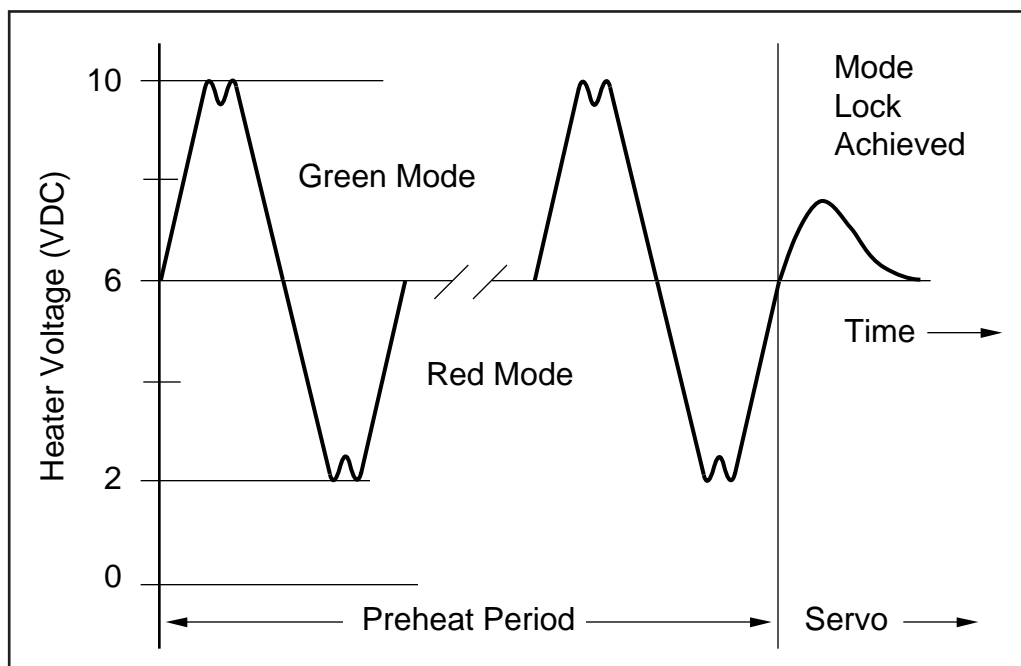


# Publication 540-0033 Operator's Manual Revision 6.1

## 0.9 mW Stabilized Single Frequency Long HeNe Laser



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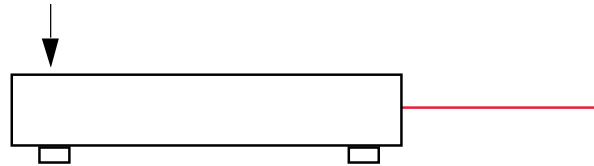
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# Labeling

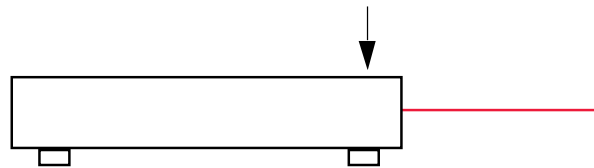


Label is located on the top at the rear of the laser housing



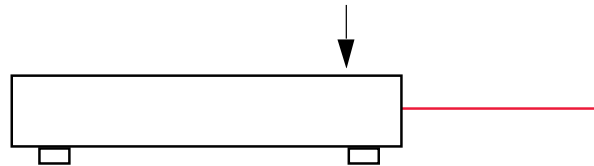
AVOID EXPOSURE  
LASER RADIATION IS EMITTED  
FROM THIS APERTURE

Label is located on the top at the front of the laser housing



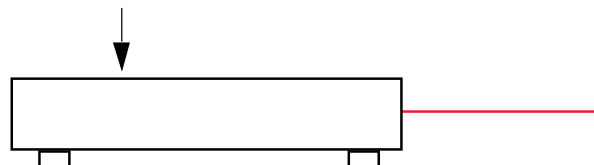
**CAUTION**  
LASER RADIATION WHEN OPEN.  
DO NOT STARE INTO BEAM.

Label is located on the top in the front of the laser housing



TELETRAC  
137 Aero Camino  
Santa Barbara, CA 93117-3101  
Manufactured \_\_\_\_\_  
Model No. \_\_\_\_\_ Serial No. \_\_\_\_\_  
This product conforms to the applicable  
requirements of 21 CFR Subchapter J  
at date of manufacture.

