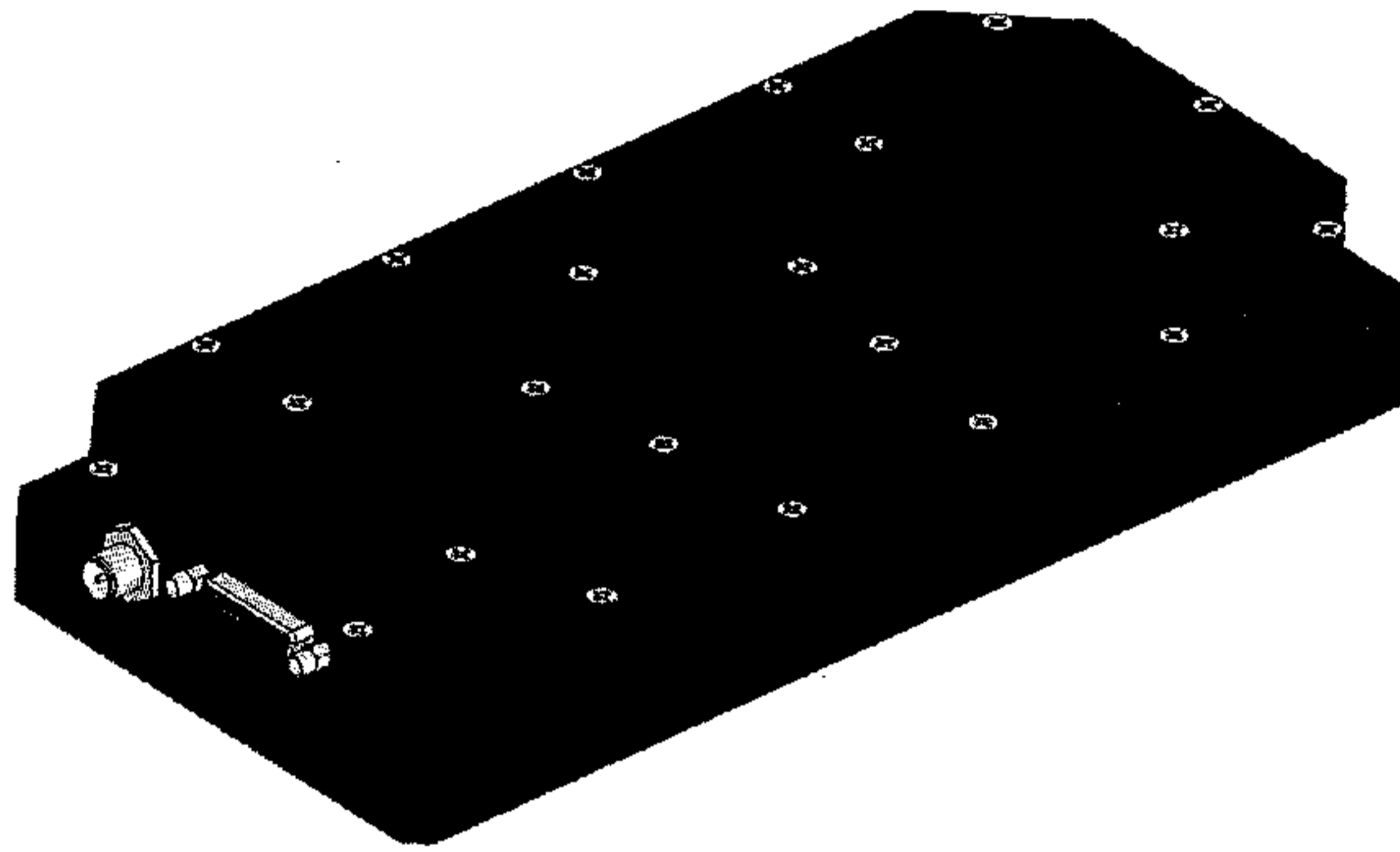


ORBITS LIGHTWAVE, INC.
OPERATING AND INSTALLATION GUIDE
ETHERNAL LASER MODULE
ETH-1060 series
ETH-1550 series



PLEASE READ THIS DOCUMENT FIRST



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User's Manual

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I User Safety

Your safe and effective use of this product is of utmost importance to us at Orbits Lightwave. Please read the "Laser Safety Warnings" before attempting to operate the laser.

Caution: To completely shut-off power to the unit, unplug its power source from the wall.

Caution: Do not open the top cover. There are no user serviceable parts inside the unit; leave all servicing to qualified service personnel. Unauthorized opening of the cover will void the warranty.

Laser Safety Warnings

The user will NEVER need to remove the laser cover to gain access to the laser enclosure. Contact Orbits Lightwave if for some reason, you want to remove the laser cover. **Unauthorized opening of the laser enclosure will void the warranty, and may result in irreparable damage to the internal components.**

DO NOT disassemble the unit since there are no user serviceable parts inside.

The **invisible** laser radiation emitted from this unit may be harmful. Avoid direct exposure to the beam. Avoid looking at the laser beam directly.

