SECTION FIVE: INSTALLATION

Installation

Installation consists of performing the following:

- Determine laser head heat sink requirements and install heat sink.
- Interconnect system components.
- Set up the system for the desired mode of operation.
- Connect the system to a power source.

The above tasks are described in the following paragraphs. After performing all of the above tasks, the laser can be turned on and operated in accordance with the section titled, Operation.

Do not operate the system without a heat sink installed on the laser head.

Do not turn on the system without the laser head pump fiber properly installed inside the power supply.

Heat Sink Requirements

Laser Head

The Compass 1064 are OEM products for integration only. Before the laser is turned on the laser head must be equipped with an appropriate heat sink. Heat sinks are optionally available. Use thermal paste to enhance the contact between the laser head base plate and the heat sink.

Table 5-1 is based on a coolant temperature of ambient air or liquid of 35°C or less.

Table 5-1. Heat Sink Requirements

LASER MODEL COMPASS	MAXIMUM BASE PLATE TEMPERATURE	MAXIMUM HEAT DISSIPATION	RECOMMENDED THERMAL IMPEDANCE OF HEAT SINK
1064-2500 MN	45	60 W	0.25°C/W
1064-4000 M	45	60 W	0.25°C/W
For assistance in thermal management and other system integration issues, please contact our technical support group.			

Power Supply

The laser diodes are mounted within the power supply on a heat sink. Cooling fans transfer heat from the heat sink to the outside of the unit. If the power supply is mounted inside of a separate enclosure, the enclosure should be ventilated to prevent heat build-up which could interfere with power supply cooling. Otherwise, the laser system will overheat and shut down in a matter of seconds.

Interconnections

To assist in establishing the physical location of the laser system components, dimensions of the laser head and the power supply is shown in Figure 5-2 and Figure 5-3.

To prevent surge currents, do not apply power to the laser system until all connections have been completed.

1. Connect the laser system as shown on Figure 5-1.

   If the laser is delivered with either the optional heat sink, fan, or external electromechanical beam shutter (EMBS) the electrical cable to the laser head has three connectors, for the laser head, the fan, and the EMBS respectively.

   Do not connect the laser system to any power source until all connections have been made.

To prevent damage to the fiber ensure that the minimum bend radius of the fiber is 100 mm.

2. Remove the protective cover from the laser head output window.
3. Ensure a shorting jumper is installed across the interlock connector or connect an external interlock as described below.

The laser uses hazardous AC and DC voltages inside the power supply enclosure. Ensure the power supply is disconnected from facility prior to performing the following procedures.

Laser diodes are sensitive to electrostatic discharge. Take appropriate measures such as wearing a personal grounding strap to avoid electrostatic discharge.

4. Ensure the laser power cord is not connected to facility power.
5. Loosen the two captive screws on the bottom of the front panel (Figure 3-3, item 12).
6. Rotate the front panel up as shown on Figure 4-1, item 6.
7. Pull the heat sink handle hinge (Figure 4-2) forward to release it from the heat sink.
8. Pull the handle down to release the upper catch (Figure 4-3). The protruding short end of the handle should be positioned in front of the lower frame as shown on Figure 4-3).
9. Remove the screw (Figure 4-3) securing the heat sink.
10. Use the handle as a lever to slide the heat sink forward by pulling the top of the handle down (Figure 4-4).
11. Slide the heat sink forward from the power supply housing until reaching a hard stop (about 27 cm).
12. Remove the protective cap over the laser diode assembly opening and store it in the box on the back of the front panel.
13. Connect the fiber optic cable as follows:

The end of the fiber optic cable constitutes an optical surface. Do not allow the end of the fiber optic cable to contact any surface, especially during insertion. Minimize exposure to the environment. The protective plastic cap should be left in place until the connection is made.

To avoid damage to the fiber optic cable, do not hold the fiber optic cable by the cable while removing the plastic cap.

a. Hold the fiber optic cable by the connector. Remove the protective plastic caps from the laser diode assembly and from the fiber optic cable and store it in the box on the back of the front panel.

Do not install a contaminated or damaged fiber optic cable. Doing so will cause a failure of the laser system. Contamination or damage can be difficult to detect. A magnifier will be helpful during examination.

b. Inspect the end of the fiber optic cable. A magnifier can be useful. If any contamination is noted, clean the optical surface using the cleaning procedures located in this section.

c. Put protective plastic cap on fiber optic cable again.

d. Feed fiber optic cable through the fiber optic cable input hole (Figure 3-4, item 12).

e. Remove protective plastic cap from fiber optic cable.

