

L4 Laser Series

Image of L4-G-¹³CO₂-WC



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Member of the TRUMPF Group



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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 welcome you to contact us whenever you have questions, concerns, or additional requirements at:

Email: sales@accesslaser.com

Phone: 425-582-8674

The L4 Series

The L4 is a pivotal design for researchers conducting power sensitive research in the mid- and far-infrared spectral regime. The innovative design provides compatibility to the full array of Access Laser enabling technologies. Combining this flexibility with a compact and robust design grants both researchers and original equipment manufacturers alike an attractive platform.

Available technology upgrades:

Acousto-Optic Modulation: Also known as a Bragg cell, this feature uses the acousto-optic effect to diffract and shift the frequency of laser light using sound waves. By mounting this unit outside the laser resonator, it enables a pulse repetition frequency of 200kHz with pulse widths of only a few hundred nanoseconds.

<https://accesslasers.wpengine.com/acousto-optic-modulator-aom/>

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/>

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/>

Stability: By actively monitoring and compensating for temperature fluctuations, our stabilized lasers enable improved power and wavelength control.

<https://accesslasers.wpengine.com/stabilized-s/>

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/>

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/>



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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 service@accesslaser.com. 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: _____

Received By: _____
(Name and title)



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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 service@accesslaser.com.

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



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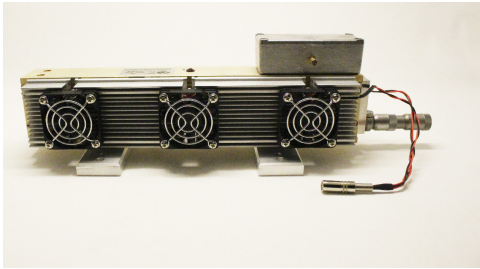


Laser Shipment Contents

The following items are included with each standard laser shipment:

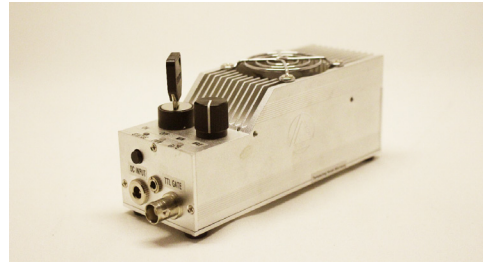
- L4 Series Laser
- RF Driver
- TNC to TNC Coax Cable
- Laser Test Documents
 - Final Test Document
 - Power Plot

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



L4 Series Laser

Figure. A1



RF Driver & Interlock Key

Figure. A2



TNC to TNC Coax Cable

Figure. A3

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 L4 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 L4 series; the Product Report shows that our warning labels comply with IEC 60825-1. The L4 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 L4 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 will result in **DEATH** or **SERIOUS INJURY**.



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



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



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



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Safety Information (continued)

Safety Label Definitions and Locations

1. Product Identification label – Indicates model, serial number and date of manufacture.
2. Yellow Compliance label – Calls out the edition of IEC 60825-1 used for label compliance and the maximum power output and frequency.
3. Yellow Danger label – Indicates laser class and includes explanatory data such a power and wavelength.
4. Safety Compliance label – 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.)
5. Aperture label – Indicates location of laser beam exit (aperture).



Figure A4

② Maximum Output 2 Watts
Emitted Wavelength(s) 9.1-11.8μm
IEC 60825-1 2014-05

④ This device is a laser component which must be installed and operated in compliance with IEC 60825-1 and 21 CFR 1040.10

③ **DANGER**
INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT

Operating Instructions

Operating the laser

1. Direct the laser toward an appropriate beam dump.



Figure. 1

2. If using the laser on an optical bench, secure the laser down with the mounting holes in the base plate



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.

3. Connect the Cooling System

A. Fan

Connect the 12V DC Power supply to the fan power connector.

