

L5 Laser Series

Image of L5-D-FC



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Thank you for purchasing an Access Laser product

Access Laser specializes in RF Excited Longwave Infrared & Mediumwave Infrared lasers for custom applications in scientific experimentation, research and development, medical and high-performance material processing. Our system architecture emphasizes flexibility, and we take pride in ensuring that every product delivers optimal performance and satisfies your precise needs. We view our role as project collaborators, striving to offer transparent information about each product to make integration with your application successful.

Access Laser remains dedicated to your needs long after your initial purchase. Our technical support and service teams are available, regardless of the warranty period, and we welcome you to contact us whenever you have questions, concerns, or additional requirements at:

Email: <u>sales@accesslaser.com</u>

Phone: 425-582-8674



The L5 Series

The L5 is a versatile laser platform, originally designed to work in highly demanding industrial environments for marking and coding of printed circuit boards. However, this affordable base point can be adapted for more high performance applications by changing from fan to water cooling.

Available technology upgrades:

Acousto-Optic Modulation: Mounting an AOM external to the laser cavity can increase the pulse repetition frequency to 200kHz without optically saturating sensitive targets.

https://accesslasers.wpengine.com/acousto-optic-modulator-aom/ **Dual Drive:** Changing the DC power supply to the RF driver allows for a fluid switch from continuous wave output to Super Pulse, providing flexibility to your enduse.

http://accesslasers.wpengine.com/dual-drive-d/ **Diffraction Grating:** For many applications, producing a single wavelength of light is an absolute requirement. By implementing an intra-cavity grating, ALC provides access to more than 80 discrete lines in the Midwave and Longwave Infrared spectral regions.

http://accesslasers.wpengine.com/diffraction-grating-g/ **Isotope Gas Mixtures**: The standard CO₂ laser provides spectral output between 9.2-10.8µm. For applications requiring other wavelengths, Access Laser can extend our lasers' spectral reach and power by varying gas mixtures.

https://accesslasers.wpengine.com/isotope-gas-mixtures/ Line Tracker: Utilizing our unique software-controlled optical feedback loop, Access Laser provides industry-leading power stability and wavelength selection.

https://accesslasers.wpengine.com/line-tracker-t/ **Polarization**: Augment your beam for polarization-dependent performance. We can add specialized coatings to internal optics that greatly improve the polarization extinction ratio.

https://accesslasers.wpengine.com/enhanced-polarization-l/ **Piezo Tuning**: Laser performance is highly correlated to maintaining precise control over resonator length. Command-driven frequency compensation is one way to enable high performance.

https://accesslasers.wpengine.com/piezo-cavity-modulation-z/ **Super Pulse:** By driving the laser gain three times harder for a shorter duration than standard pulse width modulation a discrete pulse train can be generated.

http://accesslasers.wpengine.com/super-pulse-p/ **Stability**: By actively monitoring and compensating for temperature fluctuations, our stabilized lasers enable improved power and wavelength control. https://accesslasers.wpengine.com/stabilized-s/



Warranty

All of Access Laser Company's lasers come with a one-year standard warranty. This certifies that your laser is free of any defects in material or workmanship.

Please see https://accesslasers.wpengine.com/legal/ for detailed warranty information.

Upon final inspection of your order, please complete the information below and email to <u>service@accesslaser.com</u>. If Access Laser Company is not notified within 14 days of delivery, we will assume that the shipment arrived in satisfactory condition.

Date Received:	
Laser Model:	
Laser Serial Number:	
RF Driver Serial Number:	
RF Driver Serial Number.	

Received By: (Name and title)



Returns

If a failure should occur, please contact your Access Laser Company representative or contact Access Laser headquarters directly at 1-425-582-8674 or <u>service@accesslaser.com</u>. A company representative will determine whether your laser should be returned for repair or maintenance. If the laser needs to be returned, a Return Merchandise Authorization (RMA) will be issued. Any laser returned without an RMA will be at the client's sole expense.

An ALC representative will make a determination regarding shipping costs. Typically, for failures within the first 45 days, ALC pays all shipping costs to and from ALC. For failures after 45 days, but within the first year, the client shall be responsible for shipping costs to ALC; ALC will pay all shipping costs to return the item(s) to the client. Please be sure to verify shipping costs in advance with your ALC representative, as special considerations may apply.