In the next step, do not allow the end of the fiber optic cable to contact the diode laser assembly. Failure to do so can damage the optical surface.

f. Carefully insert the fiber optic cable into the laser diode assembly.

In the next step, do not allow the cable to rotate while tightening the connector.

g. Finger tighten the connector. Tighten the union nut only slightly with a 5/16 inch (8 mm) wrench.

In the next step, do not allow the fiber to sag as it can break when the heat sink is pushed back.

14. Push the heat sink (firmly) back into the power supply. The 15 pin sub-D connector and two pin power connectors on the rear of the laser diode assembly mate when the heat sink is reinserted and the two screws are firmly seated.
15. Install the screw on the bottom of the heat sink front side. Ensure that the screw is firmly tightened to ensure the connectors on the rear side are firmly mated.
16. Close the front cover and tighten the two screws at the bottom front panel.
17. If an external control/monitoring circuit will be used, refer to Table 5-2 and Table 5-3 for a list of signals at the QS and LD I/O interface connectors.

    If an external computer (PC) will be used, refer to Table 3-1 for a list of commands and queries.
18. In Section Three, Operation, refer to the paragraph titled, Operating Mode, for the initial setup and refer to the paragraph titled, Daily Turn-On, to turn the system On.

External Interlock

The system will not operate with the interlock open. An INTERLOCK connector is located on the power supply rear panel (Figure 3-4, item 11).

An external interlock circuit can be connected to the laser system and wired to a door switch to provide additional operating safety. When the door is opened, the laser will shut down. The laser power must be cycled off, then on again to restart the laser.

To incorporate an external safety interlock circuit into the laser system, turn off the laser and remove the jumper from the INTERLOCK connector on the power supply rear panel. Attach a user furnished external interlock circuit to this connector. Any external interlock circuit should be equivalent to a mechanical closure of the circuit.

Digital Interface

The Compass 1064-2500 MN and -4000 M is equipped with an RS-232 interface for computer control of various laser functions. Refer to Section Three, Operation, for additional information on the

