

***n* LIGHT**

High-Power Semiconductor Lasers

***n*LINE™ | 260 Optical Head**



***n*POWER™ | 7200 Laser Electronics Rack**



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LINE BEAM SYSTEM | 7200:260

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Additional Documentation

This manual is part of the Line Beam System | 7200:260 manual suite listed below:

CONTROL NUMBER	TITLE
EX-OM-0003	Line Beam System 7200:260 OPERATORS Manual
EX-OM-0004	Line Beam System 7200:260 INSTALLATION Manual
EX-OM-0005	Line Beam System 7200:260 SERVICE Manual

Figure 1: Line Beam System | 7200:260 Manuals

Warranty

*n*LIGHT Photonics offers a limited warranty to ensure customer satisfaction. For complete details, please contact your *n*LIGHT sales representative.

ABOUT THIS
MANUAL

This manual provides important product and safety details, as well as basic service and repair information. A current version of this manual must be made readily available to service technicians at all times.

Revision
History

REV	DATE	DESCRIPTION	INITIALS

Figure 2: Revision History

Disclaimer

While all efforts have been made to ensure the accuracy and validity of information contained in this document, nLIGHT Photonics Corporation assumes no responsibility and disclaims all liability for any errors and/or omissions that may be contained herein.

Due to possible changes and/or updates to component design and software application, this document, completely or in part may become obsolete or out-of-date until a subsequent revision is released by nLIGHT Photonics Corp.

nLIGHT may make changes to specifications, product descriptions, and documentation at any time, without notice.

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Symbols

To ensure safe and proper use of *n*LIGHT products, the following symbols are used throughout this manual to highlight important safety and product information. Symbols may be used alone to indicate the pre-defined conditions listed below.

Operators, buyers, and technicians must observe each occurrence of these symbols as they appear throughout this document. Failure to do so may result in serious product damage and/or physical injury or death.













SYMBOL	DESCRIPTION
	NOTE: Useful tips and information
	FIRE: Possible fire hazard
	ELECTROSTATIC DISCHARGE : Observe the necessary precautions to prevent ESD where this symbol appears.
	IMPORTANT: Important safety or product information
	CRITICAL: VERY important product and/or safety information
	IEC WARNING: Laser radiation hazard
	DANGER: Possible dangerous conditions
	HIGH VOLTAGE: Risk of electrical shock
	ATTENTION: Possible hazardous conditions
	LASER EYE PROTECTION: REQUIRED where this symbol appears
	CLEANROOM NITRILE GLOVES: REQUIRED where this symbol appears
	CLEAN ROOM SUIT: REQUIRED where this symbol appears

Figure 3: Document Symbols

PRODUCT SAFETY

Laser beams are powerful enough to burn skin, clothing, and most surfaces. They can ignite volatile substances such as alcohol, gasoline, ether, and other solvents, and can damage the light-sensitive elements in video cameras and photodiodes.

Laser Classification

Based on US Federal and International safety regulations, laser products and systems must be classified based on output/energy and wavelength.

In accordance with classifying standards and criteria set forth by US Federal and International regulatory agencies, the Line Beam System | 7200:260 is designated as a Class 4 beam laser, as it is designed to emit radiation in the infrared part of the spectrum at 975 nm.

Class 4 lasers are high power (c.w. >500mW or pulsed >10J/cm²) devices. Some examples of Class 4 laser use are surgery, research, drilling, cutting, welding, and micromachining.

The direct beam and diffuse reflections from Class 4 lasers can be hazardous to the eyes and skin. Class 4 laser devices can also be a fire hazard depending on the reaction of the target when struck.

The Line Beam System | 7200:260 also generates a visible, low power beam to assist optical alignment. The alignment beam emits Class 3B laser emission.

Laser Safety

For the safe use of this product, operators, technicians, users, and all individuals working inside the designated laser control area must be keenly aware of the dangers associated with Class 4 laser operation and the safety measures required to avoid injury.

Operators and technicians must be adequately trained in laser safety per US Federal and International safety standards and regulations. This training can be provided by the Manufacturer, the Operator, or from a recognized laser safety expert. Training procedures should be documented whenever possible.

Trainers and laser safety experts must be specifically acquainted with Class 4 laser systems and able to recognize the dangers and risks of operating a high-powered beam laser.

Safety Guidelines

This product must be used ONLY in the manner for which it is intended by the manufacturer. Operators must ALWAYS observe the warnings and precautions provided throughout this manual.

Damages and/or injuries resulting from improper use or care of nLIGHT product(s), and/or the failure to comply with applicable governing regulations, and/or failure to adhere to the guidelines provided herein, absolve the manufacturer of all liability.

- ONLY qualified personnel are authorized to install, operate, and service this product.
- NEVER remove protective covers from the Optical Head.
- ALWAYS ensure the laser control area is adequately ventilated.
- NEVER operate the laser near flammables, explosives, or volatile solvents such as alcohol, gasoline, or ether.
- ALWAYS wear *Personal Protective Equipment* (PPE) to prevent radiation exposure.
- ALWAYS limit access to the laser control area to authorized and full-trained personnel ONLY.
- ALWAYS use a beam stop of appropriate material to terminate any potentially hazardous laser beams.
- ALWAYS use diffusely reflecting materials near the beam, where appropriate.
- ALWAYS provide appropriate laser protective eyewear to personnel within the laser controlled area.
- ALWAYS ensure the beam path of the laser is secured above or below eye level for any standing or seated position in the facility.
- ALWAYS cover/block windows, doorways, open portals, etc. to reduce escaping laser beams below appropriate ocular MPE level.
- NEVER use interlocks to shut down the system except in an emergency.
- NEVER use damaged cables or hoses before system start-up the Defective cables, hoses, and fibers must be replaced immediately. The laser should be shut down in the interim.
- ALWAYS verify all cables, hoses, and fittings are properly/securely connected before starting the Line Beam System.
- ALWAYS install the Laser Electronics Rack in close proximity of the mains disconnect circuit breaker or switch.
- ALWAYS ensure the mains disconnect is clearly marked and within immediate reach of the operator at all times.

EYE SAFETY

Class 4 laser output can be invisible to the naked eye. Direct ocular interception of the laser output beam can cause serious eye damage or blindness.



**LASER EYE
PROTECTION IS
REQUIRED WHEN
OPERATING ALL
CLASS 4 LASERS.**

- ALWAYS wear laser eye protection when operating and/or servicing the laser.
- ALWAYS wear laser eye protection inside the laser control area.
- NEVER look directly into the laser output port.
- NEVER set up or align laser and optical components at eye level.
- ALWAYS ensure eyewear provides sufficient protection based on radiation emission and wavelengths (see Eyewear Selection Chart below).

Simplified Method for Selecting Laser Eye Protection for viewing Wavelengths between 400 and 1400nm

Q-Switched Lasers (1 ns to 0.1 ms)		Non-Q-Switched Lasers (0.4 ms to 10 ms)		Continuous Lasers (0.25 s to 10 s)		Continuous Lasers Greater than 3 hours		Attenuation	
Output Energy (J)	Beam Radiant Exposure (J-cm-2)	Laser Output Energy (J)	Beam Radiant Exposure (J-cm-2)	Power Output (W)	Beam Irradiance (W-cm-2)	Power Output (W)	Beam Irradiance (W-cm-2)	Attenuation Factor	OD
10	20	100	200	NR	NR	NR	NR	100,000,000	8
1.0	2	10	20	NR	NR	NR	NR	10,000,000	7
10-1	2 x 10-1	1.0	2	NR	NR	1.0	2	1,000,000	6
10-2	2 x 10-2	10-1	2 x 10-1	NR	NR	10-1	2 x 10-1	100,000	5
10-3	2 x 10-3	10-2	2 x 10-2	10	20	10-2	2 x 10-2	10,000	4
10-4	2 x 10-4	10-3	2 x 10-3	1.0	2	10-3	2 x 10-3	1,000	3
10-5	2 x 10-5	10-4	2 x 10-4	10-1	2 x 10-1	10-4	2 x 10-4	100	2
10-6	2 x 10-6	10-5	2 x 10-5	10-2	2 x 10-2	10-5	2 x 10-5	10	1
NR = Not Recommended									

Figure 4: Laser Eye Protection Selection Chart

Safety Features

In accordance with US Federal and international safety regulations and requirements, including IEC EN60825-1, the Line Beam System | 7200:260 is equipped with the following engineering controls/safety features:

- Protective Housing
- Protective Housing Interlock
- Master Switch Control
- Optical Viewing System Safety
- Beam Stop or Attenuator
- Laser Activation Warning System
- Remote Interlock Connector
- Laser Safety Labels

PROTECTIVE HOUSING

A protective housing is required for all classes of lasers except at the beam aperture. In some cases, the walls of a properly enclosed room can be considered as the protective housing for an open beam laser.