Label is located in front of the yellow label on the top of the laser housing



## Laser Cautions

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**NEVER** look directly into the laser Beam Port  
or at specular reflections off of polished surfaces.

**Do not disassemble the laser.**

**Refer internal servicing to authorized and trained personnel.**

### **DANGER**

**Potentially lethal voltage may be present in the interior  
of the laser even after power has been disconnected.**

**Exposure to hazardous levels of laser light may result if  
procedures or adjustments outside of the scope of this  
manual are performed.**

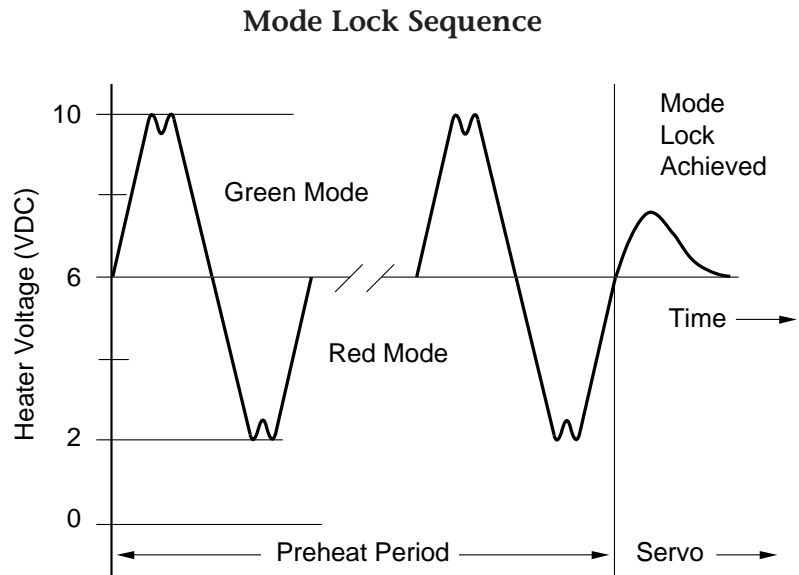
### **WARNING**

**Up to 5 milliwatts of laser power is accessible in the interior.  
Warranty is void if covers are removed and interior accessed  
by unauthorized personnel.**

# Theory of Operation

## Theory of Operation

The helium-neon laser tube is stabilized in a single frequency mode by means of a thermal control servo loop. As the electronic circuitry detects the start of any deviation in mode, an active thermal source responds to either heat the laser tube or to allow the tube to cool.



## Recommendations for Use

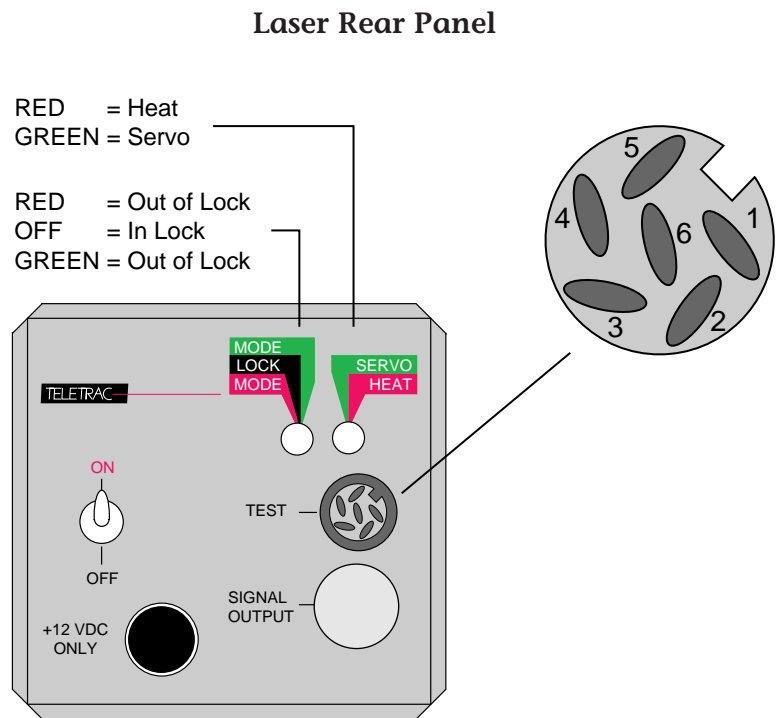
1. Do not locate the laser in a position where it will be exposed to air vents from other equipment. Do not block the air inlet on the bottom of the laser or the air exits on either side.
2. Maximum plasma tube lifetime will be realized if the laser is turned off while not in use for a period longer than 12 hours.
3. To achieve optimum stability, minimize any mechanical or acoustic vibration into the laser case. The dimensional changes of the laser-tube length required to maintain stability are less than a millionth of an inch. The effect of acoustic vibrations can be observed by tapping the case when the laser is in mode lock and observing the MODE LED flicker as the servo attempts to correct the acoustically-induced error.
4. The unlocked mode sweep of the laser during warm-up is approximately 680 MHz.
5. In the normal mode lock condition this excursion is reduced to less than 1 MHz.
6. External magnetic fields may cause Zeeman splitting or failure to mode lock.