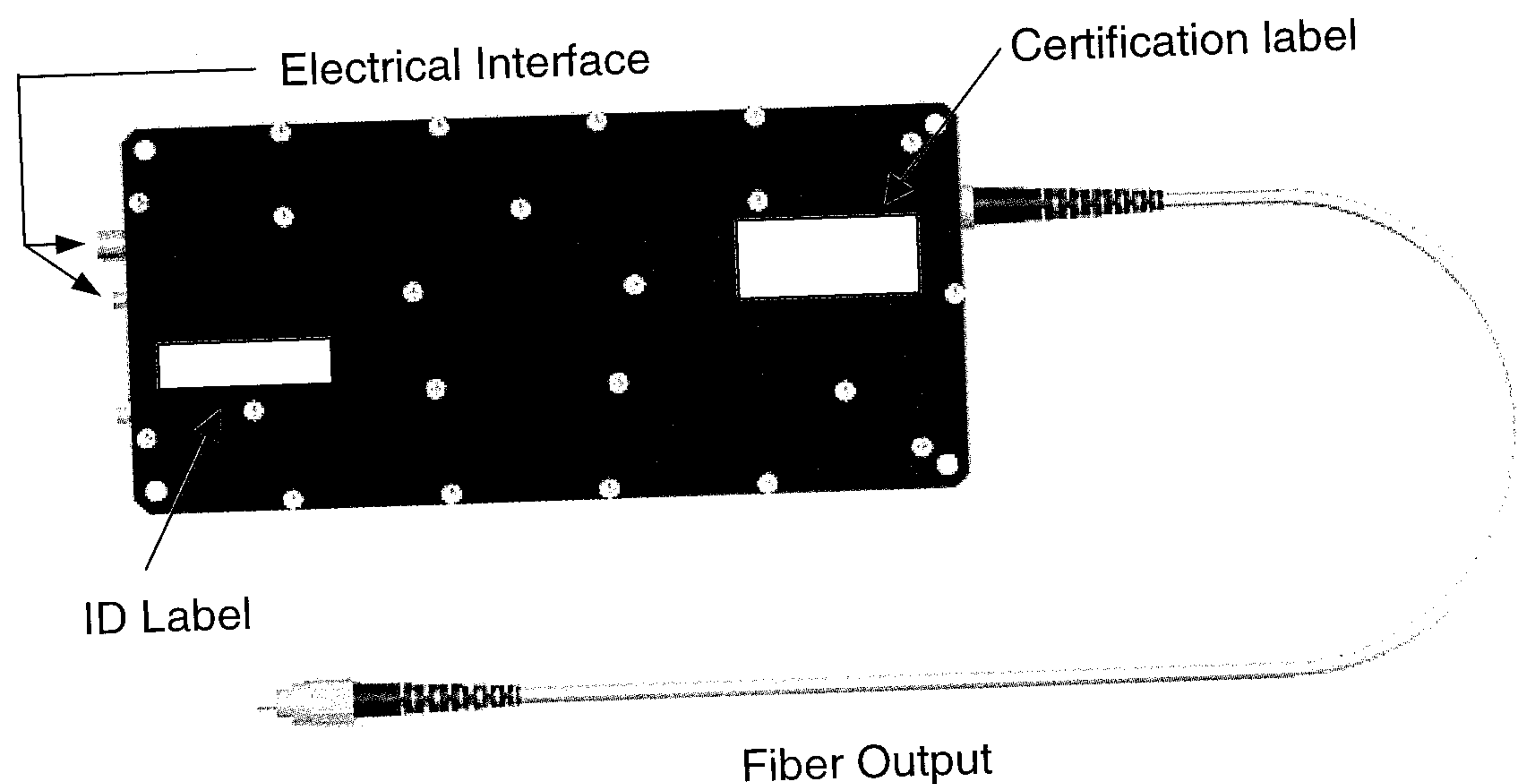


Figure 1 - ETH-series laser module top view with laser safety ID/Certification label



II Introduction

Congratulations on your purchase of an Orbits Lightwave, Inc. fiber laser product. Your Orbits Eternal™ “virtual ring” laser with StableLase™ technology is designed and manufactured using the latest fiber laser technology, providing excellent noise performance with high frequency stability. Before you begin using this product, there are a few things that you need to know.

Unpacking

Carefully unpack your laser product and inspect it for any evidence of shipping damage. If any damage is found, notify your freight carrier and Orbits Lightwave as soon as possible.

Check the contents of the shipping container against the shipping list. Notify Orbits Lightwave immediately if any discrepancy is found.

Caution: To avoid hazardous electrical shock, do not power up the laser when there are any signs of shipping damage.

Caution: Laser ESD Sensitivity

The Orbits Eternal™ fiber laser contains a pump laser that is highly sensitive to Electro Static Discharge ESD. This laser has been purchased from a reliable manufacturer and has been installed with the fiber laser using the best industry standards for safe handling and operation. Improper handling and use by the customer can damage or destroy the pump laser chip.

Observe standard ESD precautionary practices when connecting or disconnecting your laser, including the use of wrist straps and floor mats to minimize the risk of static discharge.



III Quick Start

This section outlines the quickest path to using your ETH-series Eternal fiber laser. Please read the "Laser Safety Warnings" before attempting to operate the laser. Please read this manual carefully and thoroughly to obtain the best possible performance from your unit, and retain this manual for future reference. Refer to the detailed setup instructions in Section IV – Setup For operation for additional information regarding operation of your Eternal fiber laser module.

Setting Up

1. Place the laser enclosure with Eternal Label facing upwards on a flat, clean and stable surface with good heat sink capability (5-10W). Take care to connect the output fiber to a desired instrument or otherwise secure the output fiber in a safe direction so that direct exposure to the laser radiation is avoided.
2. Plug the 25-pin cable from the power supply into the laser head. Plug in line power to the power supply¹.
3. Flip the power switch on the back of the power supply (see Fig. 4) box to turn on power to the laser. The red indicator light on the power supply front panel should come on.
4. Laser output is activated by the key switch on the front of the power supply box with an associated green indicator light. After turning this key switch, the laser control circuitry will be powered up and activated within approximately 10 seconds. Although power will be available from the laser after this initial delay period, please allow 20 to 30 minutes warm-up time to achieve optimal operating conditions.

The laser should always be deactivated with the key switch before shutting off the power supply.

If the power control SMA connector is left open, the laser will operate at a predetermined output power set at the factory. If power control is desired, a voltage can be applied here to set the laser power level. Please refer to the laser test data (supplied with the laser) for voltage limits for your particular laser.

Please contact our technical support with any questions at (+1-626-584-5994).

¹ Note: The laser power supply is configured at the factory for the line voltage and frequency appropriate for your country.



IV Setup for Operation

The equipment required to operate the Eternal laser is:

- Laser power supply²
- Optical connector cleaning kit
 - Cotton swabs
 - Alcohol (ethanol or methanol)
 - Compressed dust-free air

Place the Eternal™ laser module on a flat, clean and stable surface with the Eternal™ label facing up. It is desirable to attach the laser to the surface using the provided mounting holes (see

1. Figure 5). The mounting surface should be heat conducting to provide sufficient (5-10W) heat sinking for laser operation
2. Connect the power supply cable with 25-pin connector to the laser chassis. Module. See Figure 2. Use standard ESD protection practices when handling the laser module.
3. Plug in line power to the power supply².
4. Ensure that the laser output is disabled by checking that the key switch is rotated to its counterclockwise position.
5. Turn on the power supply using the switch located on the back of the PS-1 power supply module (see Fig. 4). The red power indicator should come on (see Figure 3).
 - If you are not using the PS-1 power supply with the laser module, the various power lines should be connected to the 25-pin micro-D. Ensure that the laser is disabled (pins 11 and 12 are open) before turning on power to the module.

² Orbits laser power supply is preset at the factory to maintain the pump laser current and the internal pump laser TE cooler at their appropriate operating points.



