



**Red  
Patient Positioning Laser**

**Installation and Setup Manual**



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800131 REV C

This manual contains the latest information at the time of publication. Diacor, Inc. reserves the right to revise this manual without notice.

### **WARNING**

*The Diacor Centralite Model DLL Series Red Patient Positioning Laser uses the output of a laser as its source of visible light. While every precaution has been taken to make exposure to this light safe, serious injury to the eyes could occur if a person were to stare at the beam of output light. Please study Section 3, Laser Safety Considerations, before installing or operating the Diacor Centralite Model DLL Series Red Patient Positioning Laser.*

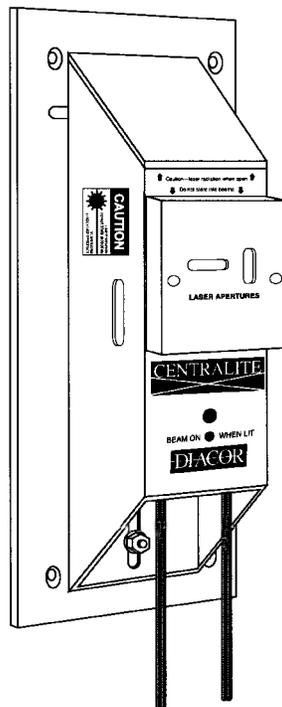
*Also be advised that a proper installation of the laser patient positioning system requires that the "Power On" indicating light turns on whenever power is applied to the laser light system. This light should be located near the system power switch.*

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DLL-2  
DLL-2M  
DLL-4  
DLL-4M

*Figure 1.1 Diacor Centralite Model DLL Series Red Patient Positioning Laser*



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**INTRODUCTION**

A laser isocenter-light system has become as fundamental a tool to the field of radiation oncology as the rotational isocentric treatment machine that it complements. The task of an isocenter-light system is simple. An array of laser beams must be converted into sharply focused orthogonal intersecting planes of light that can be adjusted to be coaxial with the radiation beam central axis in the vertical and horizontal positions. Ideally, this task should be performed with optimal simplicity, low cost, and ease of installation, adjustment, and maintenance—all without compromising position stability.

These requirements form the design criteria of the Diacor, Inc. Centralite family of Patient Positioning Laser Lights (see figure 1.1). These instruments are reasonably priced, and they are designed specifically to be easy to install and adjust, to maintain their adjustment with excellent stability, and to be repaired quickly at minimum cost.

A complete Centralite system typically included four units, two mounted on the side walls, one on the ceiling, and one high on the wall facing the base of the treatment couch (the latter is referred to as the sagittal unit). Two orthogonal fan-shaped beams are produced by the sidewall and ceiling units. The sagittal unit produces a single fan-shaped beam. With this system, a patient can be repositioned on the couch for daily treatment by reference to skin markings.

The Centralite family of patient positioning laser lights includes models based on solid-state laser diodes (DLL series). The side-wall and ceiling units in the DLL series contain two diode laser assemblies. The DLL series sagittal unit contains a single diode laser assembly. To produce the desired fan-shaped beam, the beam generated by each diode laser passes through a cylindrical lens that is an integral part of the diode laser assembly.



**GENERAL DESCRIPTION****2.1 GENERAL**

This section contains a brief description of the Diacor Centralite diode laser (DLL Series) patient positioning lights, which include the following:

***Diode Laser Units***

DLL-2	Manual compact side-wall or ceiling unit
DLL-4	Manual compact sagittal unit
DLL-2M	Motorized compact side-wall or ceiling unit
DLL-4M	Motorized compact sagittal unit

The laser assembly used in DLL units is the Melles Griot ElectroOptics P/N 9068-01009. This laser operates within the limits established by Federal Regulations for Class II lasers.