Accordingly, the *n*LINE | 260 Optical Head and *n*POWER | 7200 Laser Electronics Rack are securely enclosed by Protective Housings to safeguard operators, technicians, and others working within the laser controlled area from Class 4 radiation exposure.

For additional information and/or product specifications for the *n*LINE Optical Head, please see Page 142.

PROTECTIVE HOUSING INTERLOCKS

Interlocks, which cause beam termination or reduction of the beam to MPE levels, must be provided on all panels intended to be opened during operation and maintenance of all Class 3B and Class 4 lasers. The interlocks are typically connected to a beam shutter. The removal or displacement of the panel closes the shutter and prevents possible exposure.

Under the requirements of the ANSI Z 136 Standard, for embedded Class 3B and Class 4 lasers only, the interlocks are to be "fail-safe"

The Line Beam System | 7200:260 is equipped with five Protective Housing Interlocks: 2 inside the Line Beam Head, and 3 inside the Laser Electronics Rack.

MASTER SWITCH CONTROL

All Class 4 lasers and laser systems require a master switch control. The switch can be operated by a key or computer code. When disabled (key or code removed), the laser cannot be operated. Only authorized system operators are to be permitted access to the key or code.

The Line Beam System | 7200:260 is equipped with two security key switches located:

1. AC Power Distribution Enclosure
2. *n*POWER IntelliSync Enclosure

**OPTICAL VIEWING
SYSTEM SAFETY**

Interlocks, filters, or attenuators are to be incorporated in conjunction with beam shutters when optical viewing systems such as telescopes, microscopes, viewing ports, or screens are used to view the beam or beam-reflection area. For example, an electrical interlock could prevent laser system operation when a beam shutter is removed from the optical system-viewing path. Such optical filter interlocks are required for all lasers, except Class 1.

**BEAM STOP OR
ATTENUATOR**

Class 4 lasers require a permanently attached beam stop or attenuator, which can reduce the output emission to a level at or below the appropriate MPE level when the laser system is on "standby." Such a beam stop or attenuator is also recommended for Class 3B lasers.

**LASER ACTIVATION
WARNING SYSTEM**

An audible tone or bell and/or visual warning (such as a flashing light) are recommended as area controls for Class 3B laser operation. Such a warning system is mandatory for Class 4 lasers. Such warning devices are to be activated upon system start-up and are to be uniquely identified with the laser operation. Verbal "countdown" commands are an acceptable audible warning and should be a part of the SOP.

**REMOTE INTERLOCK
CONNECTOR**

All Class 4 lasers or laser systems must have a remote interlock connector to allow electrical connections to an emergency master disconnect ("panic button") interlock or to room, door or fixture interlocks. When open circuited, the interlock shall cause the accessible laser radiation to be maintained below the appropriate MPE level. The remote interlock connector is also recommended for Class 3B lasers.

LASER PRODUCT
SAFETY LABELS

United States Federal and international laser safety standards require all Class 4 laser components to be properly labeled by the manufacturer.

Optical Head

Accordingly, the following safety and warning labels are affixed to the nLINE | 260 Optical Head prior to shipping:

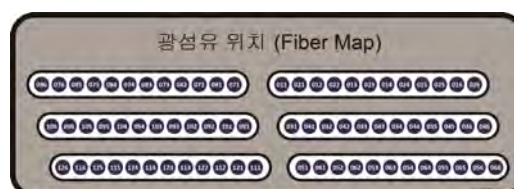
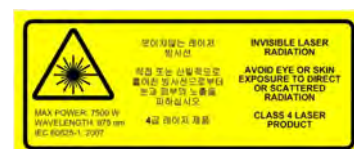
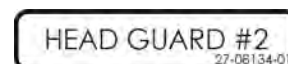
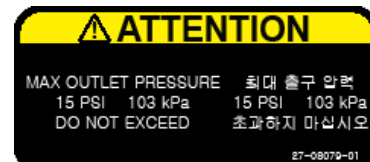
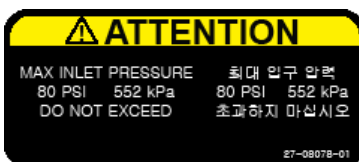


Figure 5: Optical Head Safety Labels

Laser Electronics Rack

The following safety and warning labels are affixed to the *n*POWER™ | 7200 Laser Electronics Rack:

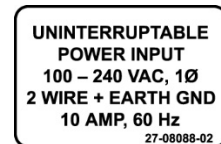
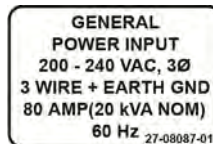
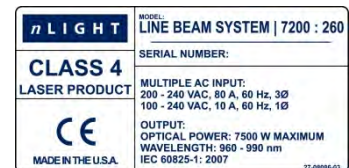
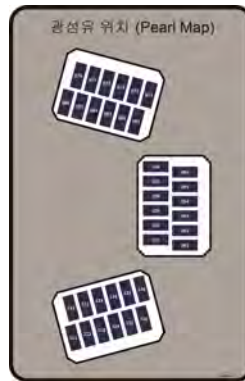
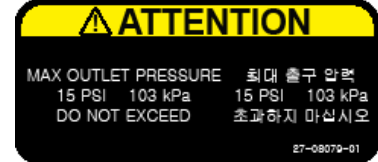
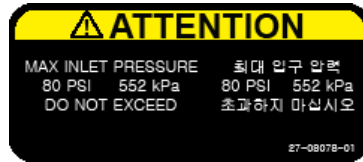


Figure 6: Laser Electronics Rack Safety Labels

CARE AND MAINTENANCE

Although the Line Beam System | 7200:260 requires minimal maintenance, *n*LIGHT Photonics Corp. recommends preventive measures contained throughout this manual to maximize the life span of this product.

Any damages and/or injuries resulting from improper use or care of *n*LIGHT products, and/or the failure to comply with applicable governing regulations and/or requirements will absolve the manufacturer of all potential liability.

Failure to observe the recommendations, precautions, and guidelines presented throughout this manual absolves the manufacturer of all potential liability.

- The laser output window should be kept very clean, free from dust, smudges, and deposited matter. If the window becomes contaminated, the user should follow standard optical cleaning practices to return the window surface to its original clear state.
- Operate the laser system in an environment free from widely varying temperatures.
- Operate the laser system in an environment free from dust and smoke
- Keep all umbilical cables positioned so that they are not easily moved or snagged.
- Position the Laser Electronics Rack in a location where airflow around the unit is free to circulate.
- Do not impose any mechanical shock to the Line Beam Optical Head.

Hydrostatic Pressure Drop Test

Conduct this test to identify potential coolant leaks.

STEP	DESCRIPTION
1.	Verify all fittings are properly tightened.
2.	Adjust regulator for maximum pressure (screw all the way in).
3.	Slowly pressurize system to 483 kpa (70 psi) \pm 21 kpa (3 psi). <i>a. To do this, open outlet valves, and then slowly open the inlet valve.</i>
4.	Close the inlet and outlet valves.
5.	Verify both pressure gauges in the bottom of the rack read pressure \pm 7 kpa (1 psi).
6.	Record starting pressure.
7.	Wait 30 minutes, and record ending pressure.
8.	Drain coolant using compressed air.
9.	To pass this test, the ending pressure must be within 21 kpa (3 psi) of the starting pressure.



Flow meters can be damaged if an over speed condition occurs.

Fiber Handling

Fiber Optic Cables are fragile and require proper handling and inspection to achieve and maintain maximum performance. Improper care and handling can damage and ultimately shorten the lifetime of Fiber Optic Cables.

Things To Remember When Handling Fiber Optic Cables:

- NEVER touch the tip when handling an optic fiber.
- ALWAYS allow the fiber to coil naturally, to its lowest stress position.
- ALWAYS place a cap on the collimator when fiber is not in use.
- ALWAYS plug unused ports on the Input Manifold.
- ALWAYS inspect and clean Fiber Tips before connecting them to the manifold.
- NEVER bend or twist fiber optic cables.