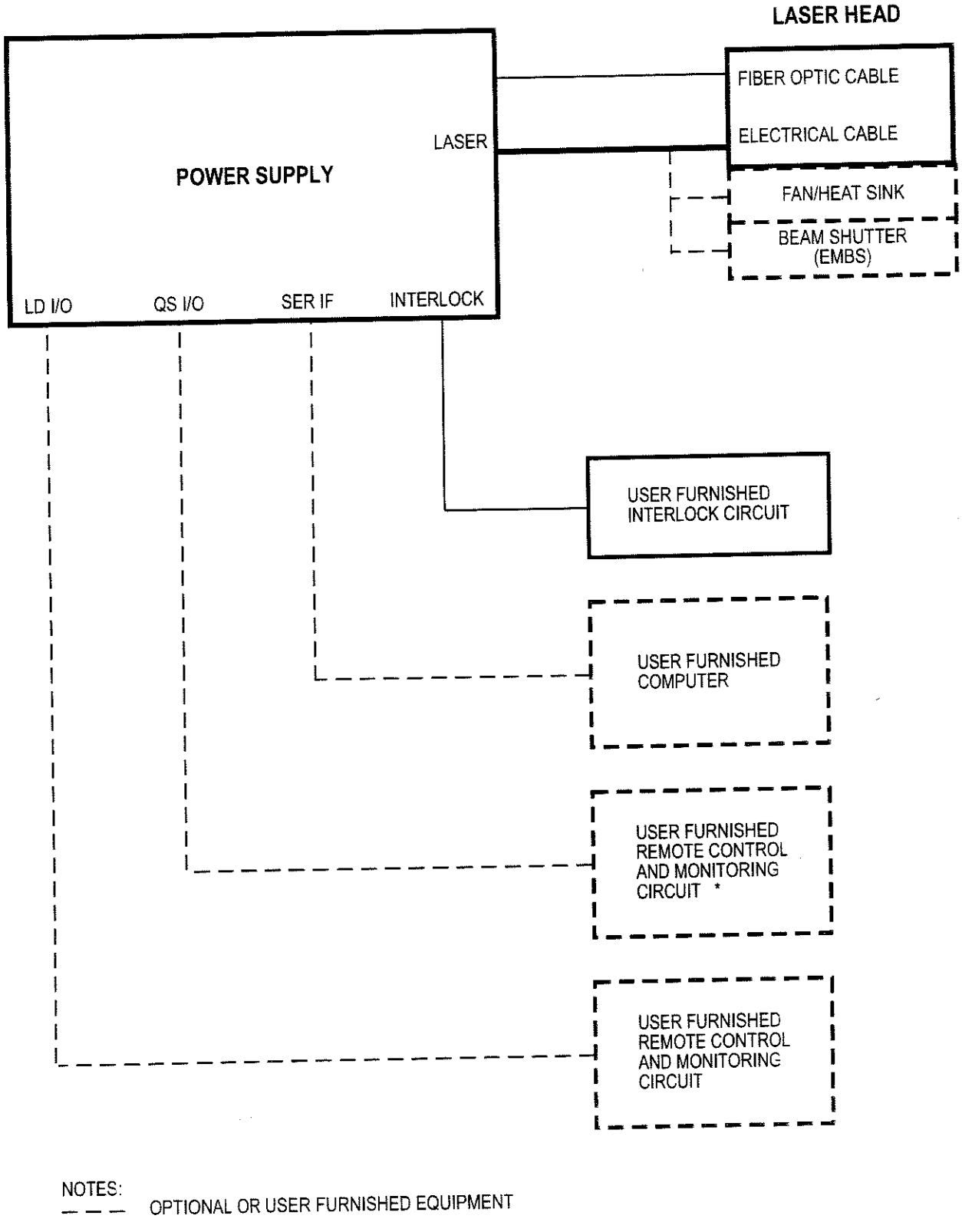


Figure 5-1. Interconnection Diagram