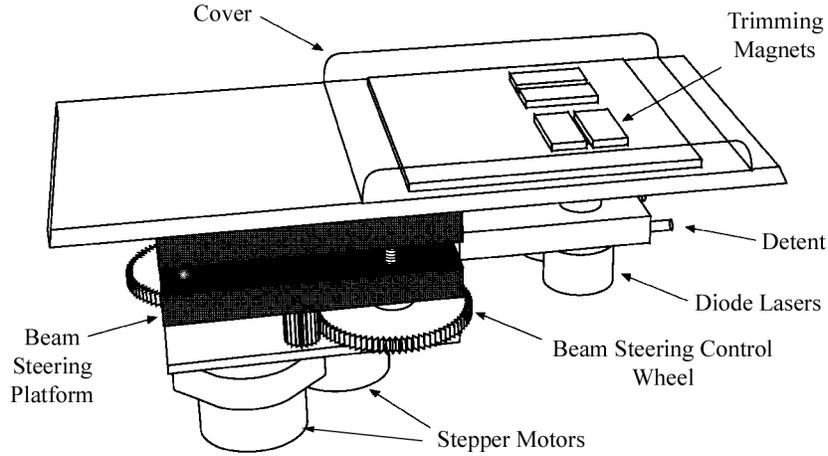
The laser assemblies used in Centralite units produce a very intense, highly collimated beam of red light that is not harmful unless it is allowed to dwell on the retina of the eye. Nevertheless, a potential hazard exists because the light beam is extremely localized. Therefore, a person who looks into the beam will not experience the natural protective mechanism of a sensation of discomfort typically experienced when staring into a very bright light.

The potential hazard associated with all Class II lasers is minimized in Centralite units because the beams that exit from the laser assemblies are spread into two fan beams, which markedly dissipates beam energy. However, please carefully read the information on laser safety provided in Section 3 before installing or operating your Centralite units.

**2.2 DIODE LASER MODELS (DLL SERIES)**

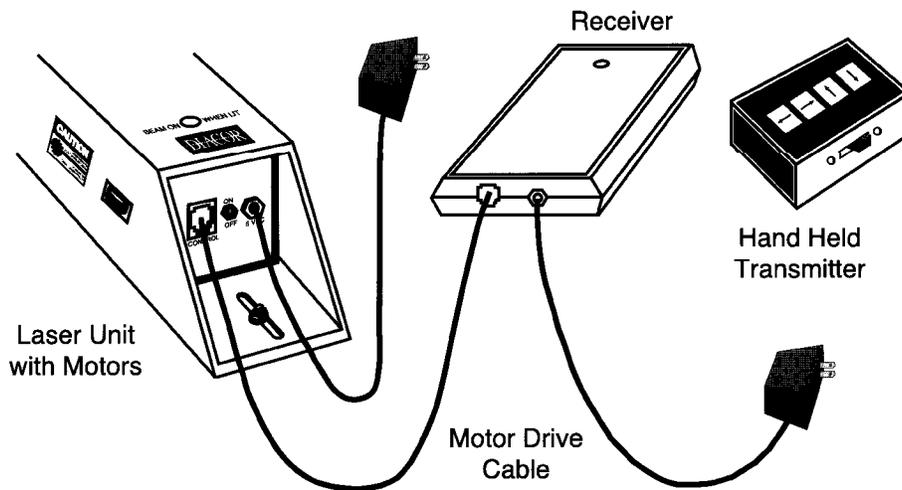
The major functional elements that make up the beam generation and projection system in Centralite DLL side-wall and ceiling units includes two solid-state diode laser assemblies, a beam steering platform and two beam steering platform adjustment wheels (drive gears) (see figure 2.1). These components are mounted in a compact painted aluminum case. In manual (non-motorized) units, movement of the beam steering platform is controlled by manually rotating the adjustment wheels.