When requesting an RMA, please have the following information ready:

- Date of purchase
- Laser model
- Serial number for the laser
- Serial number for the RF driver
- Brief description of the issue
- Date the issue was first discovered

Fill out the RMA as completely as possible and include a copy of the RMA with the shipment. Include the laser and ALL accessories when returning the laser. This allows ALC to test each component and determine the source of the issue. SHIP TO:

Access Laser Company Attn: Service Department 2211 W. Casino RD Suite A Everett, WA 98204



Laser Shipment Contents

The following items are included with each standard laser shipment:

- L5 Series Laser
- **RF** Driver
- BNC to TNC Coax Cable
- D-sub 15 Dongle
- Laser Test Documents
 - Final Test Document _
 - Power Plot -

If you have questions about the contents of your shipment, please contact us.



Figure. A1



Figure. A2



BNC to TNC Coax Cable Figure. A3



D-Sub 15 Dongle Figure. A4



FDA and International Regulations

Access Laser Company (ALC) lasers are designed, tested, and certified to comply with United States (US) and European Union (EU) regulations. For commerce within the US, laser safety requirements are governed by the Center for Devices and Radiological Health (CDRH) as set forth by United States Radiation Control for Health and Safety Act of 1968. For International commerce outside the US, laser safety is commonly governed by IEC Standards.

If you are an OEM that manufactures a laser product that is sold in the US or imported into the US, you are required to file a Product Report with the CDRH, prior to entering commerce in the US, that demonstrates compliance to 21 CFR 1040.10. If you are an OEM that operates and sells outside of the US, use IEC 60825-1 for laser safety compliance. It is the responsibility of the OEM or system integrator to assure complete compliance with any and all applicable regulations when an L5 series laser is integrated into their system.

Since ALC is a US-based company with international sales, ALC has filed an OEM Product Report with the CDRH for all lasers in the L5 series; the Product Report shows that our warning labels comply with IEC 60825-1. The L5 laser complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.

Both 21 CFR 1040 and IEC 60825-1 require OEM lasers to be incapable of lasing when removed from the OEM system. In such cases the laser must comply with all applicable requirements of 21 CFR 1040 or IEC 60825-1. When wired compliant to laser safety regulations the L5 does not operate when removed from the OEM system.

Safety Information

Safety Symbols and Terms

Commonly used safety symbols and terms are used throughout this manual and on our products. Please familiarize yourself with the definitions and use of the terms and symbols.



Indicates a hazardous situation which could result in **DEATH** or **SERIOUS INJURY**.

Indicates a hazardous situation which will result in



Indicates a hazardous situation in which could result in **MINOR** or **MODERATE INJURY**.



Indicates an unsafe practice that can result in **PROPERTY DAMAGE**.



Safety Information

Safety Label Definitions and Locations

- 1. Product Identification label on the top of the laser in the middle Indicates model, serial number and date of manufacture.
- 2. Yellow Danger label on top of the laser, towards the front Calls out the edition of IEC 60825-1 used for label compliance and the maximum power output and frequency. Indicates laser class and includes explanatory data such a power and wavelength.
- 3. Safety Compliance label on the side of the laser, towards the front Indicates whether the laser was manufactured in compliance with United States Code of Federal Regulations and/or International standards. (For OEM lasers, the laser component does not comply with all standards for complete laser products as specified by 21 CFR 1040.10 or IEC 60825-1: 2014-05.)
- 4. Aperture label on the side of the laser (towards the front of laser) Indicates location of laser beam exit (aperture).





Operating Instructions

Operating the laser

1. Close the laser shutter (if present).



2. Direct the laser toward an appropriate beam dump.



3. Secure the laser to a bench top.



Do not torque, twist or bend the laser body during the mounting process.

Applying uneven pressure to the laser body may distort the laser body, causing poor performance and possible damage. 4. Connect the Cooling System

<u>Water:</u>

Connect the tubing to the PISCO fitting as described in the Water Cooling Connection Instructions on page 13.

5. Connect the RF Driver to the laser with the coax cable using the TNC and BNC connectors, as shown in the Connection Diagrams on page 15.



6. Connect the RF Driver to the DC power supply.



Figure. 4



Operating the laser (Continued)

7. Verify the enabling plug on the D-sub 15 connector is installed on the RF driver.



8. Verify the beam path is pointed at an appropriate beam dump

DANGER

Eye Protection Required.