IV Setup for Operation

6. Use standard fiber connector cleaning procedures before attaching the laser output. The laser output fiber should be connected prior to turning on the laser.
7. Turn on the laser by rotating the key switch in the clockwise direction. The "Laser On" green indicator light should come on.
 - If you are not using the PS-1 power supply, the laser is enabled by shorting pins 11 and 12 together on the 25 pin micro-D connector
8. Typical warm up time for the laser module is 20 to 30 minutes to achieve optimal operating conditions. However, power is available from the laser within several seconds after the laser output is enabled.

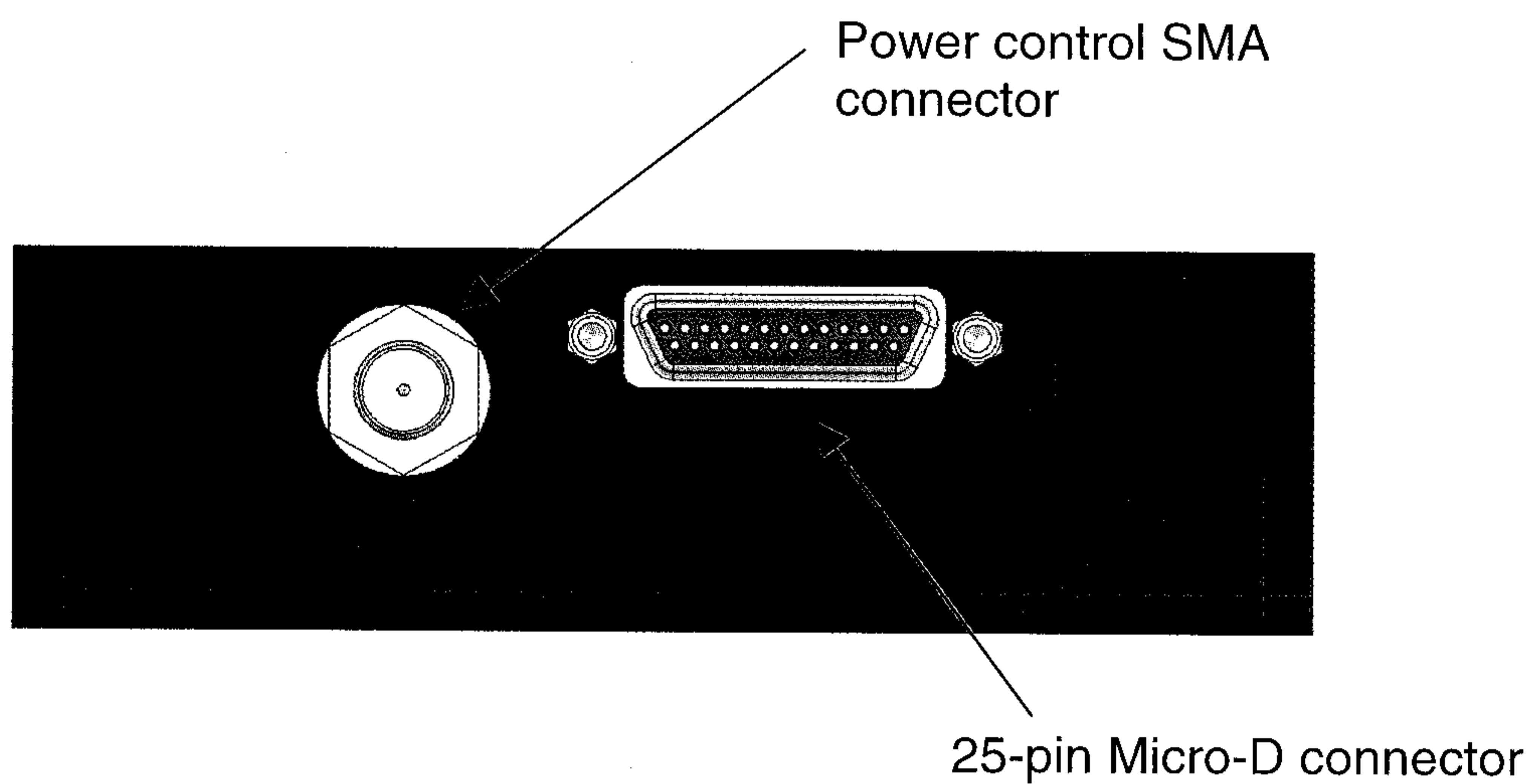


Figure 2 - Location of SMA & 25-pin D-sub connectors



IV Setup for Operation

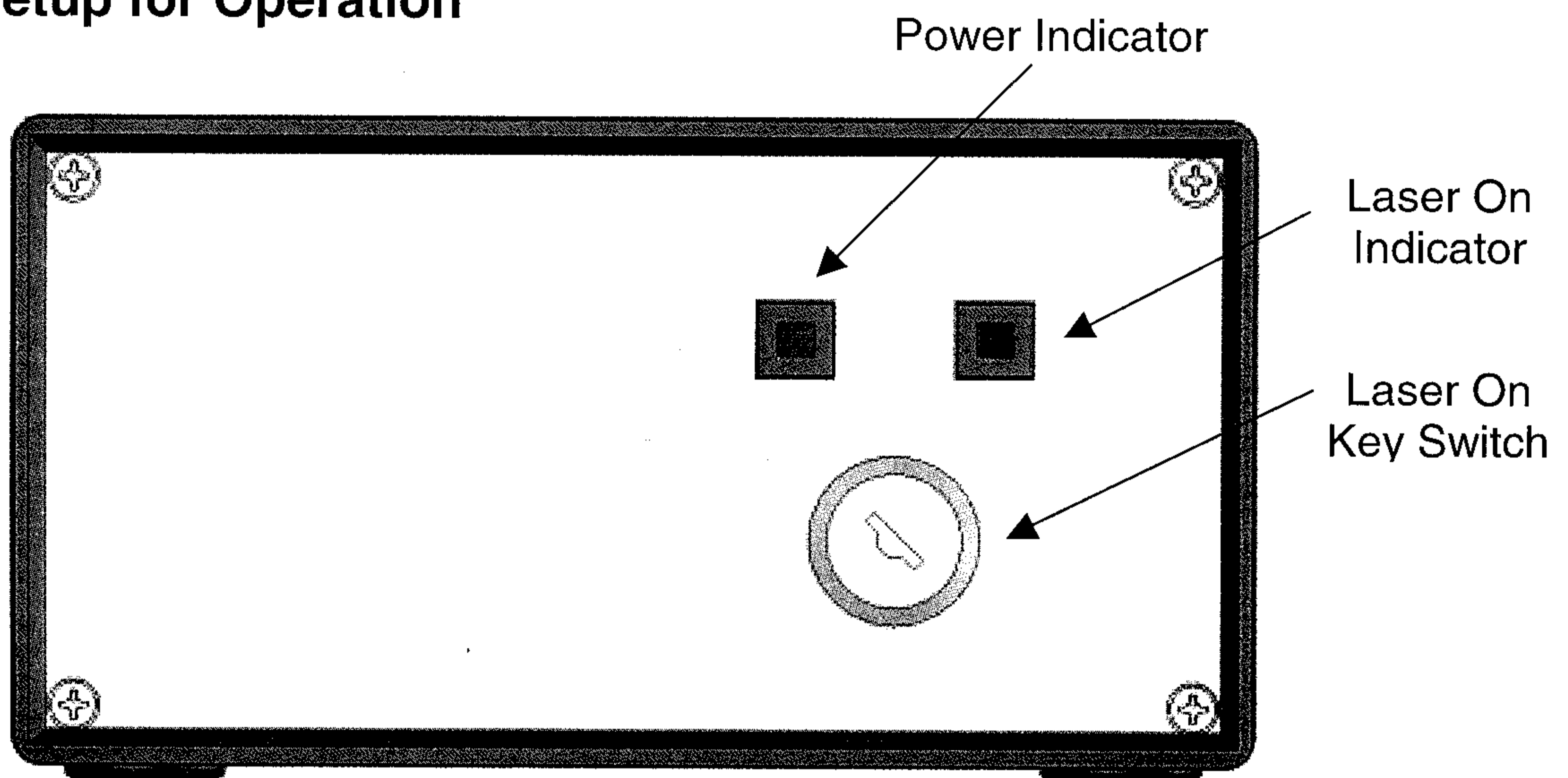


Figure 3 – PS-1 Power supply front panel

In order to shut down the laser, the key switch should be turned counterclockwise until the green laser indicator light on the PS-1 power supply turns off. This should always be done prior to shutting off power to the laser. Failure to follow the proper laser enable and disable procedures can result in damage to the laser module.

If power control is not needed, the laser can be operated with the power control SMA connector open. In this case the laser will operate at a factory preset power level. The output power of the laser can be set by applying a voltage nominally between 0 and 2.5V on the SMA connector (see Fig 2). Please refer to the laser data sheet (supplied with your laser) for the safe operating range for your particular laser.

The laser output power can alternatively be set using the diagnostic connector (Pin 7) on the rear of the PS-1 power supply (see Figure 4, Table 3). Please note that only one of the two methods should be used at any one time and that these connections should be left open if not in use.

If you are not using the PS-1 power supply, connections to the 25-pin micro-D should be made according to the pin assignments shown in Table 2. The power-up procedures outlined above should always be followed. All diagnostic pins shown should be left open when not in use. Please contact Orbits Lightwave technical support (Ph: 626-584-5994) for more details if you are planning not to use the PS-1 power supply unit.



V Product Warranty

The Orbits Lightwave fiber laser product is sold with a one-year warranty, which is valid when the product is operated within an environment as described above and in Table 1.