The beam generation and projection system for motorized side-wall and ceiling units also

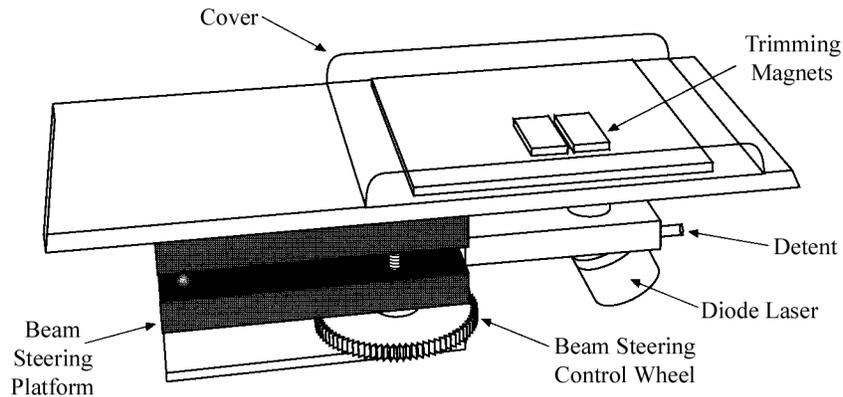


**Figure 2.1 Centralite Motorized Red Diode Laser Unit Major Elements**

includes a pair of stepper motors that drive the adjustment wheels, a gear mounted on the motor support plate (shown in figure 2.1), a hand-held, battery-powered transmitter unit, and a receiver unit that is mounted near the Centralite unit (see figure 2.2). These components allow remote control of beam movement. The transmitter is used to generate movement commands that are transmitted to the receiver, which is connected to the stepper motors in the Centralite unit by a cable. The stepper motors drive the beam steering platform adjustment wheels to achieve positioning of the beam steering platform and the associated laser beams.



**Figure 2.2 Motorized Centralite Unit with Transmitter and Receiver**



**Figure 2.3 Centralite Sagittal Diode Laser Unit Elements (Manual Adjustment)**

The DLL sagittal unit (figure 2.3) includes a single diode laser assembly and beam steering platform adjustment wheel and, in motorized units, a single stepper motor.

Trimming magnets control the length of the output laser lines. They attach to a small magnet metal plate that rests on the laser housing under the cover and over the output apertures of the lasers. The position of the magnets determines the length of the output lines.

### **2.2.1 Diode Laser Assembly**

The Melles Griot diode laser assembly is a self-contained unit that requires no modification for mounting in the Centralite case. DLL side-wall and ceiling units have two diode laser assemblies, one to generate each of the two orthogonal beams, and the sagittal unit has a single diode laser assembly. The diode laser assembly housing contains electronics to power condition the diode laser, the diode laser itself, focusing lenses and a cylindrical lens that converts the collimated beam generated by the laser into a fan-shaped beam.

The two diode laser assemblies in the Centralite side-wall and ceiling units are identical and are mounted so that the beams produced by the two lasers are oriented at 90 degrees to each other. These assemblies are mounted through two holes in a mounting bracket attached to the beam steering platform. A spring-loaded detent presses against the barrel of each diode laser assembly and provides enough force to hold the assembly securely in the orientation to which it has been adjusted.

The holding load generated by the detent is low enough to allow the orientation of the diodes to be adjusted if necessary to make the two beams orthogonal to each other. A small adjustment handle is clamped securely to the barrel of the diode laser assembly. Thus, you can adjust the orientation of the diode laser simply by moving the handle to rotate the laser in one direction or the other.

## CAUTION

*The detent that holds the diode laser in the diode holder is adjusted at the factory to provide the proper force against the diode laser barrel. Do not attempt to adjust this detent. Adjusting the detent too tightly may cause damage to the diode laser assembly.*

***Note:** Beam orthogonality should be adjusted during the initial installation and setup. No further adjustment should be necessary.*

The sagittal unit uses only one laser assembly, and provides a beam coplanar with the beam generated by the overhead laser that bisects the patient from nose to toe. The beam generated by the sagittal unit is angled down towards the treatment couch, as this laser is typically mounted fairly high on the wall at the foot of the patient table.

### **2.2.2 Beam Steering Assembly - Manual Units**

For accurate patient positioning, it is important that the laser beams always be aimed at an exact point in space called isocenter. To accomplish this, the laser beams must be checked on a regular basis against this known target position, and adjusted if necessary. The function of the beam steering assembly is to make this adjustment as simple and straightforward as possible.

