**techsupport@thorlabs.com**). Do not disassemble the unit.

See the troubleshooting guide below for basic help.

7.2. Troubleshooting

Problem	Suggested Checks
No Output	Check that power is supplied and connected properly. Check that key switch is turned on. Confirm that laser is warmed up (30 - 60 s). Confirm the interlock circuit is complete. Check that the indicator LED is glowing continuously. Check that a trigger signal is being provided. Check that the shutter is open.
Beam is Distorted	Check to see if the lens dirty. If so, see the cleaning instructions in "Lens is Dirty."
Lens is Dirty	Blow any loose dust off with dry air. If lens requires further cleaning, gently wipe with lens tissue that is moistened with either isopropyl or methyl alcohol. Do not apply drops of solvent directly to the lens. Do not use acetone or other aggressive solvents.
Power is Low	NPL64A: Check the trigger frequency. Item numbers ending in B: Check the trigger frequency and settings of pulse width and repetition rate controls. Item numbers ending in C: Check the trigger frequency and pulse width control setting.

Chapter 8 Declaration of Conformity

THORLABS
www.thorlabs.com

EU Declaration of Conformity

in accordance with EN ISO 17050-1:2010

We: Thorlabs Inc.

Of: 56 Sparta Avenue, Newton, New Jersey, 07860, USA

in accordance with the following Directive(s):

2014/35/EU	Low Voltage Directive (LVD)
2014/30/EU	Electromagnetic Compatibility (EMC) Directive
2011/65/EU	Restriction of Use of Certain Hazardous Substances (RoHS)

hereby declare that:

Model: ***NPL52B, NPL64A, NPL64B, NPL41B, NPL45B, NPL49B, NPL41C, NPL45C, NPL52C, & NPL64C, NPL79B, NPL81C, NPL82B, NPL98B***

Equipment: ***Nanosecond Pulsed Laser***

is/are in conformity with the applicable requirements of the following documents:

EN 61010-1	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use.	2010
EN 61326-1	Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements	2013
EN 60825-1	Safety of laser products	2014-05
EN 62471-1	Photobiological Safety of Lamps and Lamp Systems	2009

and which, issued under the sole responsibility of Thorlabs, is/are in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8th June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment, for the reason stated below:

does not contain substances in excess of the maximum concentration values tolerated by weight in homogenous materials as listed in Annex II of the Directive

I hereby declare that the equipment named has been designed to comply with the relevant sections of the above referenced specifications, and complies with all applicable Essential Requirements of the Directives.

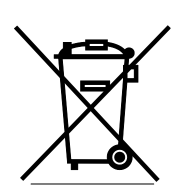
Signed: *On:* 27 January 2017

Name: Daneille Strong

Position: Director of Quality and Compliance *EDC - NPL52B, NPL64A, NPL64B, NP...*

CE

Thorlabs verifies our compliance with the WEEE (Waste Electrical and Electronic Equipment) directive of the European Community and the corresponding national laws. Accordingly, all end users in the EC may return “end of life” Annex I category electrical and electronic equipment sold after August 13, 2005 to Thorlabs, without incurring disposal charges. Eligible units are marked with the crossed out “wheelie bin” logo (see right), were sold to and are currently owned by a company or institute within the EC, and are not dissembled or contaminated. Contact Thorlabs for more information. Waste treatment is your own responsibility. “End of life” units must be returned to Thorlabs or handed to a company specializing in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site.



ANNEX I

Chapter 9 Thorlabs Worldwide Contacts

For technical support or sales inquiries, please visit us at **www.thorlabs.com/contact** for our most up-to-date contact information.

USA, Canada, and South America
Thorlabs, Inc.
sales@thorlabs.com
techsupport@thorlabs.com

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Thorlabs GmbH
europe@thorlabs.com

France
Thorlabs SAS
sales.fr@thorlabs.com

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UK and Ireland
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techsupport.uk@thorlabs.com

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China
Thorlabs China
chinasales@thorlabs.com

THORLABS

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