# Installation

1. Connect the power cord to the mating connector on the 12 VDC power supply. Connect the power supply to the correct line voltage as specified on the tag attached to the line plug. The power supply may be configured for operation on line voltages of:

100-120 VAC, 47-63 Hz. (internal jumper set to "100")  
200-240 VAC, 47-63 Hz. (internal jumper set to "200")

2. Turn on the switch located on the rear of the laser.
3. The HEAT/SERVO LED will be RED when the laser is first turned on. The MODE LED may be either RED, GREEN, or OFF.
4. During the laser warm-up period the HEAT/SERVO LED will be red, and the MODE LED will slowly alternate from red to green. At the end of the warm-up period, the HEAT/SERVO light will turn green.
5. The MODE light will slowly alternate one or two more red/green cycles and then extinguish. This is the mode lock condition. The laser is now ready for use.



**Figure 2**

# Laser Service

## WARNING!

**HIGH VOLTAGE** may be present in the laser case interior long after the unit has been turned-off and/or unplugged. Use caution in discharging the residual voltage present at the plasma tube, ballast resistor and high voltage leads to the laser case.

The laser is equipped with a 6-pin DIN test socket. This test socket can be used for remote monitoring of the LASER READY status. The LASER READY test point is an open-collector type and requires an external pullup resistor (+24 VDC max) and should sink no more than 10mA. A typical application would use a pullup resistor of 1000 ohms to +5V. The LASER READY signal is active low (i.e., when the line is low the laser is mode locked).

### Laser Ready/Monitor

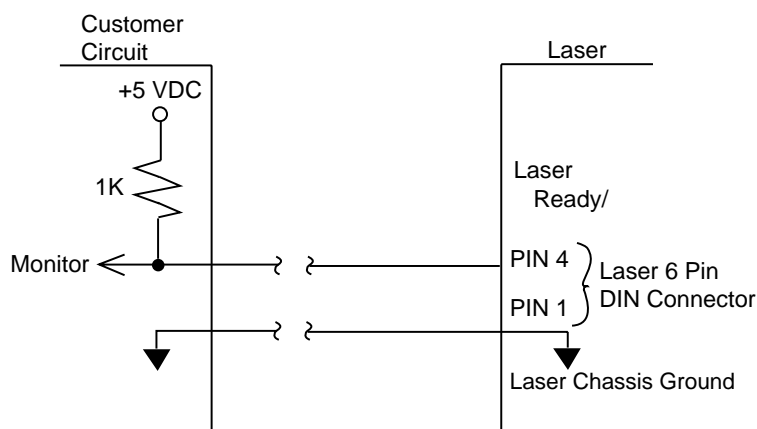


Figure 3

PIN	FUNCTION
1	GROUND
2	MODE
3	TUBE TEMPERATURE*
4	LASER READY/(External pullup required to +24VDC maximum)
5	TEMPERATURE SET-POINT
6	SERVO DRIVE

**CAUTION: PROBING THESE TEST POINTS MAY CAUSE TEMPORARY OUT OF LOCK CONDITION.**

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**\*NOTE: Grounding pin 3 will force the servo into the heat mode, causing the tube to mode-cycle upward to a higher temperature.**

**Please consult with TELETRAC before attempting this adjustment!**



# Trouble-Shooting

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## 1. LED's ON REAR PANEL DO NOT ILLUMINATE

- No DC power.
- Fuse open on servo laser control PCB inside laser.
- Wrong or reversed voltage applied to laser.
- Power supply failure.

