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# THORLABS

## **S1FC405, S1FC635, S1FC637, S1FC660, S1FC675, S1FC780, S1FC785, S1FC808, S1FC980, S1FC1060, S1FC1310, S1FC1550 Fiber-Coupled Laser Sources**

### **Operating Manual**



















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# Chapter 1 Warning Symbol Definitions


Below is a list of warning symbols you may encounter in this manual or on your device.

Symbol	Description
	Direct Current
	Alternating Current
	Both Direct and Alternating Current
	Earth Ground Terminal
	Protective Conductor Terminal
	Frame or Chassis Terminal
	Equipotentiality
	On (Supply)
	Off (Supply)
	In Position of a Bi-Stable Push Control
	Out Position of a Bi-Stable Push Control
	Caution: Risk of Electric Shock
	Caution: Hot Surface
	Caution: Risk of Danger
	Warning: Laser Radiation
	Caution: Spinning Blades May Cause Harm


## 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.

**SHOCK WARNING**



**High voltage inside. To avoid electrical shock, before powering unit, make sure that the protective conductor of the 3-conductor power cord is correctly connected to the protective earth contact of the socket outlet. Improper grounding can cause electric shock resulting in severe injury or even death. Do not operate without cover installed.**



**WARNING**



**This unit must not be operated in explosive environments.**



Thorlabs provides the proper power input cable for use in the United States. If using this unit anywhere else, the user will need to supply a properly grounded power cable to power the unit.

Do not obstruct the air-ventilation slots in the housing!

Make sure that the line voltage rating marked on the rear panel agrees with your local supply and that the appropriate fuses are installed. Changing of the mains fuse can be done by the user (see Setting the AC Line Voltage and Installing Fuses).

With the exception of the mains fuses, there are no user serviceable parts in this product.

This device can only be returned when packed into the complete original packaging, including all foam packing inserts. If necessary, ask for a replacement package.

Mobile telephones, cellular phones or other radio transmitters should not to be used within the range of three meters of this unit since the electromagnetic field intensity may exceed the maximum allowed disturbance values according to EN50082-1.

<p><b>Class 1 Laser Product</b> 1550 nm      &lt;5 mW</p>		<p><b>LASER RADIATION</b> <b>AVOID EXPOSURE TO THE BEAM</b> <b>CLASS 3B LASER PRODUCT</b> 405 - 1064 nm      &lt;50 mW</p>
<p><b>Class 1 Laser Product</b> 1310 nm      &lt;5 mW</p>		<p><b>LASER RADIATION</b> <b>AVOID DIRECT EYE EXPOSURE</b> <b>CLASS 3R LASER PRODUCT</b> 600 - 700 nm      &lt;5 mW</p>

## **Chapter 3    Description**

These Fiber-Coupled Laser Sources provide easy coupling and simple control of laser-diode-driven fiber optics. These laser sources are available in two versions: Fabry-Perot and distributed feedback (DFB). The Fabry-Perot sources are offered from five wavelengths from 405 nm to 1550 nm with standard single mode fiber or polarization-maintaining fiber output. The DFB sources are offered from 1310 nm or 1550 nm wavelengths and are equipped with a thermo-electric cooler to stabilize the output wavelength as well as a 40 dB optical isolator to eliminate frequency jitter due to back reflections.

## Chapter 4 Setup

### 4.1. Setting the AC Line Voltage and Installing Fuses

This S1FC series laser source is configured for 115 VAC operation. If you are planning to operate your unit using a 220 / 230 VAC input, or need to replace an open fuse, you must perform the following procedure.

- Remove the AC power cord if it is connected to the unit.
- Remove the cover of the unit by removing the two 4-40 Philips head screws located on the bottom rear of the unit and slide the cover off. Refer to Figure 1 on page 5.
- Locate the AC Line Select Switch and Fuse Holder. They are located near the AC Input Module towards the back of the unit. Refer to Figure 1.
- Using a flat blade screwdriver turn the Line Select Switch to the appropriate setting to match the AC input voltage you will be using.
- Remove the cover to the fuse holder. You will find the fuse installed in the cover. Remove the existing fuse and install the appropriate fuse for the line voltage you will be using:
  - For 115 VAC operation use 250 mA.
  - For 220/230 VAC operation use 160 mA.
  - In all cases use only 5 mm x 20 mm 250 VAC Type T Fuses (IEC 60127-2/III, low breaking capacity, slow blow).
- Reinstall the cover and replace the two 4-40 Philips head screws.
- Remove the small cap head screw indicating the previous voltage configuration located on the rear panel, above the AC input housing. Place the screw in the threaded hole indicating the new AC input configuration, see Figure 2.