This laser can cause mild to severe burns if skin or eyes are exposed to the beam or scattered radiation. Protective eye wear should be worn at all times.



9. Remove the protective tab from the aperture.



Figure. 7

10. Open the laser shutter (if present).



Operate the shutter using the lever closest to your body. Never pass your hand in front of the laser beam to open or close the shutter.



Figure. 8

11. Plug in the DC power supply to enable RF Driver.

DANGER

The red LED on the laser indicates the laser is powered. When the laser is powered it is able to lase upon application of a control signal.



Figure. 9



Water Cooling Connection Diagram



Figure. A6



Water Cooling Connection Instructions

If your laser is water-cooled, your laser comes with a kit containing the parts required to connect your laser to your chiller (chiller not provided). If assistance is required, please contact Access Laser.

For optimal performance with your water cooling system, keep the laser balanced, cool the left and right sides of the laser equally, and keep the laser stable. The quick connect tubing fittings are made by PISCO (www.pisco.com).

To Install

- 1. The end of the tubing must be cut off clean and flat.
- 2. The outer surface of the tubing must be free of defects for the first $\frac{1}{2}$ " (13mm)
- 3. The tubing must be round (not distorted).
- 4. The tubing must be the correct diameter for the fitting.

5. Insert the tubing into the fitting and push it in as far as possible. It should go in approximately 0.7" (18mm)

6. Pull gently on the tubing to verify that the small Stainless Steel teeth in the fitting are grabbing the tubing securely. The fitting is ready to be used.

To Remove

1. Push the tubing gently into the fitting.

2. Pull back on the ring into the fitting. This will release the small Stainless Steel teeth from the tubing.

3. While holding the ring close to the fitting, gently pull the tubing out of the fitting.

4. The fitting can be removed and replaced on the tubing multiple times, until the end of the tubing becomes scratched. If the end of the tubing is scratched, it should be cut back to expose smooth surface.

Always turn on/off the water chiller and the laser power at the same time.



L5 Laser Wiring Diagrams



Figure. A7



L5 Laser Connection Diagrams



Left to Right: L5 Laser, TNC To BNC Cable, RF10b, LC3 Controller, DC Power Supply.



RF 10b Driver Specifications

Model: Supply Voltage: Supply Current Output Power: Frequency:

RF 10b 28V DC 7 Amps 120W 40.68 MHz





Figure. A9

Caution:

- 1. Never connect the DC to the RF driver with the wrong polarity, or the RF driver will be damaged.
- 2. Never operate the RF driver without its output properly connected to the laser.
- 3. Do not block the air flow to and from the heat sink, or the RF driver will be damaged.
- 4. If the fans fail the RF driver will stop immediately.



RF 10b Driver Operation

OPERATIONS MANUA

The laser is controlled by applying 5V DC (20 mA) to the TTL Gate on the RF Driver (0V=off, 5V=on) to PIN 7 and PIN 10. The RF driver can be modulated at frequencies from 0 Hz to 100 kHz, but optimal grating frequency is 1-15 kHz using Analog Voltage Control. AVC is implemented by enabling PIN 5 and applying 0-5V DC on PIN 11. 0V to 5V results in a proportional 0% to 100% Pulse Width Modulated laser output.



PIN #	Function
1	5 VDC, 20 mA capacity, for power ready indicator. (Can be used to drive an external red LED if current limiting resistor is used.)
2	Laser ready signal; can be connected to an external green LED to indicate laser ready status; no current limit- ing resistor required.
3	Safety Key Switch Connection. When this pin is enabled by PIN 6 and there is a power outage or opening interlock (PIN 4), this pin needs to be pulled high and then low again to restore laser operation.
4	Safety Interlock. Connect to pin 15 to close interlock circuit. (This function also needs to be enabled by PIN 6.)
5	AVC (Pin 11) Enable.
6	CDRH Safety Mode. Enables keyswitch on PIN 3 and Safety Interlock of PIN 4.
7	Input gate for Laser Enable
8	Time delay control: 5 seconds between initial power on and lasing
9	Plasma conditioning
10	Input for Gate 2. (Connected to BNC input.) A 5 V signal is provided by the customer to turn the laser on/off electronically.
11	Input for Analog Voltage Control (AVC)
12-14	Do not use
15	Ground