## 2. MODE LED STAYS GREEN

- Ambient temperature is lower than the specified operating range.
- External reflections may be causing mode cycling. Block out the beam to see if the laser locks.
- Laser temperature set point is too high. Turn off laser, wait 30 minutes and then restart to see if problem re-occurs.

## 3. MODE LED STAYS RED

- Ambient temperature is higher than the specified operating range.
- External reflections may be causing mode cycling. Block out the beam to see if the laser locks.
- Laser temperature set point is too low. Turn off laser, wait 30 minutes and then restart to see if problem re-occurs.

## 4. MODE LED IS FLICKERING BETWEEN GREEN AND RED

- Block out the beam. If laser stabilizes, then optical components may need to be re-aligned to prevent laser energy from re-entering the exit aperture of the laser.
- Excessive mechanical noise is being coupled to the laser and causing deformation of the plasma tube.
- Air currents near laser inlet, outlet vents.

## 5. WHEN LASER IS TURNED ON AFTER BEING OFF FOR MORE THAN 30 MINUTES, LASER WILL REACH MODE LOCK AFTER WARM-UP PERIOD AND THEN AFTER AN INDETERMINATE DELAY WILL RE-ENTER WARM-UP MODE (HEAT/SERVO LED RED)

- Excessively low ambient temperature has lowered laser case temperature below operating limit. This condition is self-correcting requiring usually only two heat soak cycles.
- Air currents near laser inlet, outlet vents.

**NOTE: IF THE ABOVE CANNOT ISOLATE THE PROBLEM, PLEASE CALL THE FACTORY.**

**THE POTENTIOMETERS INSIDE THE LASER CASE ARE NOT USER ADJUSTABLE. THEY ARE FACTORY SET AND REQUIRE SPECIALIZED TEST EQUIPMENT FOR CORRECT ADJUSTMENT. READJUSTMENT WILL COMPROMISE THE ACCURACY OF THE SYSTEM AND NECESSITATE FACTORY SERVICE.**

## Appendix A: Specifications

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Input/Output	0.9 mW Long HeNe Laser operation condition
1. Laser wavelength	632.991269 nm (vacuum)
2. Spatial mode	TEM <sub>00</sub>
3. Polarization linear	45°
4. Warm-up time	23 ± 8 minutes @ 70° F (21° C)
5. Maximum power output	0.925 ± 0.075 mW
6. Maximum power output with fiber optic cable	0.80 ± 0.20 mW
7. Power drift over 8 hours period	± 10% peak to peak
8. Beam height	1.75 ± 0.01 inch
9. Mode sweep	1.4 - 11.0 VDC
10. Mode level at the servo mode	6.2 ± 0.2 VDC
11. Tube temperature set point	338° K ± 8° K (determined during the thermal test)
12. Tube temperature	343° K ± 9° K
13. Servo drive	1.5 - 10 VDC
14. Amplitude noise (RMS 30 Hz to 30 MHz)	< 1.0%
15. Frequency stability	< ± 1 MHz/sec < ± 3 MHz/min < ±10 MHz/24 hrs
16. Input voltage	11 - 13 VDC
17. Power consumption	
Heat	< 30 Watt
Servo @ 70° F	< 20 Watt

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### Environmental

18. Temperature range	+ 65° F to + 82° F + 18.5° C to + 27.5° C
19. Humidity	0 - 90% (non-condensing)
20. Altitude	0 - 3000 meters
21. Shock	none
22. Weight	< 4.5 Lb < 2.0 Kg

### Environmental

### Non-operation condition

1. Temperature range	- 40° F to + 100° F - 40° C to + 38° C
2. Humidity	0 - 100% (non-condensing)
3. Altitude	0 - ∞ meters
4. Shock	none

### Plasma tube specification 0.9 mW Long HeNe Laser

1. Model	T890 DI
2. Manufacturer	Zygo
3. Power drift over 8 hours period	±10% peak to peak
4. Beam diameter	0.63 ± 0.02 mm @ 1/e <sup>2</sup> point
5. Beam divergence	1.29 ± 0.05 mrad
6. Spatial mode	TEM <sub>00</sub>
7. Tube life time	20,000 hours minimum >30,000 hours typical

## Appendix B: Warranty

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TELETRAC, INC. warrants that all TELETRAC products and equipment quoted or furnished to Buyer shall be designed and manufactured to conform with specifications and all parts are and will be free from defects in material and workmanship for a period of twelve (12) months from date of shipment, unless specifically exempted from this warranty.