### 4.2. Initial Setup

- Determine the AC line voltage the unit will be connected to (either 115 VAC or 230 VAC) and set the AC Line Voltage Selector Switch to the appropriate position and install the proper fuse.
- Place the unit on a dry, level working surface.
- Make sure the POWER key switch on the front of the unit is in the OFF position (key perpendicular to working surface).
- Plug the female end of the AC line cord provided into the AC input receptacle on the rear of the unit. Plug the male end into a properly grounded AC socket.
- Connect a Fiber Optic cable to the LASER APERTURE on the front panel of the unit.

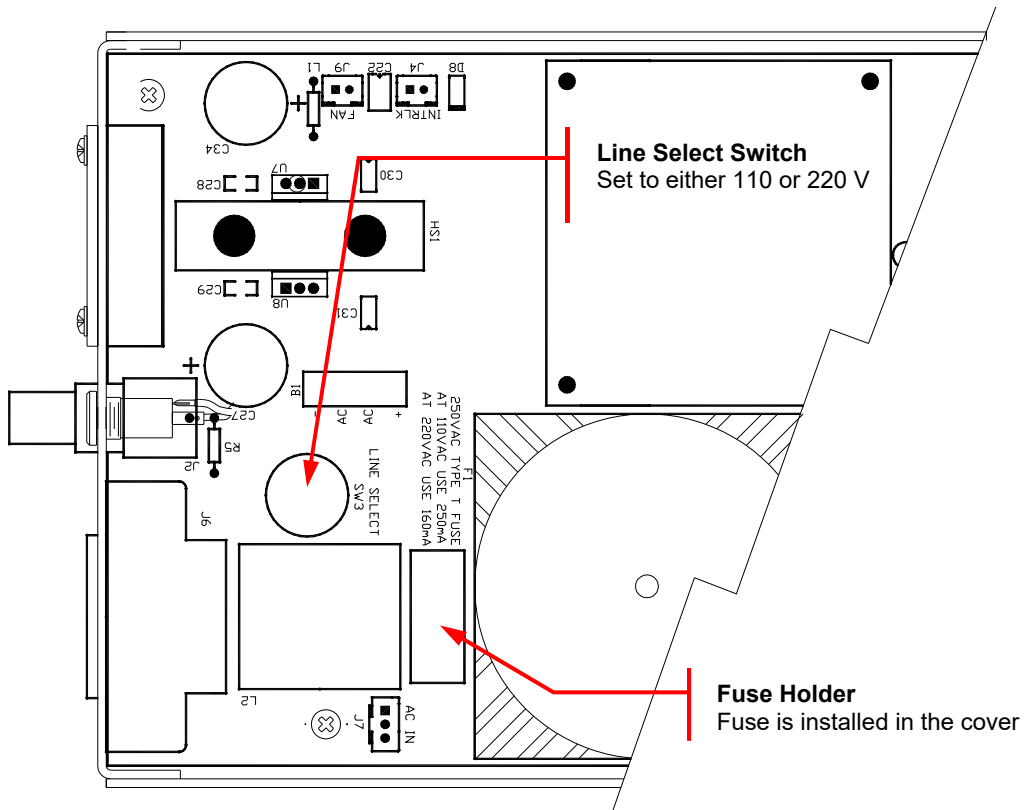


Figure 1 Locations of Line Select Switch and Fuse Holder

# Chapter 5 Operation

## 5.1. Front and Back Panel Overview

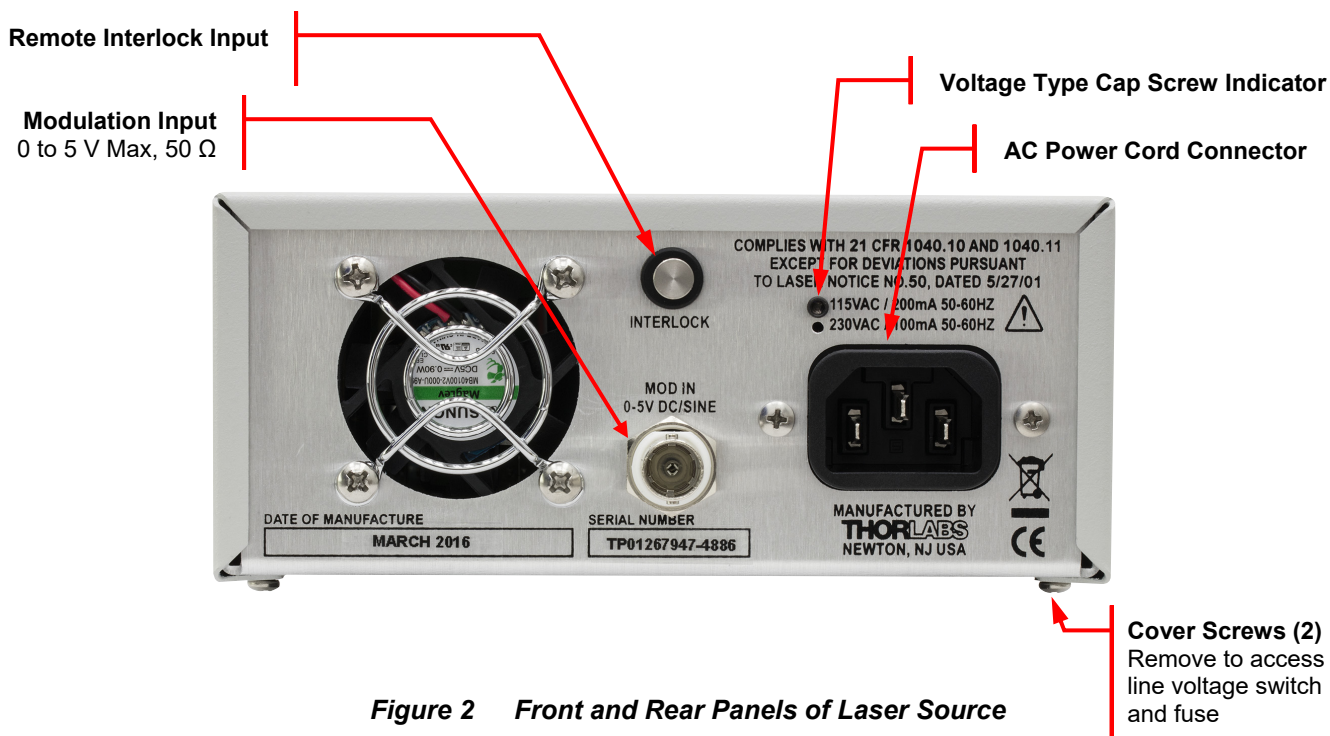
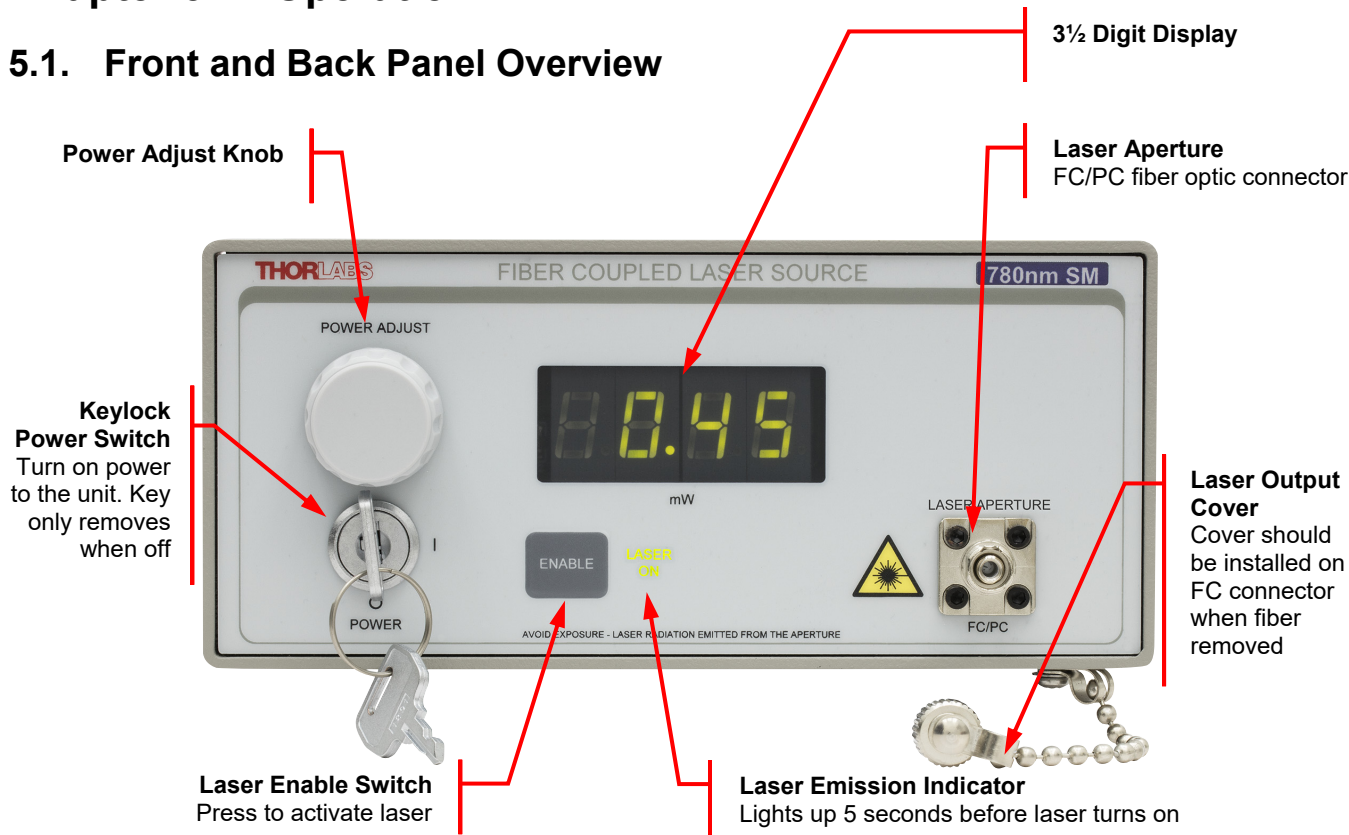