Our warranty provides that Orbits Lightwave, Inc. will repair or replace at our sole option any product which has been returned to us under the provisions of the RMA return procedure defined below, and which in our reasonable opinion is defective in materials or workmanship or which has failed to meet the product specifications defined in Table 1 below, and which in fact has failed under normal use within one (1) year of the date of shipment.

Experimental units are not covered under this warranty unless specifically authorized in writing by an authorized officer of Orbits Lightwave, Inc.

PRODUCT RETURN PROCEDURES

If you wish to return the product for any reason, please contact the Orbits Lightwave Sales Department (Sales@orbitlightwave.com or Ph: +1-626-584-5994) to obtain a Return Materials Authorization (RMA) number, which is your authorization to return the product to us. Products returned without an RMA are subject to immediate return at customer's expense. When you receive a valid RMA number, pack your product in the original product case or equivalent. Place the case in a sturdy shipping carton, and return to the following address with the RMA number clearly shown as indicated below:

Product Return RMA #
Orbits Lightwave, Inc.
101 Waverly Drive
Pasadena, CA 91105 USA
Tel: (626) 584-5994
sales@orbitlightwave.com



VI Laser Performance

With the pump laser biased at the operating point specified in the enclosed test data sheet, the Eternal laser will operate according to its guaranteed specifications, as shown in Table 1 below. It may take up to 20 minutes of warm-up time to achieve maximum performance.

TYPICAL OPERATING SPECIFICATIONS

Table 1 - Typical specifications

Parameter	Notes	Min	Max
ETH-1060 Wavelength range	Single output selectable in range	1047nm	1064 nm
ETH-1550 Wavelength range	Single output selectable in range	1530 nm	1565 nm
Frequency accuracy	Measured at case temperature 25 ± 3°C	± 0.05 nm (± 0.02 nm optional)	
ETH-1060 Output power (mW)		10, 20, 40, 80, 100, 200	
ETH-1550 Output power (mW)		10, 20, 40, 80, 100	
Output power stability (dB)			± 0.5
RIN (dB/Hz)	Measured at 1 MHz		-115
RIN (dB/Hz)	Measured at 100 MHz		-165 ¹
Optical Linewidth (Hz)	1 ms integration time		400
SNR (dB)	With 0.05 nm RBW	80	
SMSR (dB)	With 3 MHz RBW	75	
Frequency stability (MHz)	At room temperature ²		± 10
Temperature Shift (MHz/°C)	Operating case temp range; (5 - 45°C)		± 20
Power Shift (MHz/mW)			± 2
Polarization extinction ratio (dB)		> 23	
1 Shot noise limited			
2 After initial warm up at room temperature ±1°C			

PHYSICAL SPECIFICATIONS

Parameter	Notes	Value
Output fiber type	PM connector optional	Panda PM fiber
Dimensions (mm)	L x W x H	177.9 x 82.8 x 23.3
Mounting screws	Four (4) required	8-32

MAXIMUM RATINGS

Exposure of the Eternal laser to conditions exceeding these values can adversely impact device reliability.