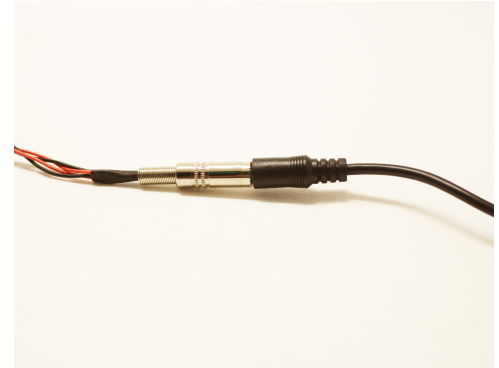


Figure. 2

B. Water

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

4. Connect the RF Driver to the laser with the coax cable using the TNC connectors, as shown in the Connection Diagrams on page 14.

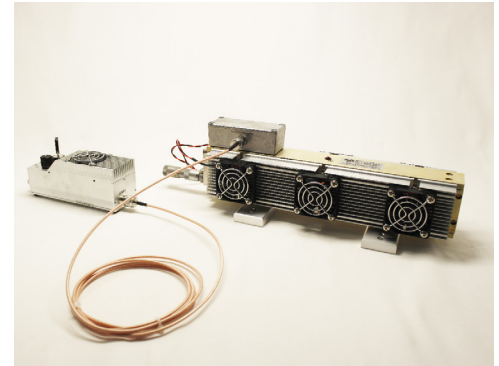


Figure. 3



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Operating the laser (Continued)

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

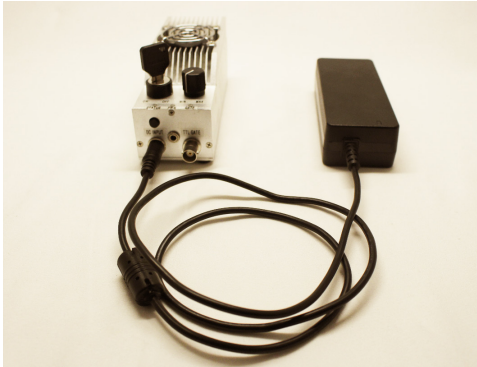


Figure. 4

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



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.

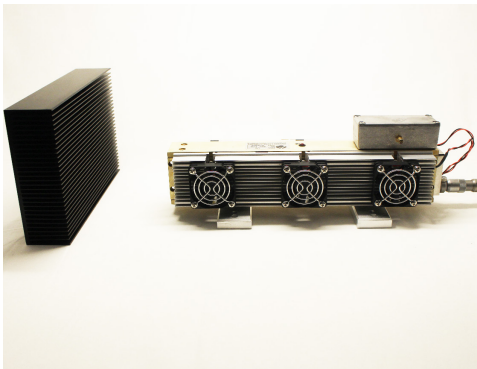


Figure. 5

7. Remove the protective tab from the aperture.

Aperture

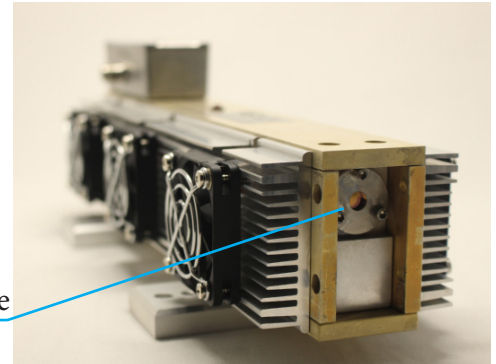


Figure. 6

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



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.

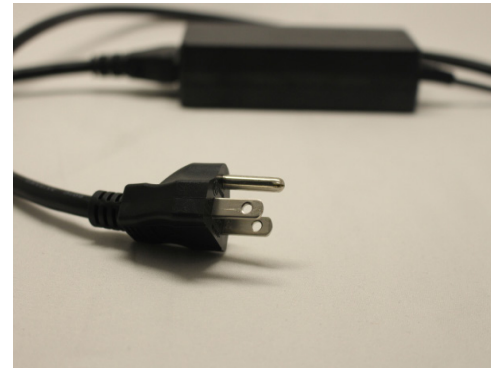


Figure. 7



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Operating the laser (Continued)