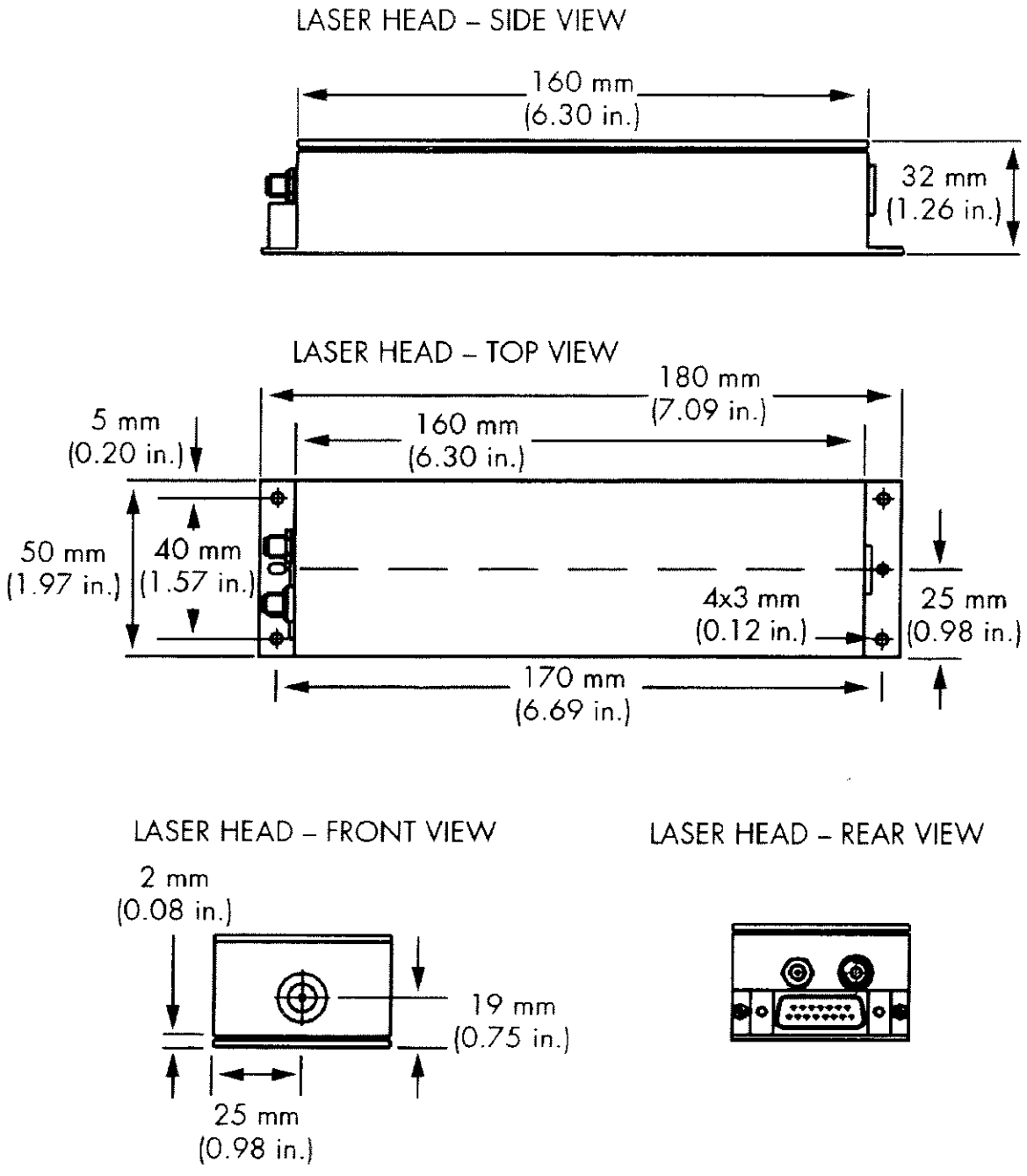
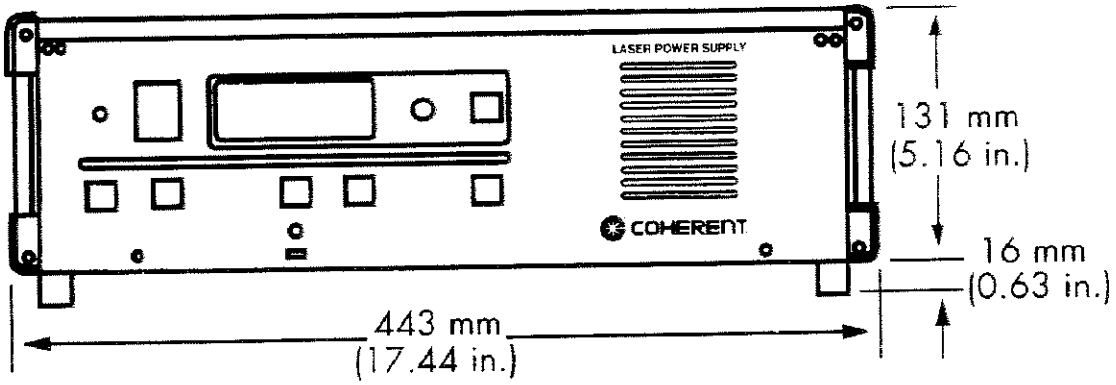