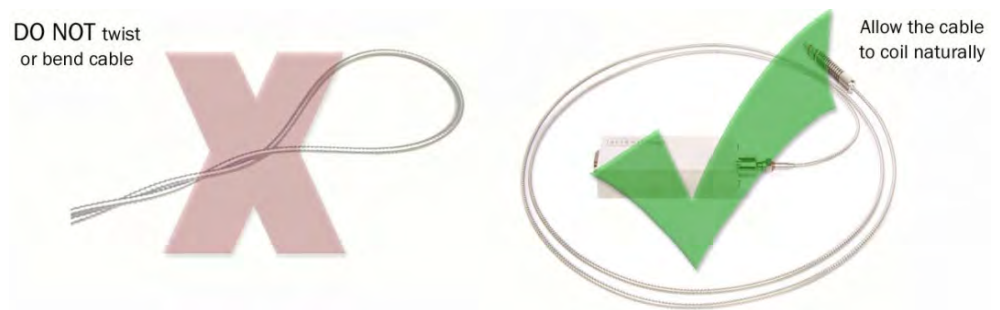


Figure 7: Fiber Optic Cable – Proper Handling

ALWAYS observe the following industry standard, *Minimum Bend Radius* when handling Fiber Optic Cables:

FIBER CORE	OPERATION	SHIPMENT & STORAGE
200 (μm)	30 (mm)	25 (mm)

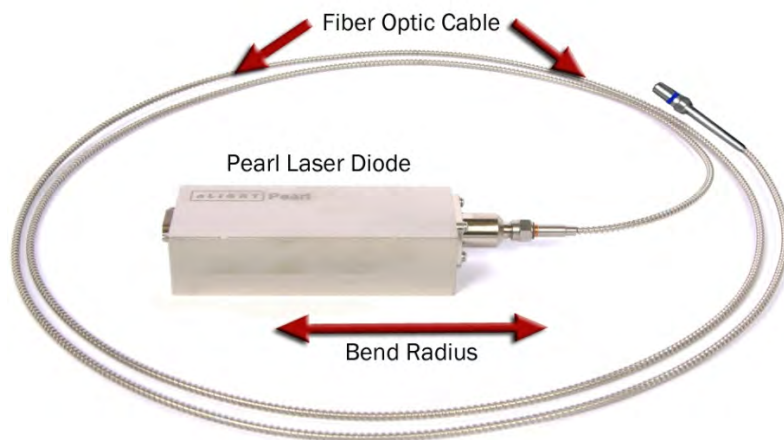


Figure 8: Fiber Optic Cable – Bend Radius

INSPECTING A FIBER
TIP

Fiber tips should be inspected regularly using a 50x or greater fiberscope or microscope.
ALWAYS inspect a Fiber Tip when:

- 1. A Fiber Cap has been removed
- 2. A Fiber has been disengaged from the manifold
- 3. A Fiber Tip has been cleaned
- 4. Preparing Fiber for installation



If more than four small particles are found within one or more quadrants, during inspection, the Fiber Tip must be cleaned immediately and re-inspected. See page 21 for fiber cleaning.

STEP	DESCRIPTION
------	-------------

- | | |
|----|--|
| 1. | Remove cap from Optic Fiber. |
| 2. | Mount Fiber under optical microscope (x50 - x100) as shown in Figure 9. |



Figure 9: Fiber Tip Inspection

- | | |
|----|--|
| 3. | Inspect each quadrant of the Fiber Tip for chips, cracks, pits or scratches.
<i>a. Allow ONLY 4 small particles per quadrant as defined below in Figure 10.</i> |
|----|--|

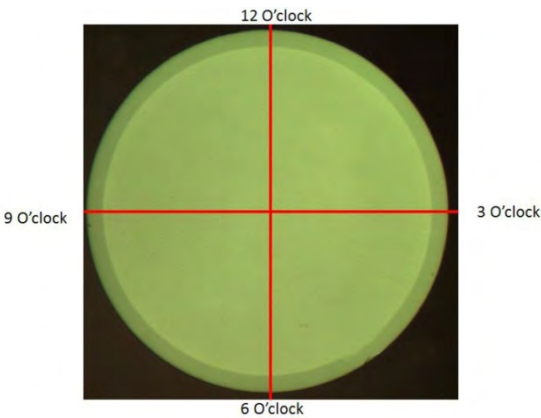


Figure 10: Inspection Criteria

**CLEANING A
FIBER TIP**

You will need the following items to properly clean Fiber Tips:



1. x50 - x100 Optical Microscope (hand-held or bench top)
2. Lint free cotton swabs
3. Reagent grade Methanol (in a contaminate-free container)



Clean Fiber Tips under low-power magnification to avoid damage.



NEVER USE ACETONE when cleaning Fiber Tips. Acetone can damage the supporting adhesive and destroy the component.

STEP	DESCRIPTION
1.	Moisten cotton swab with Methanol, and gently sweep it across the Fiber Tip in a single direction.
	
<i>Figure 11: Fiber Tip Cleaning Prep</i>	
2.	Allow Fiber Tip to partially dry, and inspect the under microscope.
	
<i>Figure 12: Inspecting a Fiber Tip</i>	
3.	Repeat previous steps until fiber meets the standard inspection criteria as defined on page 21.

ENGAGING THE FIBER

When inserting a Fiber Tip into the system or re-inserting into the SMA cap, grip the edge of the ferrule, then rotate the Tip into position with a fiber connector as shown below.

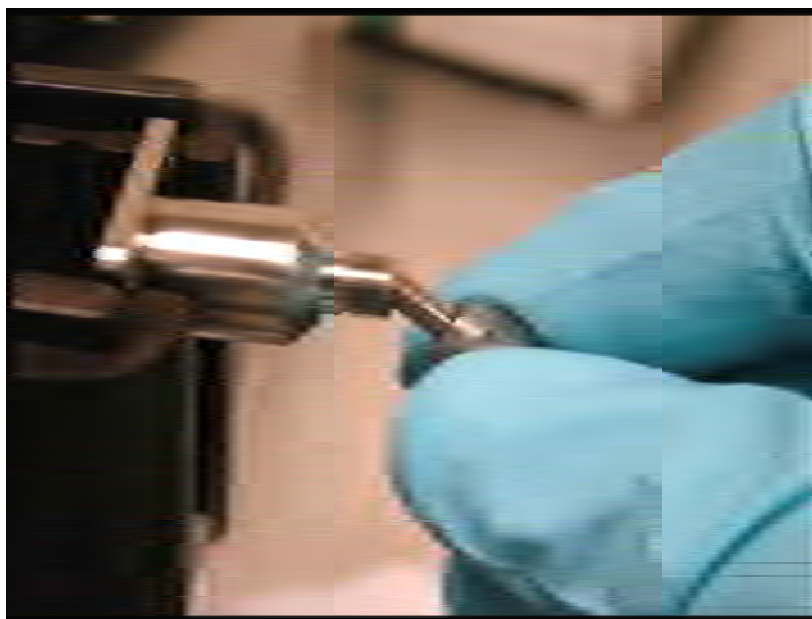


Figure 13: Inserting a Fiber Tip



The SMA-905 nut should be tightened on desire connector but should not exceed a torque of 0.5 N•m.

SERVICE & REPAIR

ONLY qualified personnel are authorized to install, operate, and service this product.

Any damages and/or injuries resulting from improper service or repair of *n*LIGHT products will absolve the manufacturer of all potential liability.

Failure to observe the warnings, precautions, and guidelines presented here and throughout this document absolves the manufacturer of all potential liability.

For spare parts and/or technical support, please contact *n*LIGHT Photonics, US Sales & Service Headquarters:

***n*LIGHT Photonics Corporation**

US HEADQUARTERS
5408 NE 88th Street, Building E
Vancouver, WA 98665, USA

Tel: 360-566-4460
Fax: 360-546-1960

Website: www.nlight.net

Sales Team: sales@nlight.net

Troubleshooting Interlock Device Faults

When the system detects certain safety faults, the respective LED on the bottom of the AC Power Distribution panel will illuminate to indicate the type of safety fault that has occurred.



Figure 14 : Interlock Device Fault Indicator LEDs

If you are unable to resolve any of the following interlock safety faults using the troubleshooting tips listed below, contact nLIGHT Photonics US Headquarters for engineering support.