During the warranty period, TELETRAC's liability is limited to replacing, repairing or issuing credit for any product that is returned to TELETRAC by the original purchaser freight prepaid and which upon inspection is determined by TELETRAC to be defective in materials or workmanship. The provisions of this warranty shall not apply to any TELETRAC product which has been subjected to misuse, improper operating conditions, machine setup, or which has been repaired or altered. Seller makes no warranty that its products are fit for the use or purpose to which they may be put by the buyer, whether or not such use or purpose has been disclosed to the seller in specifications or drawings previously or subsequently provided seller, and whether or not seller's products are specifically designed and/or manufactured for this purpose.

THIS WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, EXPRESS, IMPLIED, OR STATUTORY, OR OTHERWISE CREATED UNDER APPLICABLE LAW INCLUDING, BUT NOT LIMITED TO, THE WARRANTY OF MERCHANTABILITY AND THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL TELETRAC BE LIABLE FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING LOSS OF PROFITS, WHETHER OR NOT CAUSED BY OR RESULTING FROM THE NEGLIGENCE OF TELETRAC, UNLESS SPECIFICALLY PROVIDED HEREIN. This warranty shall not apply to the portions of the equipment not manufactured by TELETRAC, INC. TELETRAC shall assign to buyer such warranties as TELETRAC shall receive from the seller of such portions of the equipment which are manufactured by suppliers other than TELETRAC.

Upon written request, custom design work performed by TELETRAC will be subject to engineering charges. TELETRAC will retain all copyright and other proprietary rights to the product and any additional custom work. The purchaser shall respect the rights of TELETRAC and shall take measures to prevent unauthorized disclosure of information relating to the product and any additional custom design work. TELETRAC shall retain all proprietary rights and shall have the right and authority to use, sell, market research, and utilize for any other purpose at its sole discretion said product and custom design work without notification or any liability whatsoever, including but not limited to monetary remuneration, to the purchaser.

### **Product Return Procedure**

Claims for shipment damage (evident or concealed) must be filed with the carrier by the buyer. TELETRAC must be notified within (10) days of shipment of incorrect materials. No product may be returned, whether in warranty or out of warranty, without first obtaining approval from TELETRAC. No credit will be given nor repairs made for products returned without such approval. Any returned product(s) must be accompanied by a Return Authorization Number. The Return Authorization Number may be obtained by calling the TELETRAC customer service department. Products must be returned, prepaid, to the TELETRAC facility (no C.O.D. or Collect Freight accepted). The status of any product returned later than (10) days after the issuance of a return authorization number will be subject to review.

### **Warranty Determination of Returned Products**

Following TELETRAC's examination, warranty or out-of-warranty status will be determined. If upon TELETRAC's examination a warranted defect exists, then the product(s) will be repaired at no charge and shipped, prepaid, back to the buyer. If the buyer desires an air freight return, the product(s) will be shipped collect. Warranty repairs do not extend the original warranty period.