Figure 2 Front and Rear Panels of Laser Source



## 5.2. Turning On the Source

- Turn the POWER key switch clockwise. The unit is ON when the display lights up.
- Make sure the interlock input is short-circuited, see page 8 for more details.
- Press and release the ENABLE switch to turn ON the laser. The LASER ON indicator will light up and after a delay of approximately 5 seconds, the source will begin to emit light.

## 5.3. Adjusting the Laser Output Power

- Use the POWER ADJUST knob to adjust the output power to the desired level.
- The power shown on the display is the optical power at the laser aperture. The actual power at the end of your fiber optic cable may be less, depending on the quality of the connection.

Note, each unit is calibrated internally to limit the maximum operating power of the laser diode to a safe operating range.

## 5.4. Turning the Laser Off

- The Laser output should be turned off by pressing and releasing the ENABLE switch.
- When completely powering down an enabled unit, first press and release the ENABLE switch and then turn the POWER key switch counterclockwise, which will turn OFF the entire unit. Anytime the unit is turned OFF and then turned back ON, the Laser will be disabled until the ENABLE switch is pressed.

## 5.5. Modulating the Laser Output

The MOD IN input can be used to modulate the laser output, or set the laser output remotely using a +5 V power source. The 5 V maximum input corresponds to the maximum calibrated power of the laser source. Each unit is calibrated to achieve the maximum power for the particular laser diode used in the device. Due to variations in the coupling process no two units will have the same maximum power.