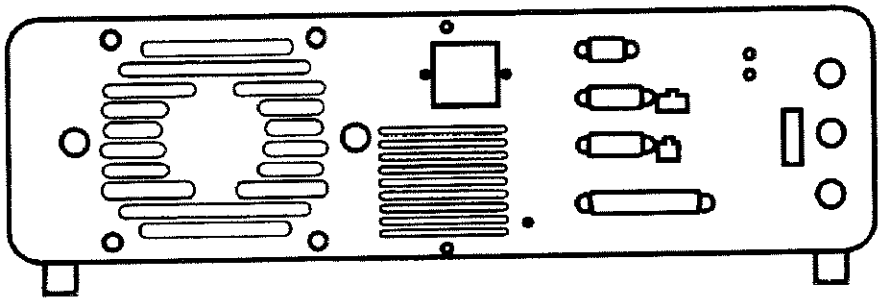
Figure 5-2. Laser Head Dimensions

communication and command syntax. Refer to Table 3-1 for a list of commands and queries. Figure 5-1 and Figure 5-4 illustrates the interconnection for the computer.

POWER SUPPLY – FRONT VIEW



POWER SUPPLY – REAR VIEW



POWER SUPPLY – SIDE VIEW

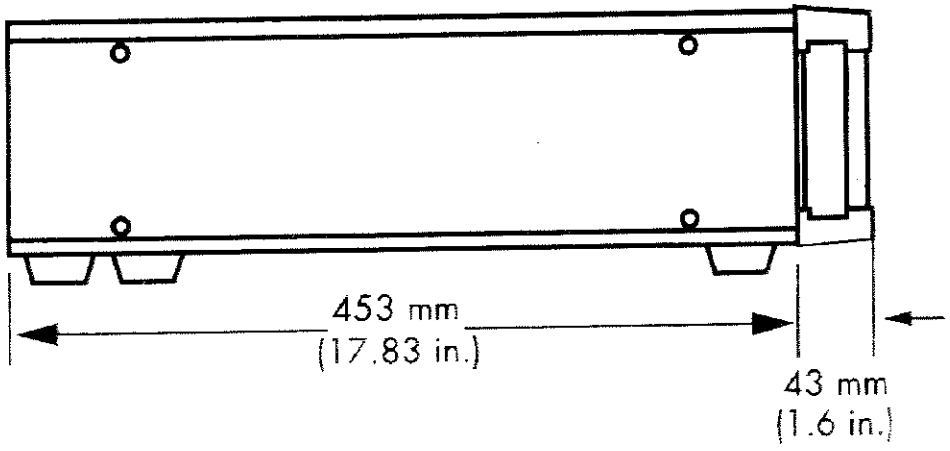


Figure 5-3. Power Supply Dimensions

Table 5-2. Laser Diode Input/Output (LD I/O) Connector Interface

PIN	FUNCTION	DESCRIPTION
1	Ground	
2	Set-point temperature of LD 2	Analog output 0 to 5 V, (slope calibration: -50 mV/°C, 2.5 V ≈ 25°C)[1]
3	Actual temperature of LD 2	Refer to pin 2
4	--- ---	Reserved for future extensions
5	Pump module plate temperature	Indicates pump module plate temperature. Analog output 0 to 5 V (slope calibration: -50 mV/°C, 2.5 V ≈ 25°C)
6	Laser output power	Outputs an analog signal corresponding to the output power of the laser. Analog output: 0 to 2 V. Calibration: see Table 5-3.
7	Actual temperature of resonator	Analog output 0 to 5 V (slope calibration: -50 mV/°C, 2.5 V ≈ 25°C)
8	Set-point temperature of resonator	Used for factory temperature set and troubleshooting. Refer to pin 7[1]
9	Drive current of LDs	Outputs an analog signal that directly follows the current of the diode laser. Analog output calibration: 1 V/10 A
10	Laser reset	Outputs a signal of 5 V (10 kΩ pull up resistor). A momentary short circuit (10 ms) from pin 10 to ground (pin 1) resets the laser. Note that a time delay of several seconds occurs between reset to laser ON and emission of laser radiation.

Laser safety regulations require that the laser reset must be manually activated for a class 4 laser. TTL input, short circuit (10 ms) to ground for reset

Please note: If a user furnished control device is used, all output signals from the laser power supply should be buffered by a high impedance (MΩ) input circuit. This is especially necessary for the temperature outputs on the LD I/O connector. By measuring with low impedance (<1MΩ) temperature set points can be significantly shifted and the laser might overheat. This may result in permanent damage.

[1] These pins may also be used as input (with approximately 4 kΩ impedance) to vary the set-point temperature. This option is not used under normal operation.

Table 5-2. Laser Diode Input/Output (LD I/O) Connector Interface (Continued)

PIN	FUNCTION	DESCRIPTION
11	--- ---	Reserved for future extensions
12	Actual temperature of LD 1	Refer to pin 2
13	Set-point temperature of LD 1	Refer to pin 2[1]
14	Laser diode power or current control	Controls the output power if the laser is in EXTernal mode (switch 10 PWRCTRL INT/EXT in position EXT). Analog input 0 to 5 V (from threshold to maximum current/power)
15	Laser ACTIVE/INACTIVE indicator	TTL output of the laser ACTIVE/STAND-BY status. After turn on, when the laser is not yet activated, this pin outputs 0 V while the laser is in stand-by. With the laser activated, this pin outputs 5 V, 0 V if inactive

Table 5-3. Calibration of Output Voltage of Pin 6 of the LD I/O Connector Laser Output Power

LASER MODEL COMPASS	CALIBRATION
1064-2500MN	2 W/V
1064-4000M	3 W/V
Note: The internal power detector is not a precise instrument. The output of pin 6 should be calibrated against an appropriate external power meter. Product Variances (PV) may have different calibrations.	