11. To activate the laser beam, turn key-switch on.



Figure. 8

12. The status light should blink red 5 times then hold steady.

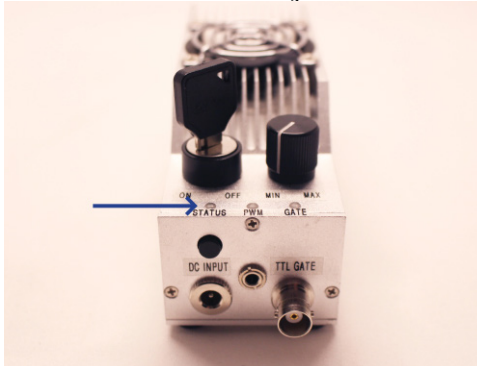


Figure. 9

13. Press the black RF power toggle button, located above the DC status light. The light will turn green.

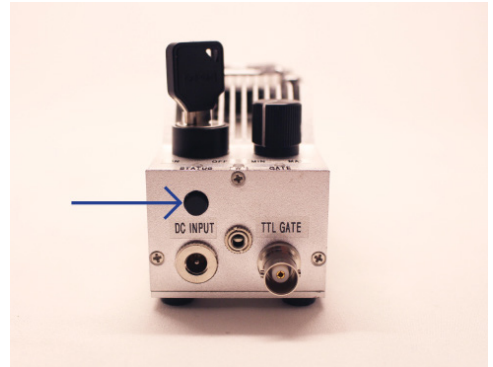


Figure. 10

14. Light is now being produced. The average power can be controlled with the duty-cycle knob on the RF4.

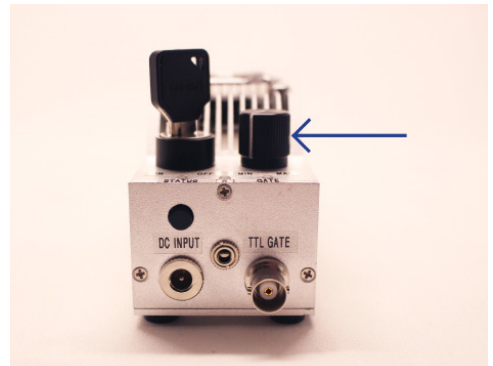


Figure. 11

Water Cooling Connection Diagram

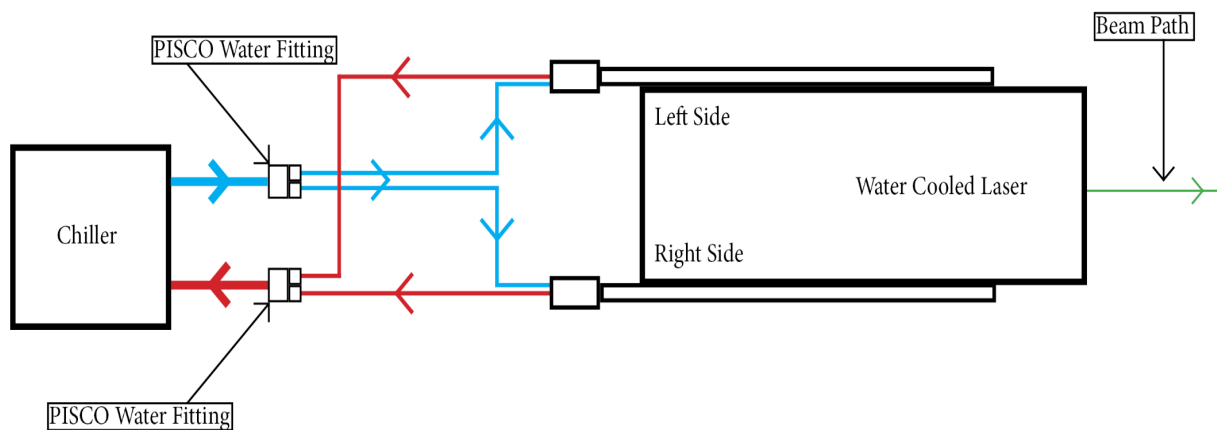


Figure. A5



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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 ½" (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 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.