- Connect a signal generator or +5 V power source to the unit using a BNC type connector.
- Set the POWER ADJUST knob to its full counter clockwise setting.
- Press the ENABLE switch to turn on the laser.
- Apply the appropriate signal to the MOD IN input. Signals above approximately 5.5 V will be clamped by internal circuits.
- Adjusting the POWER ADJUST knob will allow for a DC offset on the modulated output. Adjust the input signal accordingly to avoid clipping the output waveform, which will occur if the unit is driven to its current or power limits.

### Caution!

**DO NOT apply TTL or square wave modulation to the MOD IN input.  
Due to response delays of the constant power control loop, damage to the integrated fiber coupled laser may occur!**

## Chapter 6 Making the Safety Interlock Connections

These laser sources are equipped with a remote interlock connector located on the rear panel (see Figure 2). All units have this feature regardless of their FDA and IEC classifications. In order to enable the laser source, a short circuit must be applied across the terminals of the remote interlock connector. In practice this connection is made available to allow the user to connect a remote-actuated switch to the connector (i.e. an open door indicator). The switch, which must be normally open, has to be closed in order for the unit to be enabled. Once the switch is in an open state the laser source will automatically shut down. If the switch returns to a closed condition the laser source must be re-enabled at the unit by pressing the ENABLE switch.

All units shipped from Thorlabs are configured with a shorting device installed in the Interlock connector. If you are not going to use this feature then you can leave the shorting device installed and the unit will operate normally as described in the procedures above.

If you wish to make use of the interlock feature you will need to acquire the appropriate connector mate and wire it your remote interlock switch. Next, remove the shorting device by pulling it out with a pair of needle nose pliers and install the connector into the interlock input.

The interlock input only accepts a 2.5 mm mono jack. This connector is readily available at most electronics stores.

The electrical specifications for the interlock input are shown in the following table.

Specification	Value
Type of Mating Connector	2.5 mm Mono Jack
Open Circuit Voltage	+5 VDC with Respect to Chassis Ground
Short Circuit Current	0.5 mA DC
Connector Polarity	Tip is +5 V, Barrel is Ground
Interlock Switch Requirements	Must be N.O. dry contacts; under no circumstances should any external voltages be applied to the interlock input.

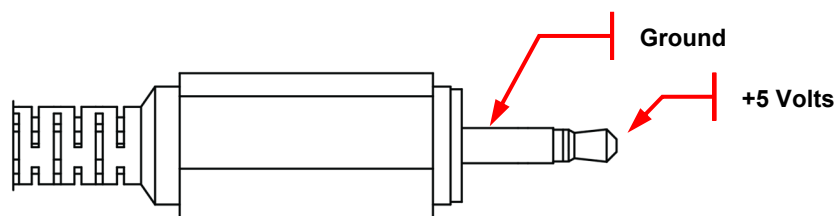


Figure 3 Remote Interlock Connector

## **Chapter 7    General Maintenance**

Aside from the AC input fuse, there are no user serviceable parts in this product. If you suspect something has failed on the unit, please contact Thorlabs for advice on returning the unit for evaluation.

### **7.1.    Cleaning**

The unit can be cleaned using a soft, slightly damp cloth. Avoid using any solvents on or near the unit.

### **7.2.    Connector Cleaning**

Always clean the ferrule end of your fiber patch cable prior to inserting it into the output FC adapter. Thorlabs recommends the FCC-7020 fiber cleaner which can be found on our website. This should be used before inserting the fiber connector into the mating barrel. You can verify the connector is clean using the FS201 fiber inspection scope.

From time to time it will be necessary to clean the barrel on the benchtop laser. We recommend using the FBC1 fiber port cleaner.