### **Non-Warranty Determination of Returned Products**

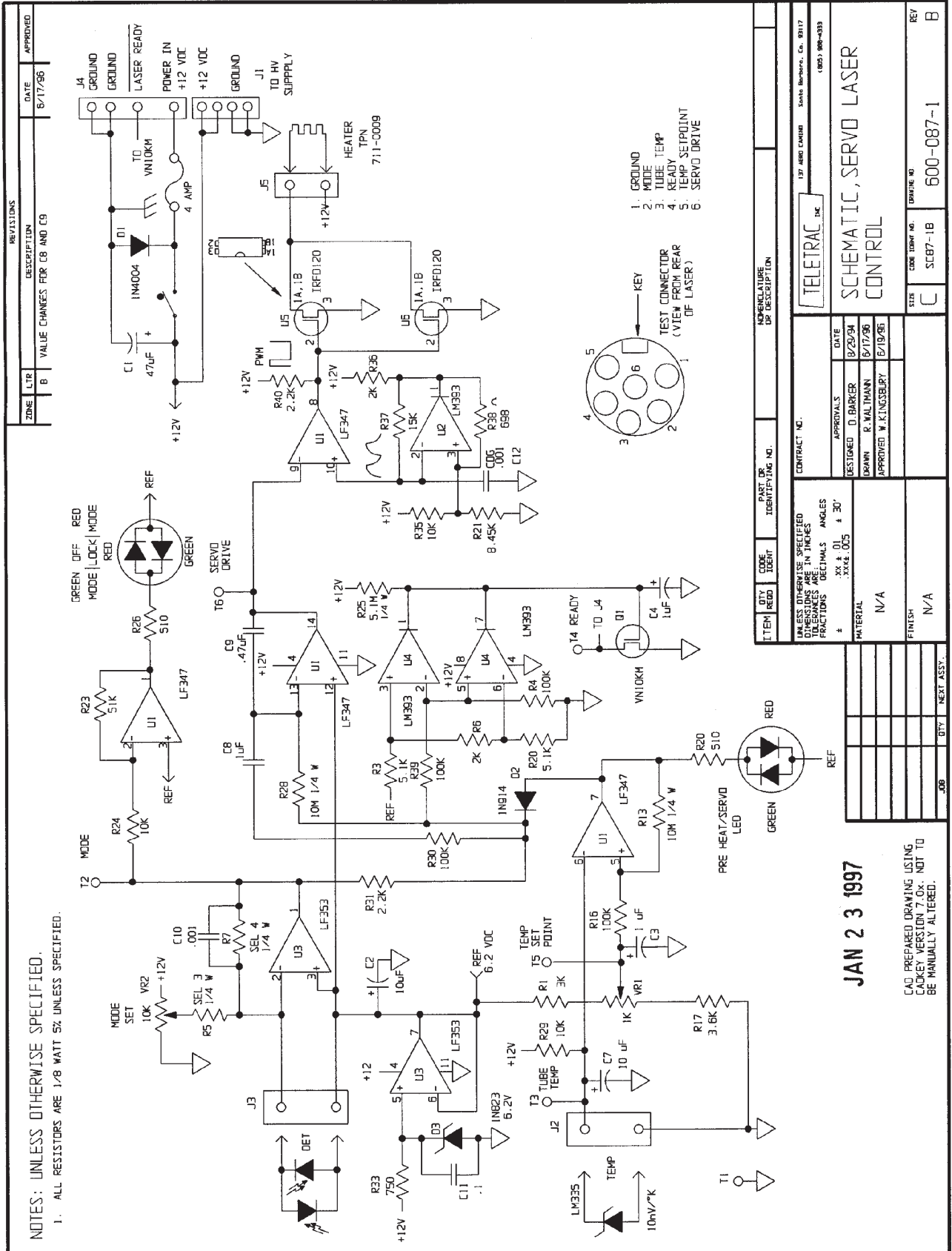
Following TELETRAC's examination, the buyer shall be notified of the repair cost. At such time the buyer must issue a valid purchase order to cover the cost of the repair and freight, or authorize the product(s) to be shipped back as is, at the buyer's expense. Failure to issue a purchase order number or approval within (10) days of notification will result in the product(s) being returned as is, at the buyer's expense. Repair work is warranted for (90) days from date of shipment. TELETRAC manufactured replacement parts are warranted for one year from date of shipment. Commercial replacement part warranties will be those assigned by the original equipment manufacturer.

### **Field Service Policy:**

If a TELETRAC product or system cannot be made functional by telephone assistance or by sending and having the customer install replacement parts, and cannot be returned to the TELETRAC facility for repair, and if TELETRAC determines the problem could be warranty-related, then the following policy applies: TELETRAC will provide an on-site Field Service Representative in a reasonable amount of time, provided that the customer issues a valid purchase order to TELETRAC covering all transportation and subsistence costs and the prevailing cost per hour (eight hour minimum) including travel time necessary to complete the repair, regardless of warranty determination. If the TELETRAC Field Service Representative determines during the on-site repair that the system or unit's problem is not warranty-related, then the prevailing service charge per hour (eight-hour minimum) shall be assessed against the issued purchase order.