FAULT	POSS CAUSE(S)	RESULT	RECOMMENDATIONS
Fiber Over Temp	Multiple: Hot fiber, faulty cable connections, fibers not properly connected to the manifold, thermistor damage, etc...	Continued operation with a faulty fiber could cause irreparable damage to the system.	Shut down the Line Beam System completely. Let the system cool down for at least 15mins before restoring to full power. IF: Cooling down the system DOES NOT clear the fault (LED remains lit), THEN: the problem resides elsewhere. Verify all cables, hoses, and fittings are properly connected throughout the entire system; verify all fibers are properly connected to the manifold and are secure inside the internal/external FMS.
Leak Detected	A coolant Leak inside the Laser Electronics Rack.	Operation will cease until fault is resolved. Leak could cause irreparable damage to the system if not corrected immediately.	Turn coolant supply OFF immediately, and shut down the system completely. Soak up any visible coolant inside the Rack, including on, under, and around the Leak Sensing Band. Locate and resolve source of leak. If problem persists or source of leak is not easily located, contact nLIGHT Photonics, US Headquarters: 360-566-4460. DO NOT resume operation until leak is resolved.
Rack Guards Open	The LEFT, RIGHT, or REAR Rack Guard(s) has been removed or is improperly mounted to the Laser Electronics Rack, causing a misalignment of the safety switch (on the top edge of the Rack) and the actuator (along the top edge of the Rack Guard).	Operation will cease until fault is resolved or bypassed.	Turn the Rack Guards Interlock Key Switch to BYPASS to resume operation without replacing the Rack Guard(s), or Return Rack Guard(s) to the Rack to resume operation. IF: Rack Guards are in place, and the indicator LED remains lit, THEN: verify Rack Guards are positioned correctly, (i.e. LEFT Rack Guard is mounted to the LEFT side of the Rack, RIGHT Guard Panel is mounted to the RIGHT side of the Rack, etc.) IF: Rack Guards are mounted in the correct position, and the indicator LED remains lit, THEN: check the Rack Guard Interlock devices to ensure each safety switch and corresponding actuator are properly aligned. IF: the safety switch and actuator are properly aligned, and the indicator LED remains lit, THEN: contact nLIGHT Photonics, US Headquarters immediately for engineering support: 360-566-4460.
Head Guards Open	Optical Head cover/guard #1 and/or #2 is open.	Operation will cease until fault is resolved.	Contact nLIGHT Photonics, US Headquarters for engineering support: 360-566-4460.

Figure 15: Troubleshooting Interlock Device

Regulating Coolant Flow Pressure



See page 144 for
Cooling System
specifications and
requirements.

To establish and maintain optimal operating temperatures, you may need to manually adjust regulate coolant flow pressure.

STEP	DESCRIPTION
1.	Turn Cooling System ON to start the flow of coolant.
2.	Start up the Line Beam System, but <u>DO NOT ARM THE SYSTEM.</u>
3.	Remove REAR Rack Guard Panel from Laser Electronics Rack.
4.	Adjust the Pressure Regulator until the LEDs on both Flow Meters turn GREEN .

Lower Back side of Laser Electronics Rack

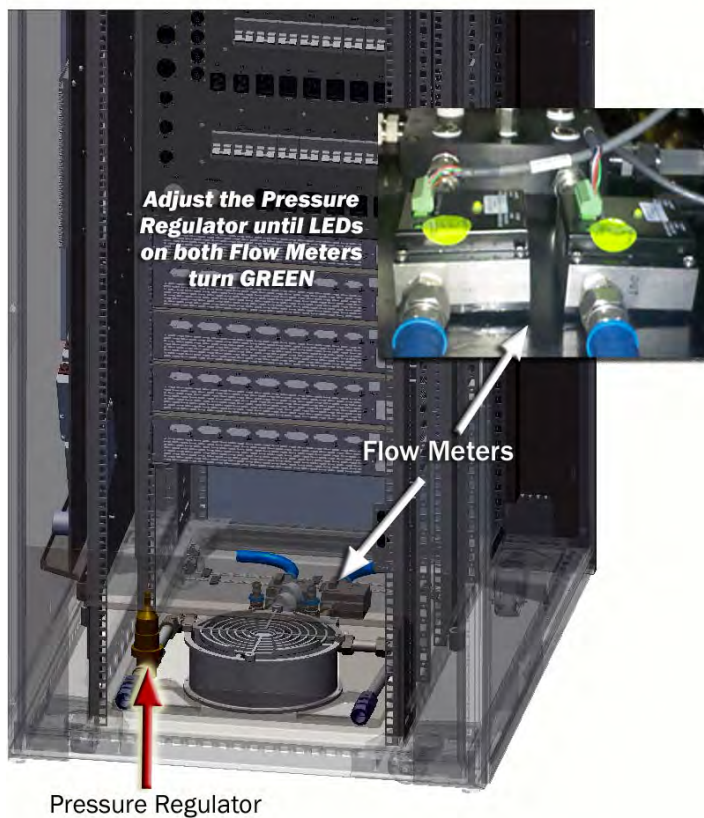


Figure 16: Regulating Coolant Flow Pressure

Replacing a Laser Diode Module

Once identified, a faulty Laser Diode can be disabled and removed so the Line Beam System | 7200:260 can resume operation while pending replacement.



Laser Diodes are ESD sensitive (Electrostatic Discharge). Always take the necessary steps to prevent ESD damage when replacing Laser Diodes.

You will need the following parts and tools to replace a Pearl Laser Diode Module:

PART DESCRIPTION	
Fiber Coupled Pearl Laser Diode Module	
TOOL	SIZE
Fiber Nut Tool	Standard
Hex Drive	2.5 mm
Fiber Cap	N/A
Manifold Plug	N/A
Guide Pins (2)	Standard (provided with Pearl shipment)

REMOVAL



DO NOT bend, pull, or twist optic fibers. See page 20 for proper handling techniques.



See page 29 for steps to install a new Pearl Laser Diode Module.

STEP	DESCRIPTION
1.	Enter software commands listed on page 64 to DISABLE Laser Diode via the Host Controller.
2.	Shut down the Line Beam System completely: <ul style="list-style-type: none">a. Turn IntelliSync Key Switch to OFF.b. Turn UPS and GPS power OFF.c. Turn Cooling System OFF
3.	Remove appropriate (LEFT or RIGHT) Rack Guard (8 screws) to access the faulty Laser Diode.
4.	Disconnect Power Cable from the Laser Diode.

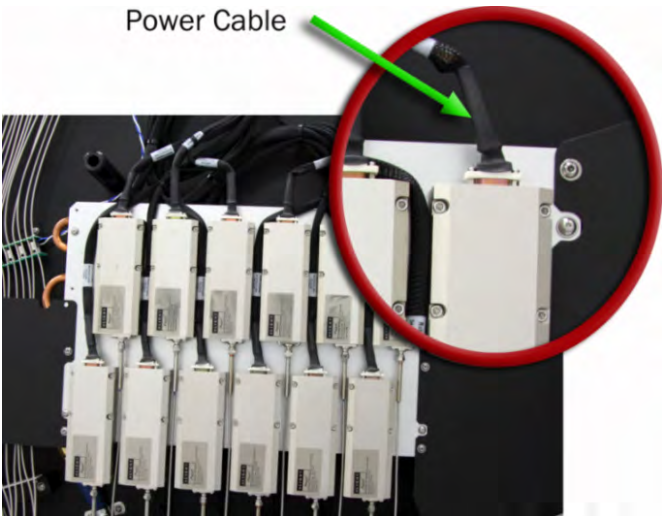


Figure 17: Disconnecting Laser Diode Power

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REMOVAL

Continued...

ALWAYS cap unused
fibers and plug
empty ports on the
Input Manifold.



DO NOT bend, pull,
or twist optic fibers.
See page 20 for
proper handling
techniques.

STEP DESCRIPTION

5. Use Fiber Nut Tool to disengage fiber from Input Manifold.
 - a. Place a Cap on the Fiber Tip to prevent damage.
 - b. Insert a plug into the empty port on the Input Manifold.

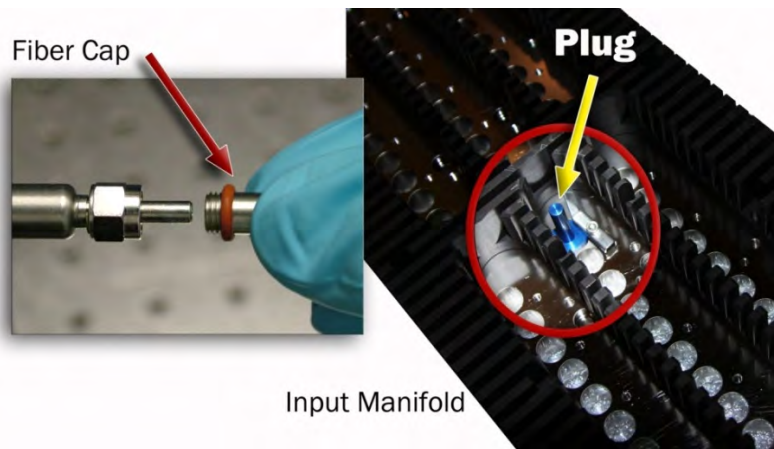


Figure 18: Fiber Cap and Manifold Plug

6. CAREFULLY release Optic Fiber from all Safety Clips throughout the internal (Rack) and external (Host/customer) Fiber Management Systems (FMS).
7. Unscrew and remove Laser Diode Module from Chill Plate (4 screws) as shown in Figure 20.
 - a. Keep hardware to install the new Pearl Laser Diode Module.