Parameter	Notes	Min	Max
Operating Temperature (°C)	Base plate temperature	5	45
Storage Temperature (°C)	Non-operating	5	70
Humidity (% relative)	Non-condensing		80



VII Electronic Interface: 25 micro-D pin-out

Table 2 - 25 pin micro-D pin assignments

Pin	Function	Notes		
1	6V high current supply	Floating power supply required. Do not attach GND-A to GND-B.	Required for laser operation	
2				
3				
4				
5				
6	6V high current return (GND-A)			
7				
8				
9				
10				
11	5V reference out	Referenced to 6V high current return (GND-A)		
12	Laser enable (pull up to 5V to turn on laser)			
13	+6V supply	Floating power supply required. Do not attach GND-A to GND-B.		
14	+/-6V common (GND-B)			
15	-6V supply			
16	+/-6V common (GND-B)			
17				
18	Pump monitor 1 anode			Optional or for diagnostics only.
19	Pump monitor 1 cathode			
20	Pump monitor 2 anode (optional)	>100mW versions only		
21	Pump monitor 2 cathode (optional)			
22	TEC good indicator (1.5V)	Referenced to GND-A		
23	2.5V laser set point reference out	Referenced to GND-A		
24	Laser set point input	Referenced to GND-A Same as SMA connector input		
25	Diagnostic diode cathode out	Referenced to GND-B		



VIII Power supply electronic interface

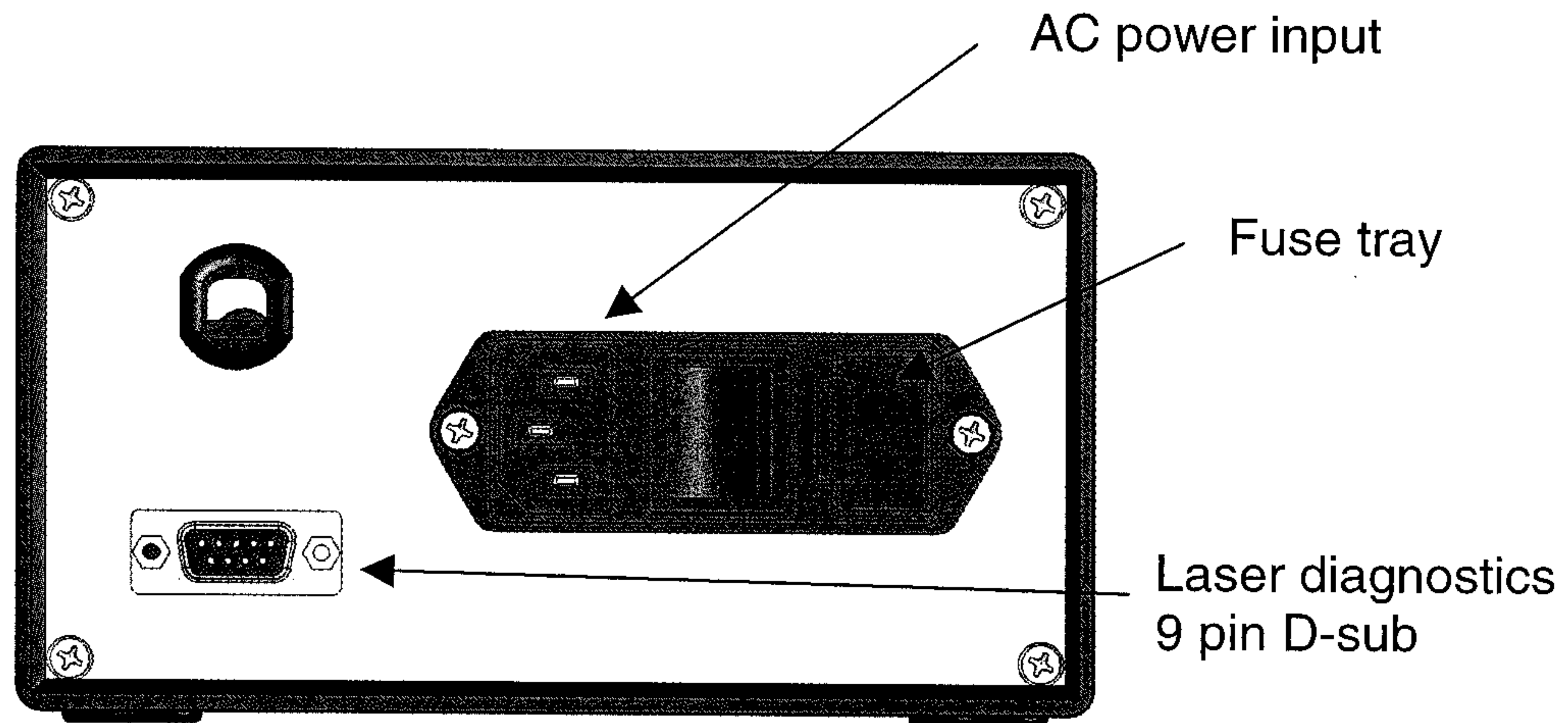


Figure 4 - Rear panel of PS-1 power supply

Table 3 - PS-1 diagnostic 9-pin D-sub pin assignments

Pin	Description	Notes
1	Pump 1 monitor anode	
2	Pump 1 monitor cathode	
3	Pump 2 monitor anode	>100mW versions only
4	Pump 2 monitor cathode	
5	TEC Monitor Voltage	1.5V approximately 25°C
6	2.5V Reference Voltage	
7	Current Set Point	Same as SMA connector input
8	N/C	For company use only
9	Circuit ground	Connected to laser module case