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L4 Laser Wiring Diagrams

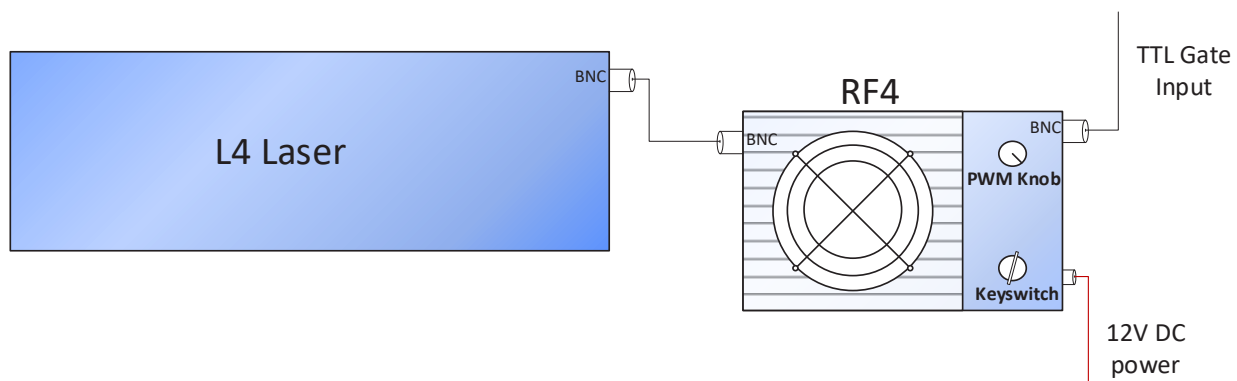


Figure. A6

L4 Laser Connection Diagrams

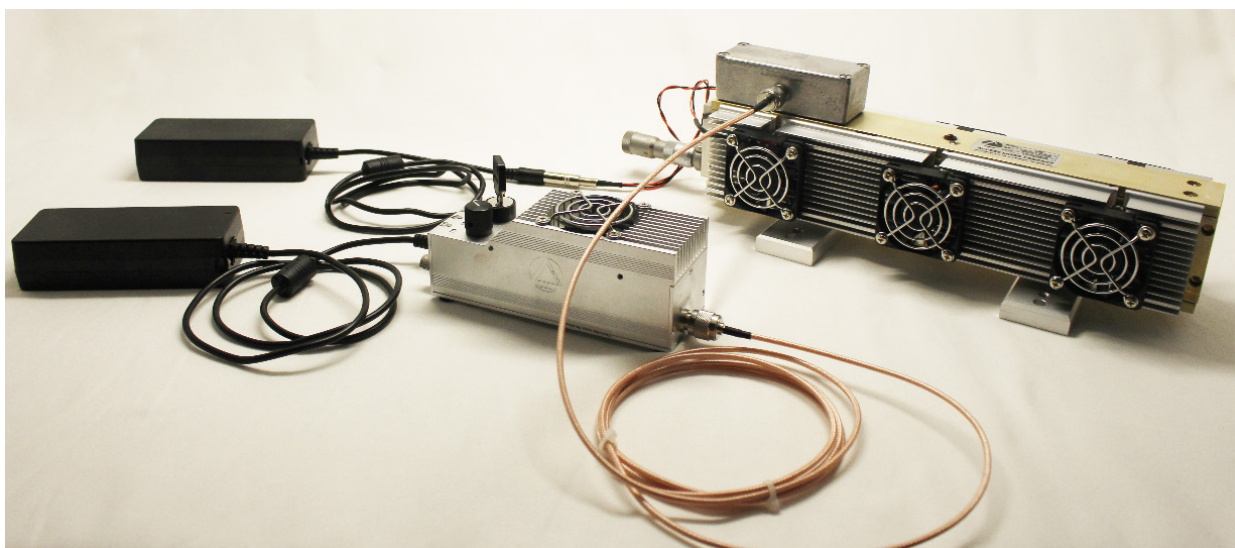


Figure. A7

Left to Right: 12V DC power supply (x2), RF4 Driver, TNC Cable, L4 Laser.