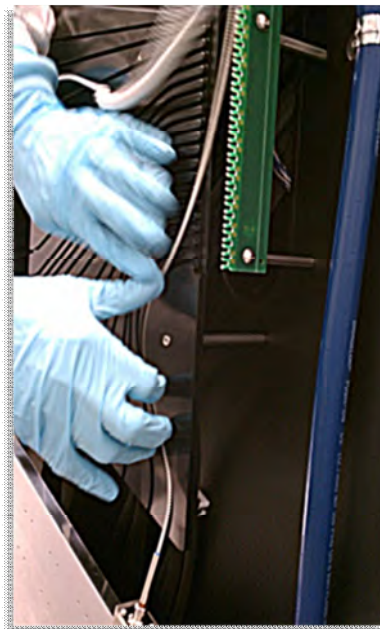


Figure 19: Releasing Fiber from FMS



Figure 20: Removing Laser Diode

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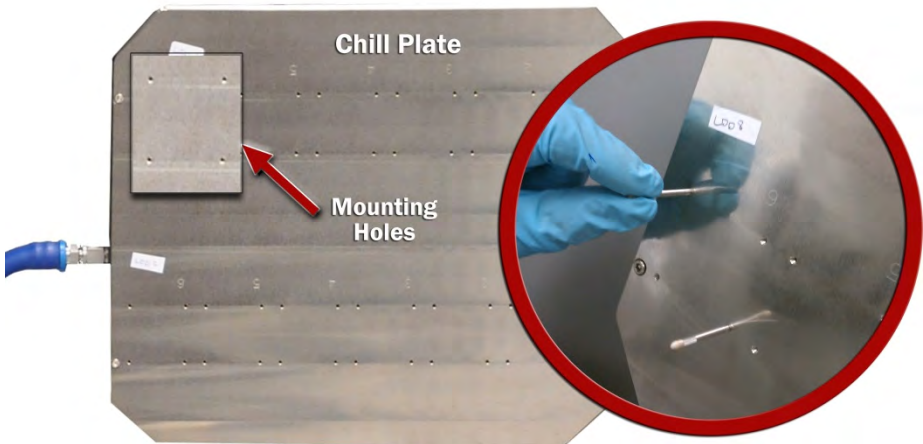
REPLACEMENT



Ensure the Line Beam System is completely shut down before proceeding.



See page 27 f or steps to remove a faulty Pearl Laser Diode Module.

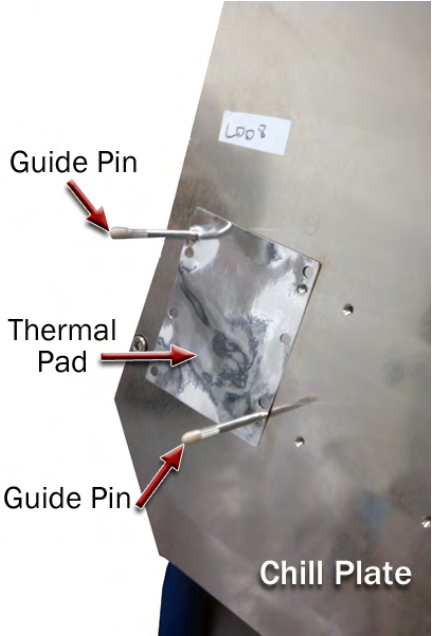
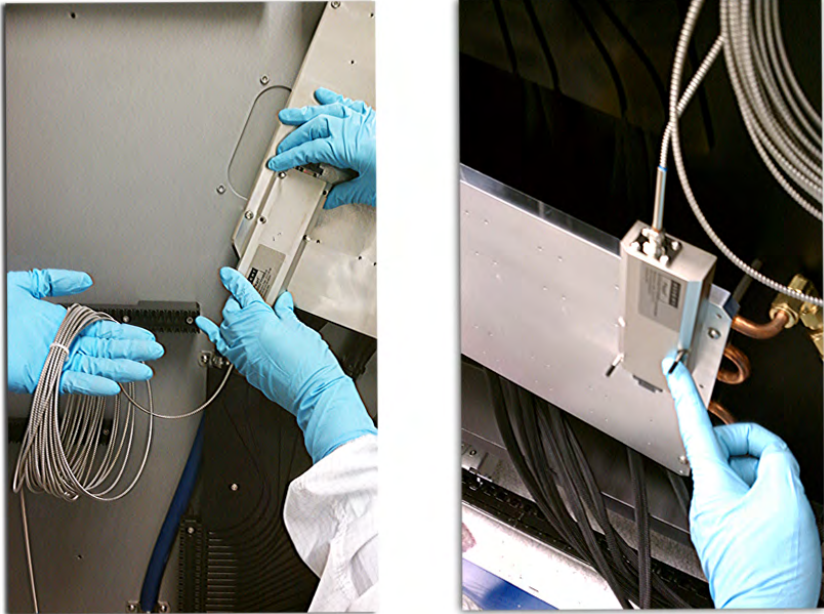
STEP	DESCRIPTION
1.	<p>Check the Thermal Pad between the Laser Diode and Chill Plate</p> <p>a. If the Thermal Pad has shifted or is damaged, discard it before proceeding onto the next step.</p> <p>b. If the Thermal Pad has NOT shifted and is in good condition, proceed onto the next step with the pad in place.</p>
	
<p>Figure 21: Inspecting Thermal Pad</p>	
2.	<p>Screw Guide Pins into 2 of the 4 pre-drilled holes on the Chill Plate so they are positioned diagonally as shown in Figure 22. DO NOT over tighten.</p> <p>a. Guide Pins are used to hold the Thermal Pad and Laser Diode in place when mounting them to the Chill Plate.</p>
	
<p>Position Guide Pins diagonally</p> <p>Figure 22: Positioning Guide Pins</p>	

Continues on next page...

REPLACEMENT

Continued...



STEP	DESCRIPTION
3.	Remove caps from Guide Pins.
4.	Slide new Thermal Pad onto the Guide Pins (skip this step if using existing Thermal Pad).
<div>  </div> <div>Figure 23: Replacing Thermal Pad</div>	
5.	Slide the new Laser Diode onto the Guide Pins as shown below.
<div>  </div> <div>Figure 24: Mounting Laser Diode</div>	

Continues on next page...

REPLACEMENT
Continued...



STEP	DESCRIPTION
6.	Ensure the Laser Diode is properly aligned with the mounting holes on the Chill Plate, and use 2 of the 4 original screws to mount in place.
7.	Remove Guide Pins and use remaining 2 screws to finish mounting the Laser Diode to the Chill Plate as shown below.




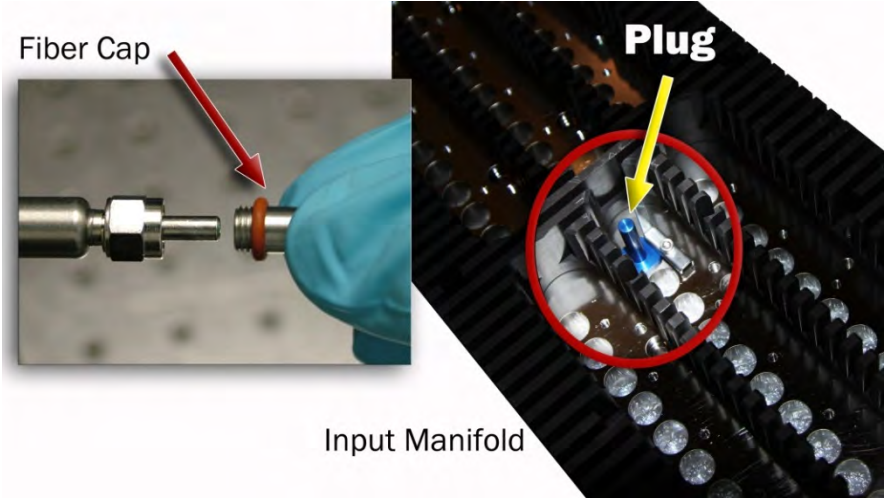
Figure 25: Securing Laser Diode to Chill Plate

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REPLACEMENT

Continued...