The diode laser assemblies are mounted on a bracket connected to the beam steering platform. The purpose of this platform is to allow precise positioning of the two beams (the vertical beam to be moved from side to side and the horizontal beam to be moved up and down). Orthogonality of the beams is not adjusted by the beam steering assembly, but rather by using the adjustment handle described in section 2.2.1.

The beam steering assembly includes two adjustment wheels, one for each laser beam. The adjustment wheels are accessible through the sides of the Centralite case, one on each side. When you rotate either adjustment wheel (fingertip pressure is all that is required), the associated beam is moved either side to side or up or down, as applicable. The adjustment wheel closest to the vertical beam moves the vertical beam from side to side. The other adjustment wheel moves the horizontal beam up or down. The two beam adjustments are nearly independent; i.e., adjusting one beam has minimal effect on the other beam. However, when you move one beam, it may be necessary to make a fine positional adjustment of the other beam.

***Note:** The adjustment wheels on motorized units cannot be rotated manually.*

### **2.2.3 Beam Steering Assembly - Motorized Units**

The beam steering assembly for motorized units includes the same beam steering platform and adjustment wheels described in section 2.2.2 for manual units. However, in motorized units, the adjustment wheels are driven by two stepper motors, one for each beam. In the motorized units, the internal resistance of the stepper motors and drive gears is such that the adjustment wheels cannot be rotated manually.

The beam positions for motorized units are adjusted by using the hand-held transmitter unit supplied with these units. This adjustment method is particularly useful when the Centralite units are mounted in the ceiling or in other locations that make it difficult to reach the units to adjust the beams manually. Use of the remote transmitter is also convenient in cases where an operator may wish to stand across the room from a Centralite unit and next to the target for the beams while adjusting the beams. In this position, the operator can see precisely the location of the beams relative to the target and make necessary adjustments without going back and forth across the room.

The transmitter unit has four buttons with arrows that indicate two directions for each of the two beams. When you press one of these buttons, the related beam moves in the direction indicated by the arrow. When you press and hold a directional button for more than 4 seconds, the rate of beam movement doubles. The transmitter unit also has a four position switch that allows you to select a specific Centralite unit for adjustment.

A separate receiver unit is provided for each Centralite unit. Switches on the receiver unit allow you to establish a unique code for each receiver. (See Appendix 1). Signals from the remote transmitter unit are received and decoded only by the selected receiver unit. An output signal cable from the receiver unit connects to the CONTROL connector on the Centralite unit (this connector is located at the bottom of the Centralite unit).

### **2.2.4 Power Requirements**

The DLL laser assembly and the transmitter and receivers supplied with motorized DLL units all operate on DC power. An AC-to-DC power converter that plugs directly into an adjacent AC electrical outlet is supplied with each DLL unit. The input cable from this power converter connects to the 5 VDC connector at the bottom of the Centralite unit.

An AC-to-DC power converter also is supplied with each receiver unit. Power for the transmitter unit is supplied by a standard 9 VDC battery mounted inside the unit.

## **2.3 LASER POWER SWITCH AND RADIATION INDICATOR**

The DLL series units have a power ON/OFF switch and a laser radiation emission indica-

tor (pilot light). The power ON/OFF switch on DLL units is located at the bottom of the Centralite unit. The pilot light on these units is an LED indicator that projects directly through a hole in the top of the laser assembly whenever DC power is applied to the laser assembly.

## **2.4 CENTRALITE CASE AND MOUNTING PLATE**

The functional elements that comprise the beam generation and projection system in all Centralite units are mounted in a small aluminum case that connects to a mounting plate. Both the case and the mounting plate are coated with chemically-resistant polyurethane paint. Dimensions of the case and mounting plate are as follows:

### ***Compact Diode Laser Units***

Case: 11.5 inches long, 3 inches wide, and 3 inches deep

Mounting plate: 13 inches long and 5.5 inches wide

Vertical adjustment slots are provided in the back plate of the Centralite case, and horizontal adjustment slots are provided in the mounting plate. Once the mounting plate has been installed, the nuts attaching the case to the mounting plate can be loosened to allow both horizontal and vertical positional adjustment of the case. The case and mounting plate have been designed in this manner to permit positional adjustment of the units after they have been installed (figure 4.2).