## Chapter 8 Specifications

Item #	S1FC405	S1FC635	S1FC637	S1FC660	S1FC675	S1FC780
<b>Wavelength</b>	405 nm	635 nm	637 nm	660 nm	675 nm	785 nm
<b>Min Full Output Power</b>	8.0 mW	2.5 mW	8.0 mW	15.0 mW	2.5 mW	10.0 mW
<b>Laser Class</b>	3B	3R	3B	3B	3R	3B
<b>Stability</b>	15 min: $\pm 0.05$ dB, 24 hr: $\pm 0.1$ dB (After 1 hr Warm-Up at $25 \pm 10$ °C Ambient)					
<b>Display Accuracy</b>	$\pm 10\%$					
<b>Setpoint Resolution</b>	0.01 mW					
<b>Adjustment Range</b>	~0 mW to Full Power					
<b>TEC</b>						
<b>Stability</b>	N/A					
<b>Setpoint Accuracy</b>	N/A					
<b>Setpoint Resolution</b>	N/A					
<b>Adjustment Range</b>	N/A					
<b>Environmental</b>						
<b>Operating Temp</b>	15 to 35 °C					
<b>Storage Temp</b>	0 to 50 °C					
<b>AC Input</b>	115 VAC / 230 VAC (Switch Selectable) 50 - 60 Hz					
<b>Modulation Input</b>	0 - 5 V = 0 - Full Power, DC or Sine Wave Input Only					
<b>Modulation Bandwidth</b>	5 kHz Full Depth of Modulation 30 kHz Small Signal Modulation					
<b>Fiber</b>	S405-XP	SM600	SM600	SM600	SM600	780HP

Item #	S1FC785	S1FC808	S1FC980	S1FC1060	S1FC1310	S1FC1550
Wavelength	785 nm	808 nm	980 nm	1064 nm	1310 nm	1550 nm
Min Full Output Power	20.0 mW	15.0 mW	13.0 mW	20.0 mW	1.5 mW	1.5 mW
Laser Class	3B	3B	3B	3B	1	
Stability	15 min: $\pm 0.05$ dB, 24 hr: $\pm 0.1$ dB (After 1 hr Warm-up at $25 \pm 10$ °C Ambient)					
Display Accuracy	$\pm 10\%$					
Setpoint Resolution	0.1 mW		0.01 mW	0.1 mW	0.01 mW	
Adjustment Range	~0 mW to Full Power					
<b>TEC</b>						
Stability	n/a					
Setpoint Accuracy	n/a					
Setpoint Resolution	n/a					
Adjustment Range	n/a					
<b>Environmental</b>						
Operating Temp	15 to 35 °C					
Storage Temp	0 to 50 °C					
AC Input	115 VAC / 230 VAC (Switch Selectable) 50 - 60 Hz					
Modulation Input	0 - 5 V = 0 - Full Power, DC or Sine Wave Input Only					
Modulation Bandwidth	5 kHz Full Depth of Modulation 30 kHz Small Signal Modulation					
Fiber	780HP	SM800-5.6-125	SM980-5.8-125	HI1060	SMF-28-J9	SMF-28-J9