*DO NOT bend, pull,
or twist optic fibers.
See page 20 for
proper handling
techniques.*

STEP	DESCRIPTION
8.	CAREFULLY secure Fiber Optic Cable in Safety Clips throughout the internal (Rack) and external (Host/customer) <i>Fiber Management Systems (FMS)</i> .
	
<i>Figure 26: Routing Fiber Throughout FMSs</i>	
9.	Remove plug from the Input Manifold; and cap from Fiber.
	
<i>Figure 27: Removing Fiber Cap and Input Manifold Plug</i>	

Continues on next page...

REPLACEMENT

Continued...



Do not remove plug from the manifold until you are ready to insert a new fiber.



DO NOT bend, pull, or twist optic fibers. See page 20 for proper handling techniques.

STEP DESCRIPTION

10. Use Fiber Nut Tool to connect fiber to Input Manifold.

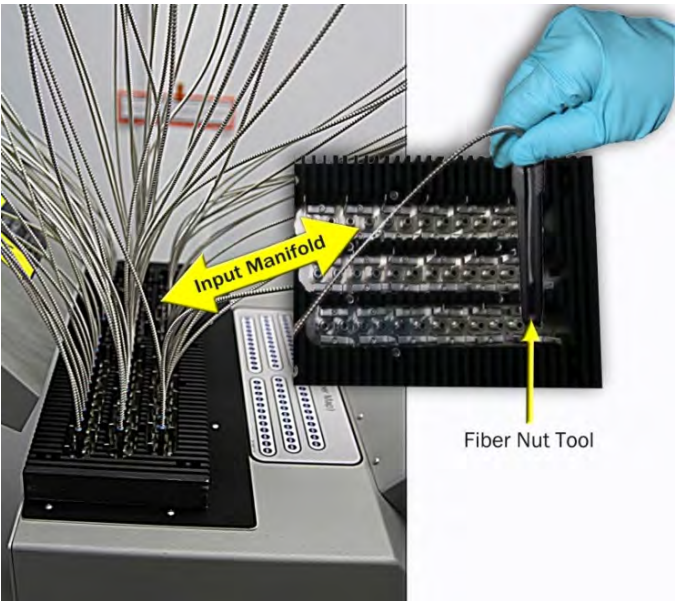


Figure 28: Connecting Fiber to Input Manifold

11. Connect Power Cable to the new Laser Diode.

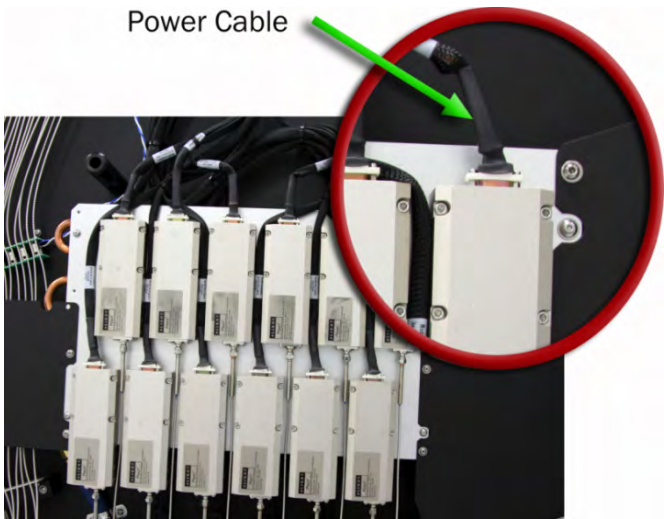


Figure 29: Connecting Laser Diode Power Cable

12. Return Rack Guard and secure in place using original screws (8).
13. Start up the Line Beam System.
14. Enter software commands listed on Page 64 to **ENABLE** the Laser Diode via the Host Controller.
- a. Installation is now complete.

Replacing the Light Tower

To replace the Light Tower Assembly, you will need the following parts and tools:

PART DESCRIPTION	
Light Tower Assembly	
TOOL	SIZE
Ratcheting Wrench	7/16

REMOVAL



STEP	DESCRIPTION
1.	Shut down the Line Beam System completely. <ul style="list-style-type: none">a. Turn IntelliSync Key Switch to OFF.b. Turn UPS and GPS power OFF.c. Turn Cooling System OFF
2.	Unscrew and remove the RIGHT Rack Guard to access the Light Tower (8 screws, numbered below).

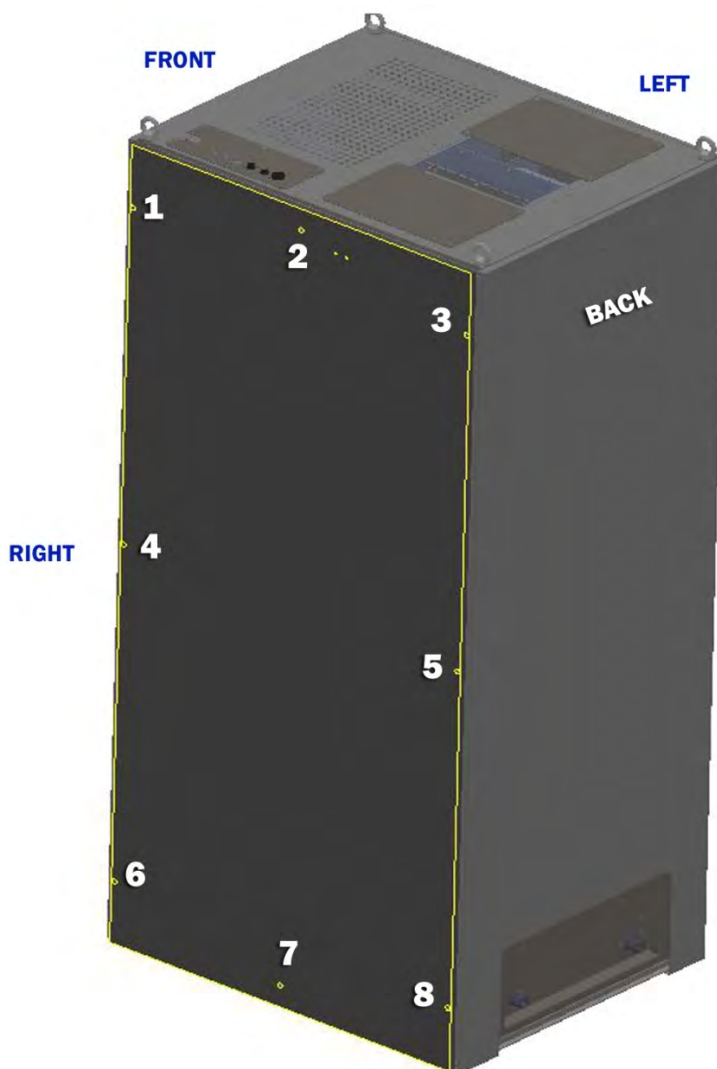
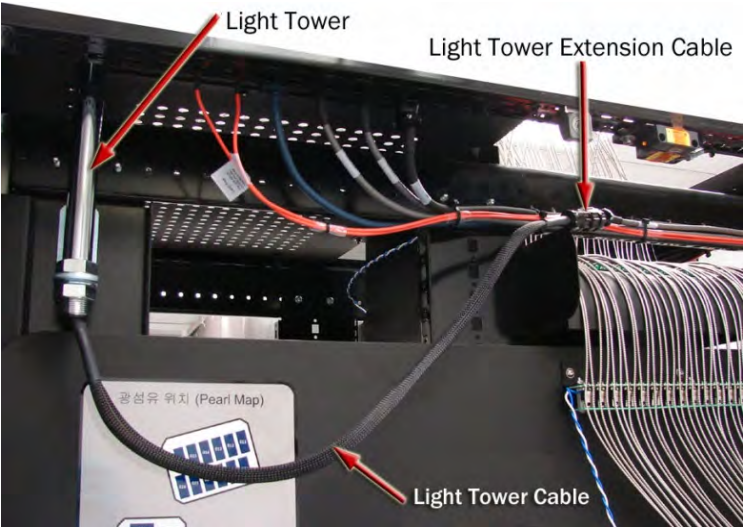
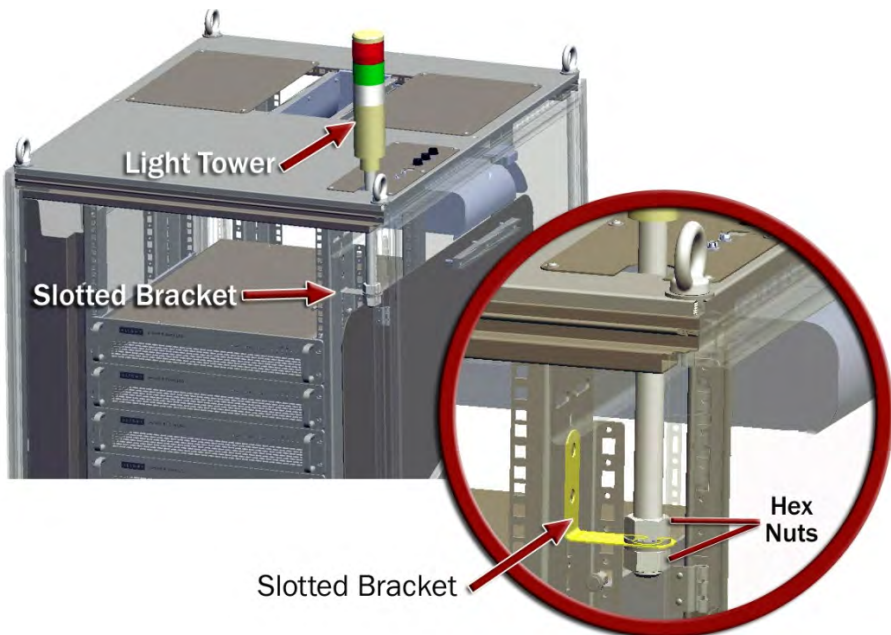