RF4 Driver Specifications

Model:	RF4
Supply Voltage:	12+/-0.4VDC
Output Power:	20W
Frequency:	27.12 MHz
Internal PWM:	16 kHz
Operating temperature:	0 to 60C
Maximum input current:	4A (typical 2.7A)
Typical power dissipation:	9.3W

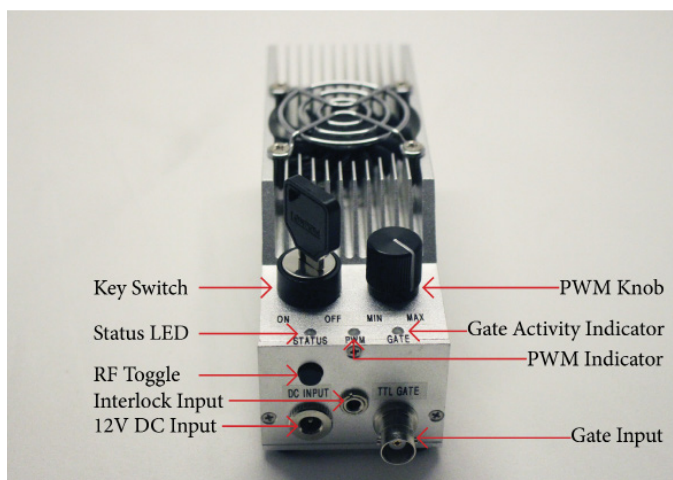


Figure. A8

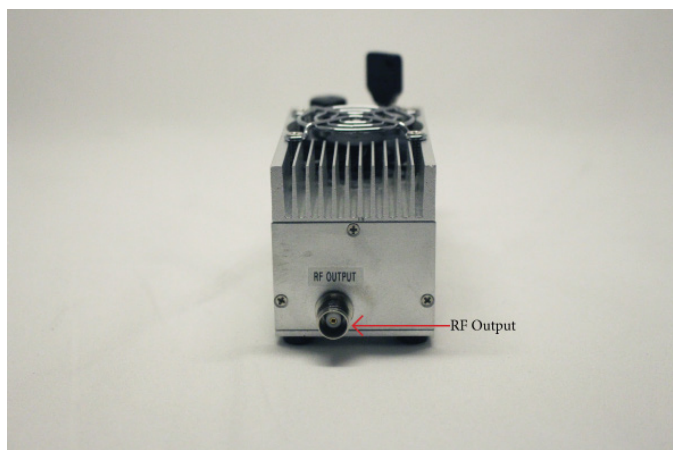


Figure. A9



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RF4 Driver Operation

There are 10 components to the RF4 (see figures A9 and A10)

1. Key Switch. Enables/Disables RF driver. (If power is removed from the RF4 while the key is switched to the on position, and then power is reintroduced, the key must then be switched to the off position and then to the on position again).
2. PWM Knob. RF pulse width modulation (PWM) adjustment from 0% (minimum) to 100% (maximum) duty cycle. (100% = CW mode).
3. Status LED:
 - Solid red – input DC voltage is applied;
 - Flashing red – five second delay after key is turned to ON position (color depends on RF switch on/off status);
 - Solid green – power is enabled and unit is in standby mode;
 - Flashing orange – fault has been detected.
4. PWM Indicator LED. Solid green = RF power is ON (unless PWM knob is at minimum position).
5. Gate Activity Indicator. Solid red = gate is externally driven low (0-5V TTL).
6. RF Power Toggle. Toggles RF output on/off. (RF power follows PWM knob).
7. 12V DC Input. DC supply jack (center positive).
8. Interlock Input (when using interlock plug)
 - Closed loop = on. This is the default;
 - Open loop = system fault - triggers system shut down. To reset, cycle the Key Switch.
9. Gate input. Defaults active high; gate off RF driver with TTL low input. (400kHz max).
10. RF Output. Output connector of RF driver.