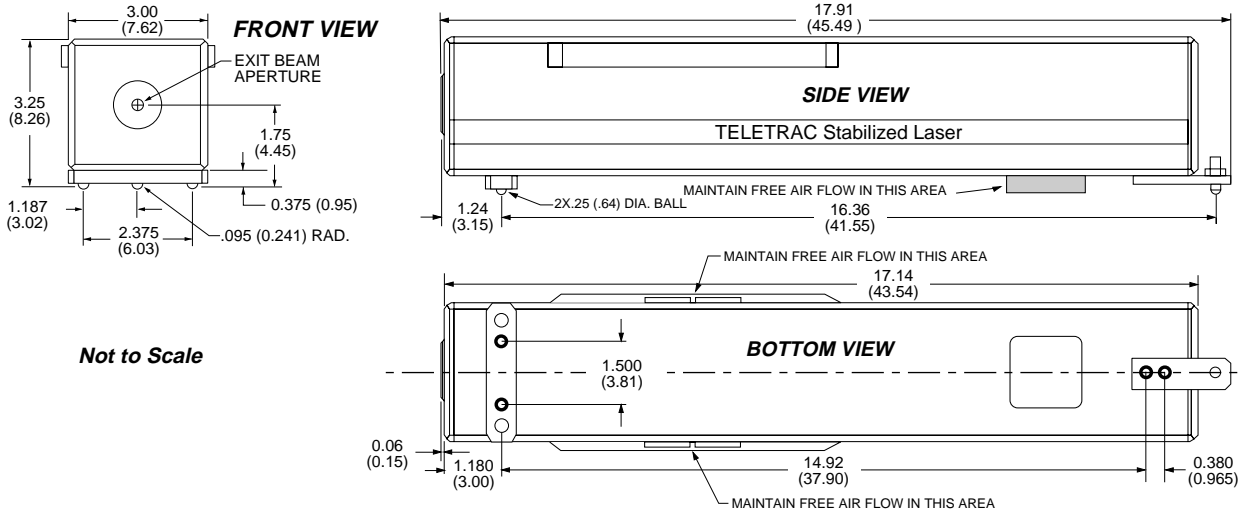
TELETRAC, INC. 137 Aero Camino Santa Barbara, California 93117

# Schematic Drawing



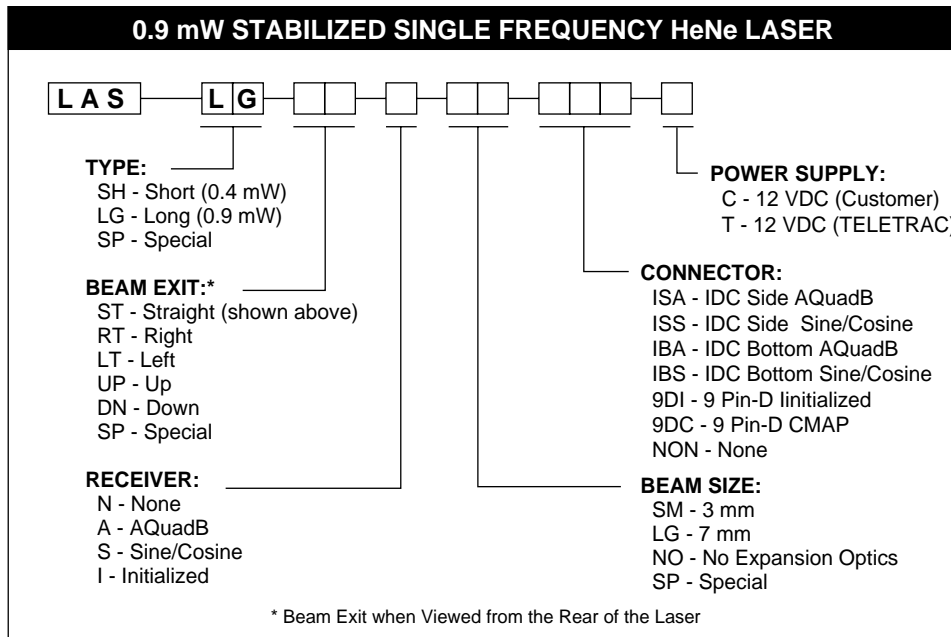
# Dimensional Drawing and Specification Guide

## 0.9 mW Stabilized Single Frequency HeNe Laser



Not to Scale

Dimensions in inches (cm)



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Santa Barbara, California 93117-3101  
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Pantech Industrial Complex  
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65 773 0256 FAX

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Managing Director  
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