Figure 30: Removing Rack Guard

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REMOVAL
Continued...



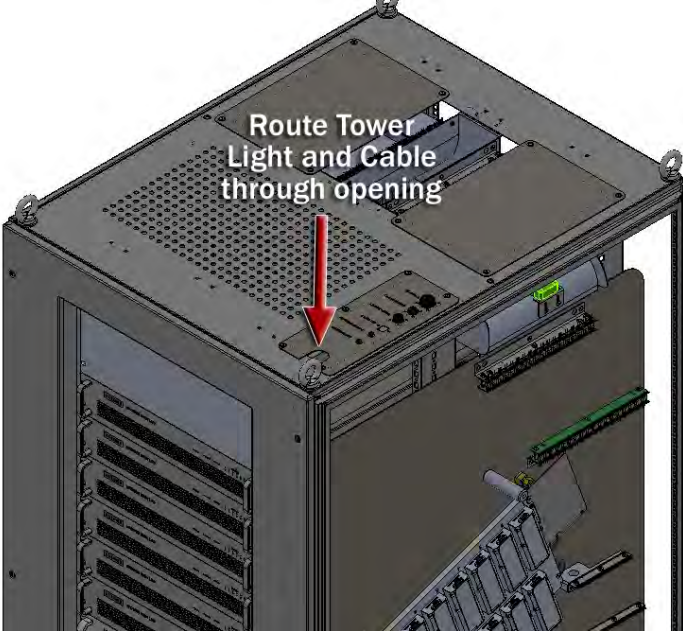
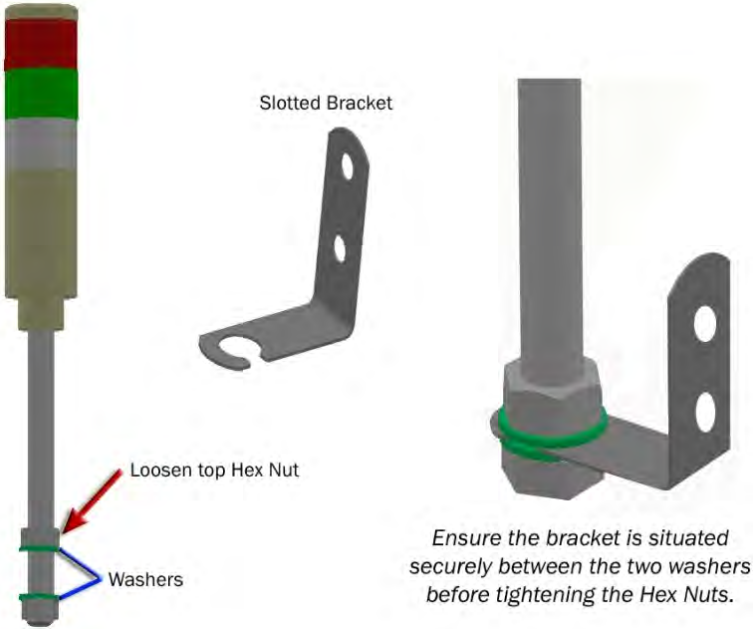
STEP	DESCRIPTION
3.	Disconnect the Light Tower cable from the Extension cable inside the Laser Electronics Rack as shown below.
	
<p>Figure 31: Disconnecting Light Tower</p>	
4.	Loosen both hex nuts securing the Light Tower to the slotted bracket.
5.	Disengage the Light Tower from the slotted bracket.
6.	Slide Light Tower and cable up though the opening on top of the Laser Electronics Rack.
	
<p>Figure 32: Slotted Bracket</p>	

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REPLACEMENT



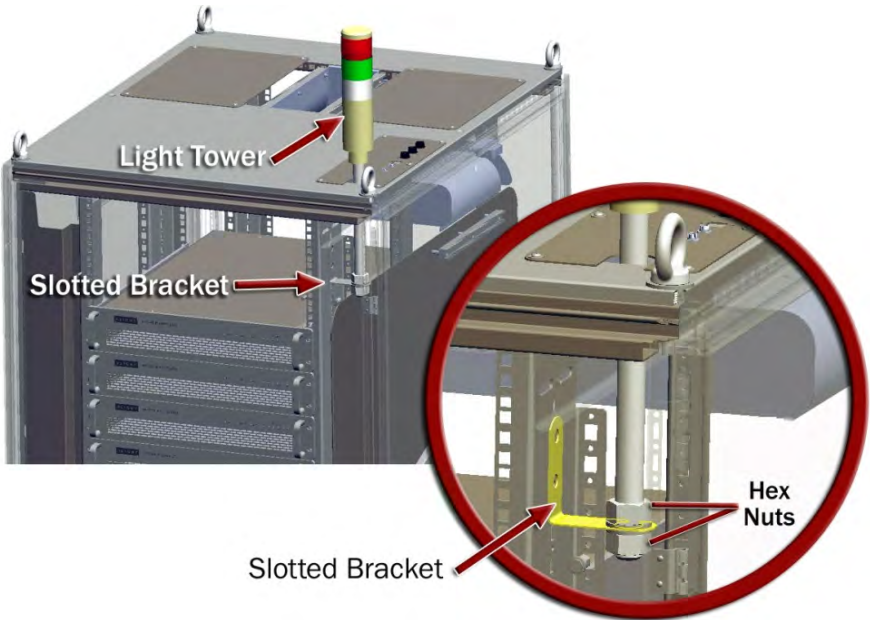
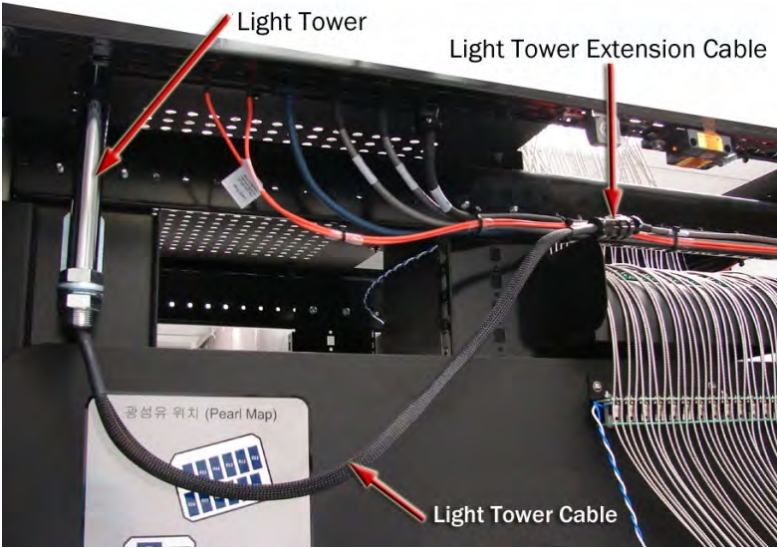
Ensure the Line Beam System is completely shut down before proceeding.

STEP	DESCRIPTION
1.	<p>With the Rack Guard removed, carefully route the Light Tower and Cable through the front opening on top of the Laser Electronics Rack.</p>  <p><i>Figure 33: Routing Light Tower and Cable into Rack</i></p>
2.	<p>Slide the Light Tower into the opening on the slotted bracket, so that the bracket is situated between the two washers and hex nuts.</p>  <p><i>Figure 34: Mounting Light Tower to Bracket</i></p>

Continues on next page...