# Chapter 9 Mechanical Drawing

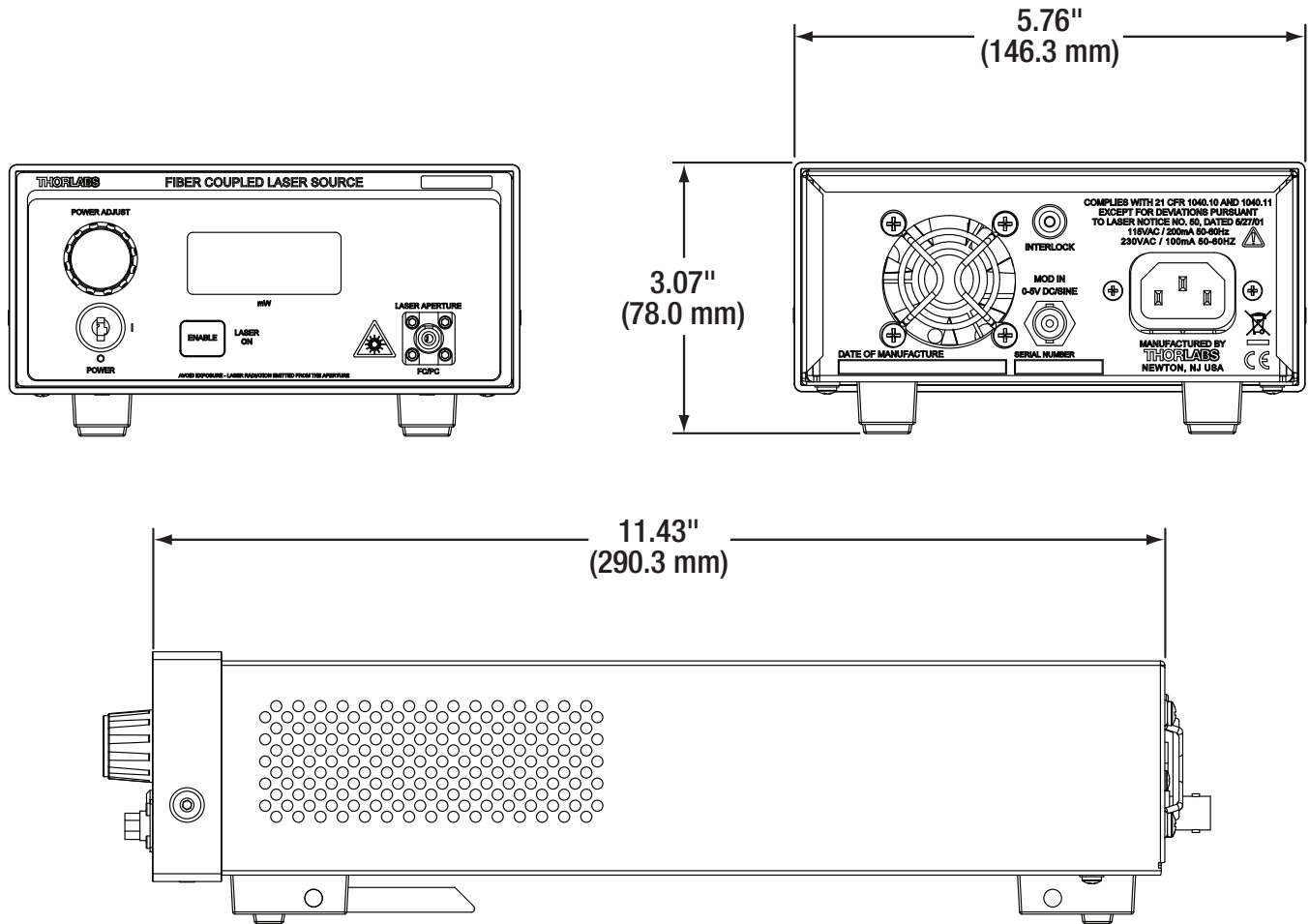


Figure 4 Mechanical Drawing

## Chapter 10 Regulatory

As required by the WEEE (Waste Electrical and Electronic Equipment Directive) of the European Community and the corresponding national laws, Thorlabs offers all end users in the EC the possibility to return “end of life” units without incurring disposal charges.

- This offer is valid for Thorlabs electrical and electronic equipment:
- Sold after August 13, 2005
- Marked correspondingly with the crossed out “wheelie bin” logo (see right)
- Sold to a company or institute within the EC
- Currently owned by a company or institute within the EC
- Still complete, not disassembled and not contaminated



**Wheelie Bin Logo**

As the WEEE directive applies to self-contained operational electrical and electronic products, this end of life take back service does not refer to other Thorlabs products, such as:

- Pure OEM products, that means assemblies to be built into a unit by the user (e. g. OEM laser driver cards)
- Components
- Mechanics and optics
- Left over parts of units disassembled by the user (PCBs, housings, etc.).

If you wish to return a Thorlabs unit for waste recovery, please contact Thorlabs or your nearest dealer for further information.

### ***Waste Treatment is Your Own Responsibility***

If you do not return an “end of life” unit to Thorlabs, you must hand it to a company specialized in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site.

### ***Ecological Background***

It is well known that WEEE pollutes the environment by releasing toxic products during decomposition. The aim of the European RoHS directive is to reduce the content of toxic substances in electronic products in the future.

The intent of the WEEE directive is to enforce the recycling of WEEE. A controlled recycling of end of life products will thereby avoid negative impacts on the environment.

# Chapter 11 Thorlabs Worldwide Contacts

For technical support or sales inquiries, please visit us at [www.thorlabs.com/contact](http://www.thorlabs.com/contact) for our most up-to-date contact information.



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