# LASER SAFETY CONSIDERATIONS

## 3.1 GENERAL

To help ensure safe operation of your Centralite system, please read this section carefully and follow the instructions and procedures provided in this manual before installing and operating the units. For most routine uses a sufficient “rule of thumb” is DO NOT STARE INTO BEAMS or other sources of bright light emanating from a Centralite unit. When alignment of the patient results in direct papillary impingement, the patient’s eyes should be protected. This consideration is particularly important for the ceiling unit. The following are required precautionary statements for Class II lasers.

### WARNING

*At all times during installation, operation, or adjustment of a Centralite unit, avoid possible eye exposure to laser or collateral radiation\* in excess of the accessible emission limits listed in the Federal Register, Volume 40, No. 148, July 31, 1975: Tables I-A, I-B, I-C, and III.*

\* Collateral radiation, as defined by the Bureau of Radiologic Health Laser Products Performance Stand, is “any electronic product radiation, except laser radiation, emitted by a laser product as a result of or necessary for the operation of a laser incorporated into that product.”

### WARNING

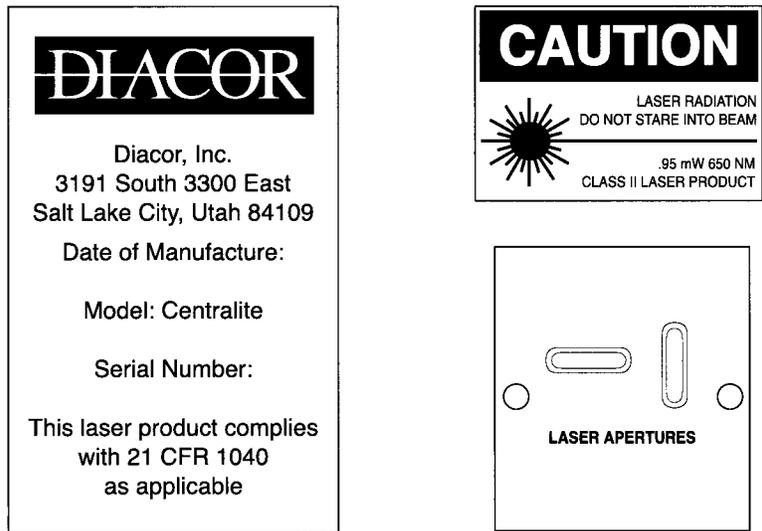
*The use of control or adjustments or the performance of procedures other than those specified in this manual may result in hazardous radiation exposure.*

## 3.2 REQUIRED LABELS

The labels on the case of the Centralite units comply with Federal regulations for laser products; these labels are shown in figures 3.1. In addition, the following statement is imprinted on the case of the Centralite lasers directly above the plastic cover plate mounted over the cylindrical lenses:

↑ **Caution — laser radiation when open** ↑  
↓ **Do not stare into beam** ↓

The labels on all Centralite units are *required* for compliance with Federal regulations. **Do not remove these labels.**



*Figure 3.1 Centralite DLL Series Labels*

**3.3 LASER SPECIFICATIONS**

Specifications for individual laser assemblies used in the Model DLL Series unit are provided in the following table:

	9068-01011
	Diode Laser
Input power (W)	0.6
Output power (mW)	0.48
Wavelength (NM)	650

**3.4 LASER SERVICING**

Centralite DLL units are not designed to allow the diode laser assemblies to be replaced separately by the user. The diode laser assembly and the associated beam steering assembly must be removed and replaced as a unit, as described in Section 6. To replace a defective diode laser assembly, contact Diacor, Inc. and obtain a Return Material Authorization (RMA) number and appropriate packing instructions for return of the beam steering and diode laser assemblies.