IX Mechanical interface

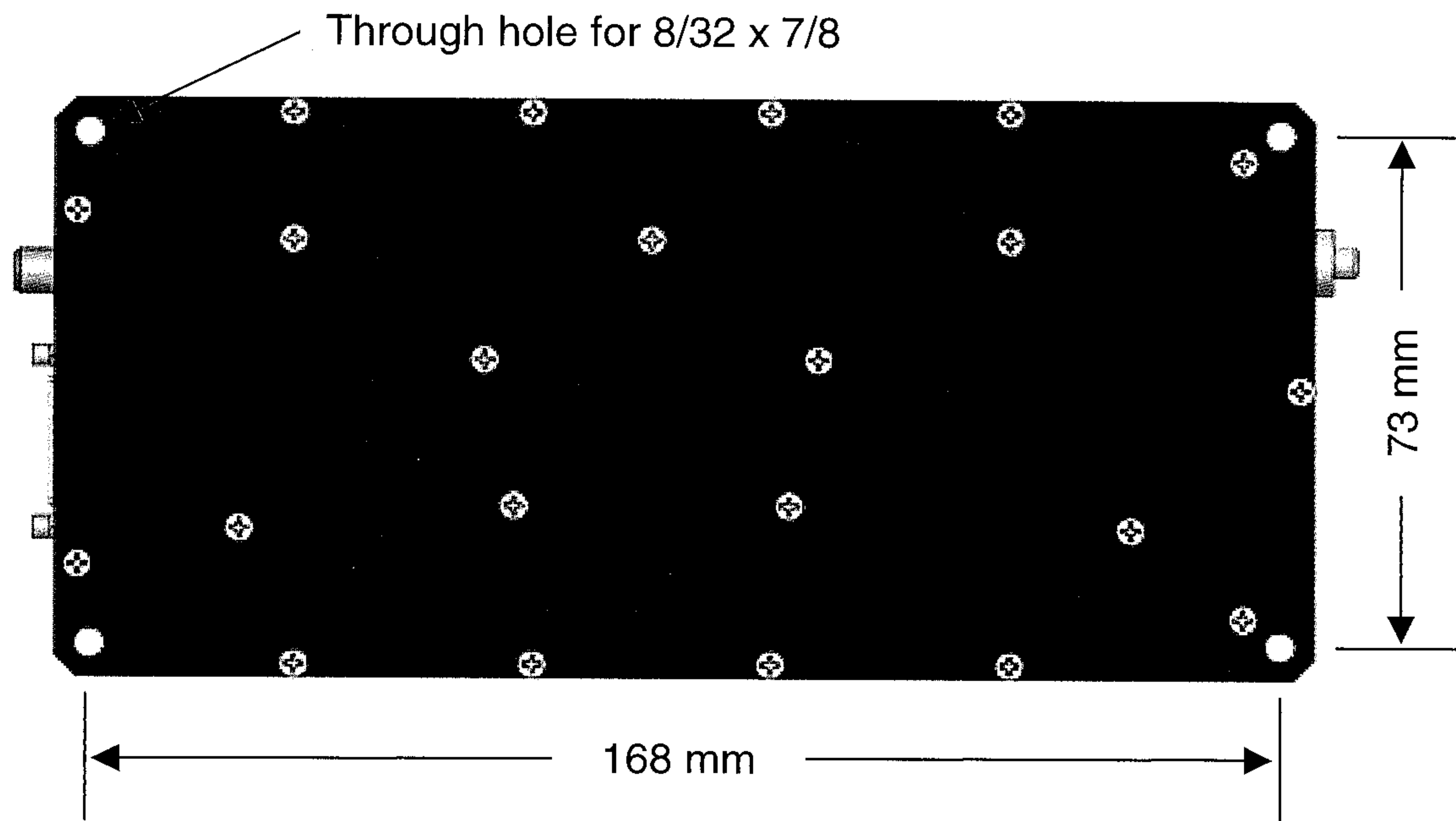


Figure 5 - Laser module mechanical mounting specifications

Note: A well-designed heat sink with a high performance thermal interface material and package mounting technique should ensure that the laser module case temperature does not exceed the maximum temperature specified for the product (refer to the absolute maximum ratings in Table 1).