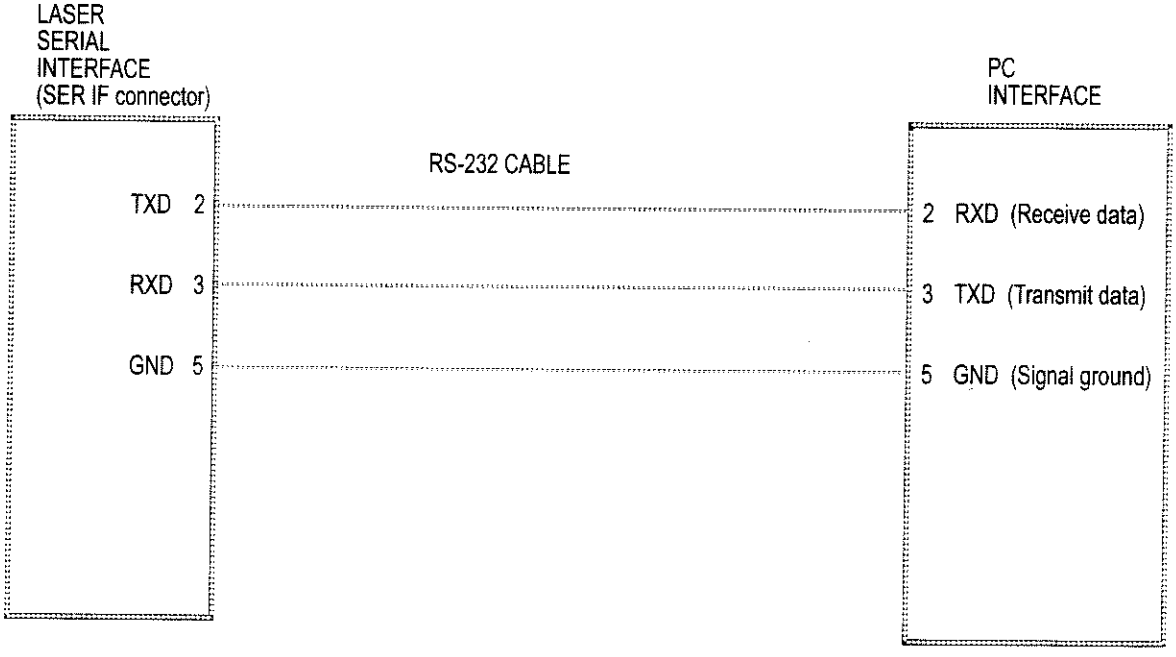
Serial Interface

A standard RS-232 cable (not included with the system) can be used to connect the laser interface to a personal computer or any adequate control device.

Configuration of the Serial Interface

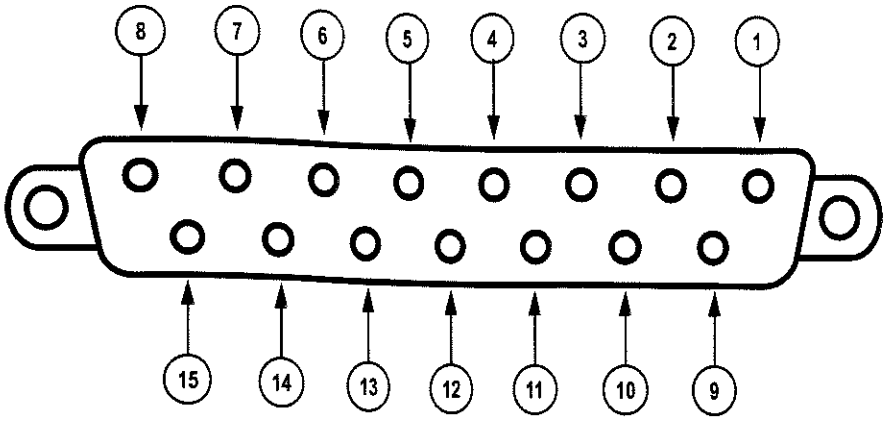
The settings of the laser's RS-232 serial interface are:

- 9600 baud
- no parity
- 8 data bits
- 1 stop bit



- Pins 4 and 6, and 7 and 8 are connected inside of the power supply to generate a hardware handshake signal for external devices.
- No further connections such as handshake signals are necessary for the laser serial interface.
- Refer to Figure 3-3, item 3 for location of the 9-pin sub D SER IF connector.

Figure 5-4. RS-232 Connections (SER IF Connector)



1. GND
2. Set-point temperature LD2
3. Actual temperature LD2
4. – –
5. Pump module plate temperature
6. Laser output power
7. Actual temperature of resonator
8. Set-point temperature of resonator (See Table 5-3)
9. Drive current of LDs
10. Laser reset
11. – –
12. Actual temperature LD1
13. Set-point temperature LD1
14. LD power or current control
15. Laser active/inactive indicator

Figure 5-5. LD I/O Connector (Female)