REPLACEMENT
Continued...



STEP	DESCRIPTION
3.	Tighten hex nuts to bracket to secure the Light Tower in place.
	
<p><i>Figure 35: Securing Light Tower to Bracket</i></p>	
4.	Connect the Light Tower Cable to the Extension Cable inside the Laser Electronics Rack as shown below.
	
<p><i>Figure 36: Connecting Light Tower Power Cable</i></p>	
5.	Return Rack Guard to the Laser Electronics Rack, and secure in place using original screws (8). <i>a. Installation is now complete.</i>

Replacing the Output Window

To replace the Output Window, you will need the following parts, tools and materials:

PART DESCRIPTION	
260 mm Optical Head Window Assembly	
TOOL	SIZE
Hex Head Driver	2.5 mm
Isopropyl Alcohol	N/A
Lint Free Cleaning Cloth	N/A

REMOVAL



STEP	DESCRIPTION
1.	Shut down the Line Beam System completely. <ul style="list-style-type: none">a. Turn IntelliSync Key Switch to OFF.b. Turn UPS and GPS power OFF.c. Turn Cooling System OFF
2.	If necessary, remove the two screws securing the existing Output Window inside the frame assembly. See Figure 37.

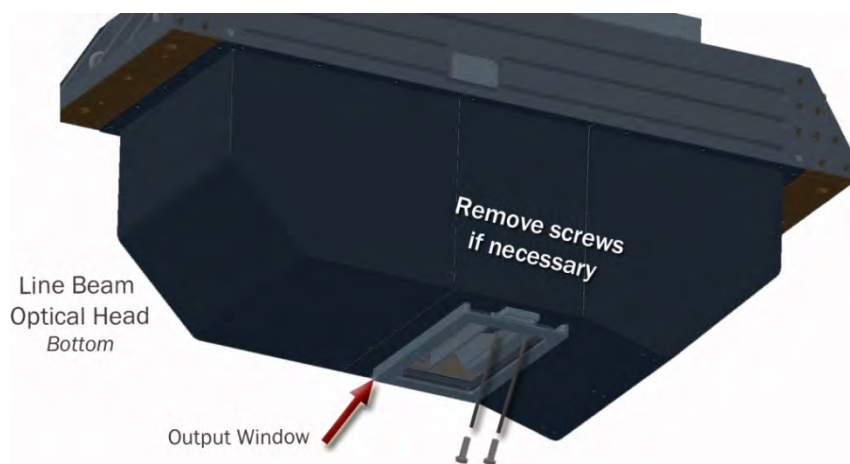


Figure 37: Output Window Screws



The Output Window is secured in place with two screws as shown above for shipping purposes. Otherwise, the Window locks into place when it makes contact with a magnet positioned along the inside edge of the frame.

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REMOVAL
Continued...



STEP	DESCRIPTION
3.	Carefully slide the Output Window out of the window frame.

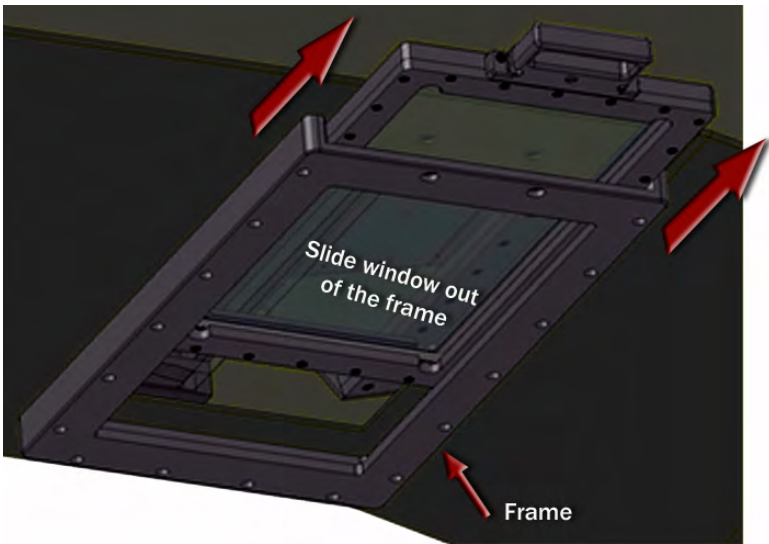


Figure 38: Removing Output Window

REPLACEMENT



STEP	DESCRIPTION
1.	Clean new Output Window using a lint-free cleaning cloth and Isopropyl Alcohol.
2.	Gently slide the Output Window into the frame, until it engages with the magnet and locks in place. <i>a. Installation is now complete.</i>

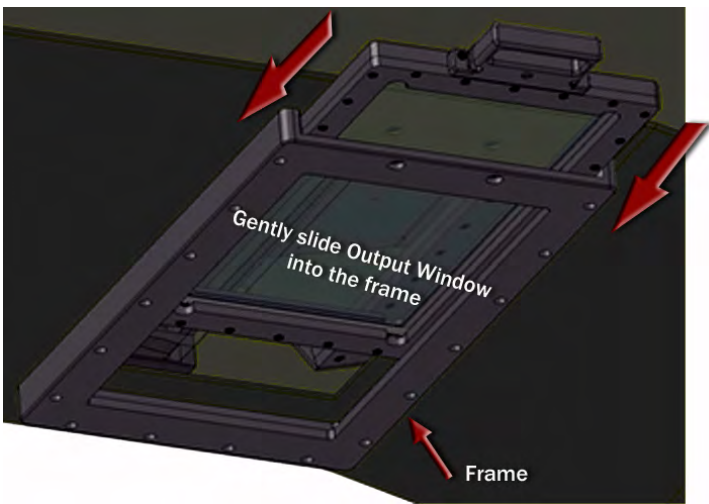


Figure 39: Installing Output Window

Replacing OmniAire 600V Filters

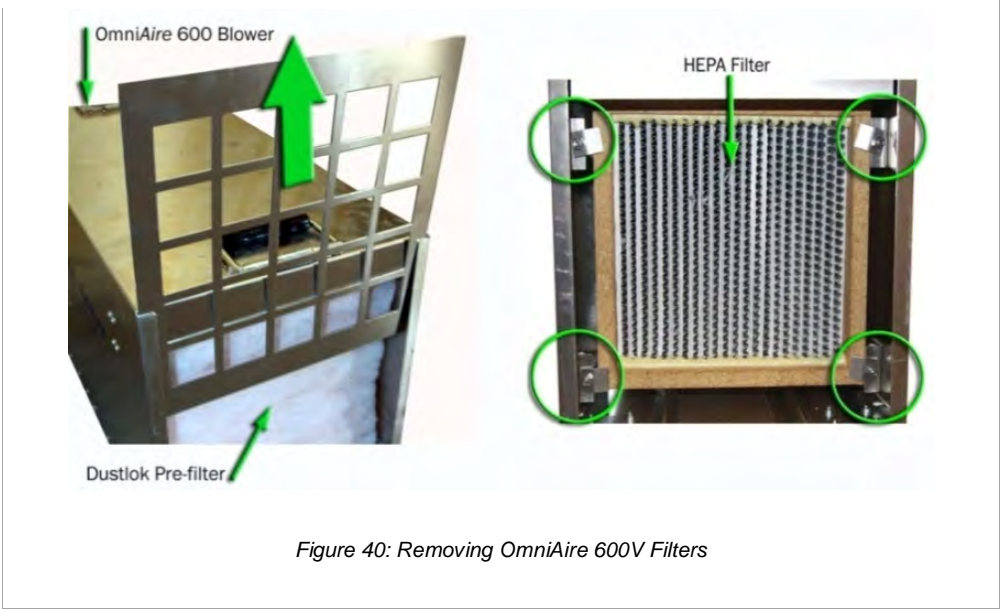
Replace OmniAire 600V Filters (HEPA and Dustlok) at least every six months to maintain optimal performance. To replace the filters, you will need the following parts and tools:

PART DESCRIPTION	
OmniAire 600V HEPA Filter (metal frame)	
Dustlok Pre-Filter	
TOOL	SIZE
Ratcheting Wrench	7/16

REMOVAL



STEP	DESCRIPTION
1.	Shut down the Line Beam and HEPA Filtration systems completely.
2.	Remove metal screen and Dustlok Pre-Filter from the Blower. See Figure 40.
3.	Use a ratcheting wrench to remove the four nuts and metal tabs securing the HEPA Filter to the Blower (circled in Figure 40).
4.	Remove existing HEPA Filter.



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