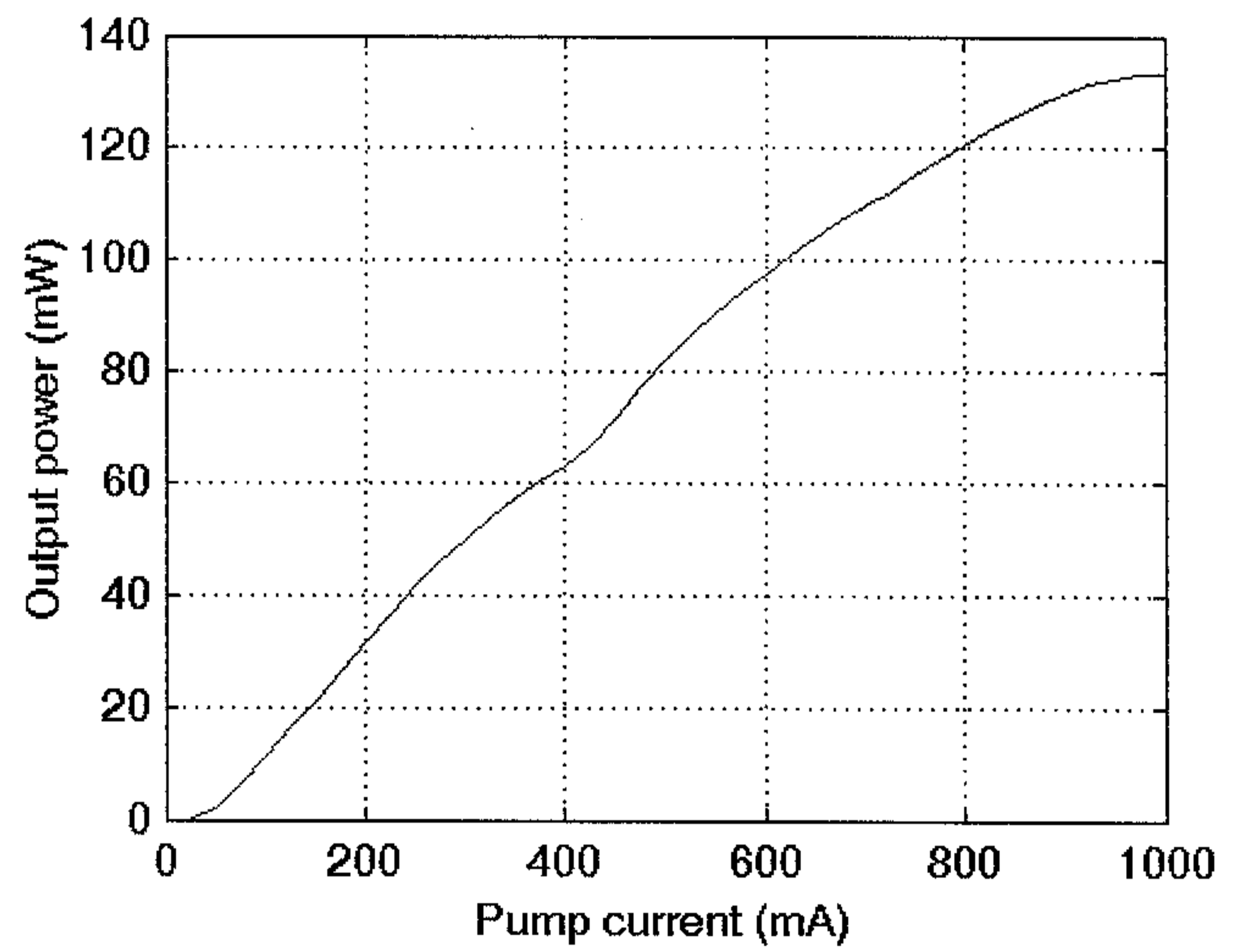
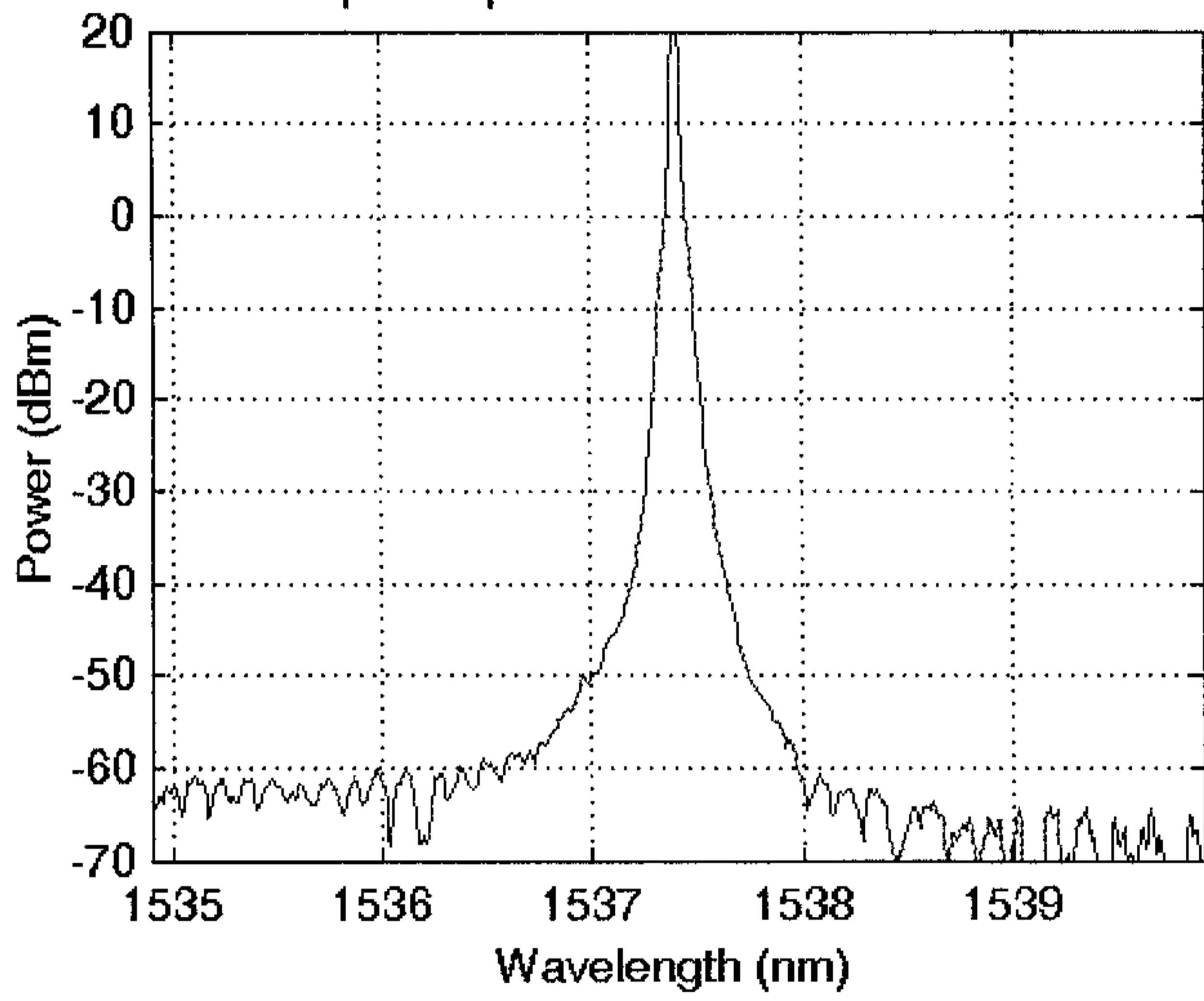
Failure to keep the package base below the specified maximum temperature may cause overheating and result in module damage.

The general mounting guidelines:

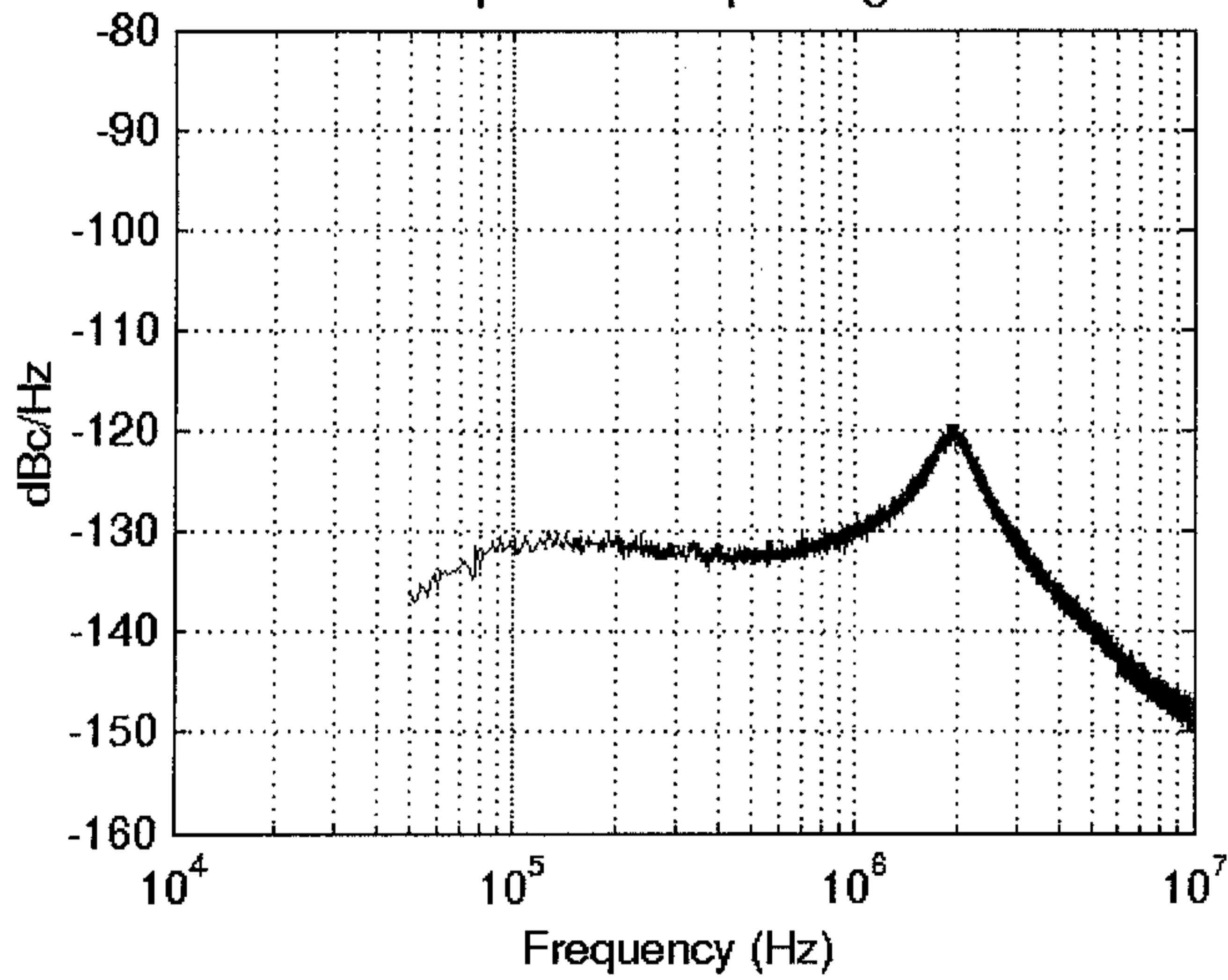
1. Select a high performance thermal interface material
2. Design a heat sink to meet module heat dissipation requirements (5-10W)
3. Put module on the heat sink with the thermal interface material in between
4. Use 4 ea. 8-32 x 7/8" screws to secure the module and ensure good thermal transfer to the heat sink
5. Follow all integrated circuit standard practices including prevention measures. Follow standard ESD safety guidelines
6. Ensure that all operational and assembly equipment are properly grounded

Parameter	Value	Unit	Notes
Wavelength	1537.40	nm	At 25°C; Channel C50
Frequency accuracy	±0.05	nm	
Operating temperature	RT	°C	
Recommended minimum current set point	0.5	V	
Recommended operating point	1.76	V	2.50 V max
Output power	108	mW	
Maximum output power	133	mW	
SMSR	> 75	dB	RBW = 3 MHz
SNR	> 80	dB	RBW = .05 nm
Power stability	< ±0.5	dB	
RIN peak	-120	dBc/Hz	
RIN, f > 5 MHz	< -140	dBc/Hz	
Polarization extinction	> 25	dB	
Fiber output	PM FC/APC		slow axis

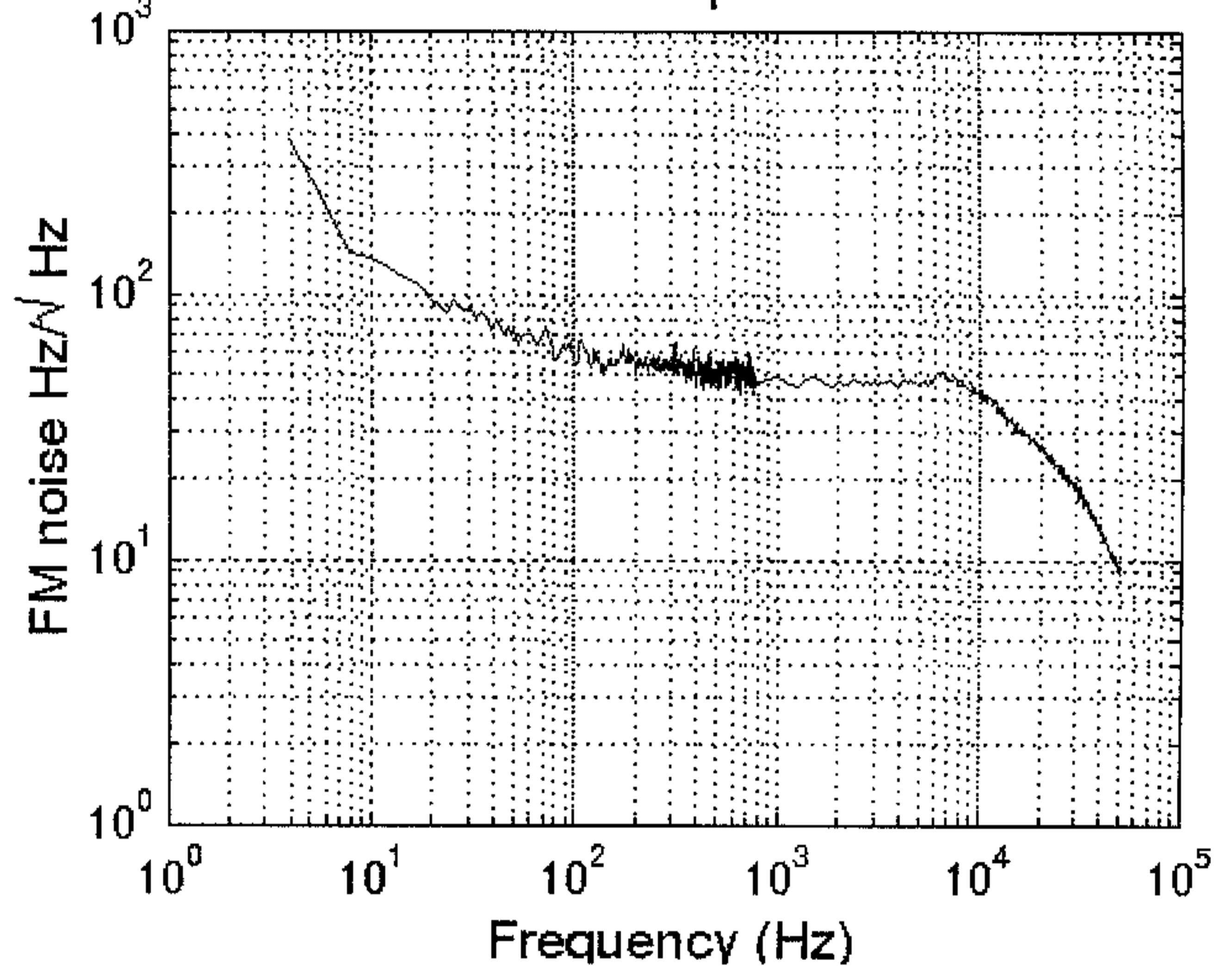
Optical spectrum 0.05nm resolution



Noise spectrum at operating current



FM noise spectrum



Tested by: Dan Provenzano Date: 12/27/2006