**3.5 PROTECTIVE EYE WEAR**

Protective eye wear is not necessary for typical applications where direct pupillary impingement by the beams is a random momentary event while moving about the room. Under atypical conditions requiring more protracted ocular exposure, protective eye wear or other protective procedures may be required. Consult the user standards of the American

National Standards Institute (ANSI), the Laser Institute of American, and/or the Occupational Safety and Health Act (OSHA) for guidance in this area.

### **3.6 COMPLIANCE**

The Centralite Model DLL Series units and the Melles Griot 9068-01011 diode laser comply with Title 21 of the United States Government CDRH Performance Standards, Chapter 1, Subchapter J, Section 1040, as applicable. These products are categorized as Class II.



## UNPACKING AND INSTALLATION

### 4.1 GENERAL

All Diacor Centralite units are designed to allow you to unpack and install the units yourself without special tools.

### 4.2 UNPACKING AND INSPECTION

When you order multiple Centralite lasers for the same installation, every effort is made to ship these lasers at the same time, unless you specify different arrangements. In addition, any special angle brackets or custom-made standoff platforms ordered for the Centralite lasers are shipped at the same time as the lasers. Use of the angle brackets and standoff platform is discussed further in section 4.5.6.

When you receive your lasers, inspect all shipping containers for evidence of physical damage before the shipper's agent leaves your premises. If there are any signs of damage, have the shipper's agent present during unpacking. If you observe any dents, scratches, or other evidence of physical damage to the laser(s), note the damage on the shipper's copy of the bill of lading and file a claim against the shipper.

If there are any shortages in your shipment or if any of the lasers malfunction, notify Diacor immediately to arrange for replacement or repair. Refer to section 6.4.2 for the discussion of replacement or repair of lasers under warranty. We recommend that you save all packing containers and materials for the Centralite laser in case one needs to be returned to Diacor for replacement or repair.

### 4.3 ELECTRICAL CONSIDERATIONS

The Centralite Model DLL series lasers can be connected to any standard 90-260 volt, 50-60 Hertz outlet. A double-insulated AC-to-DC power converter with USA standard two blade pins is supplied with each laser. Each power converter includes a 6 foot cord with a special plug that allows the cord to be connected to the 5 VDC connector at one end of the DLL series laser. Output power specifications for the AC-DC converters are as follows:

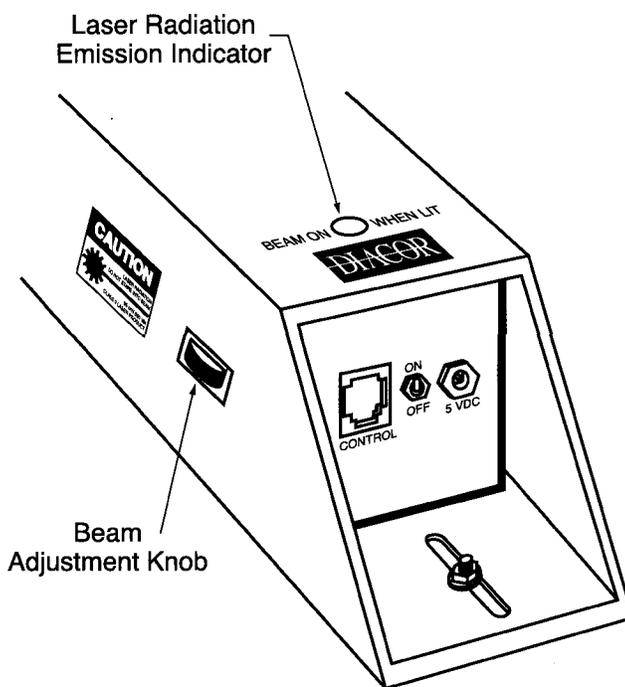
DLL series units: 5 VDC at 2.2 amperes

Receiver units: 12 VDC at 0.8 amperes

To optimize efficient use and to maximize the life of the laser, we recommend that it be left on only during normal working periods. Ideally, a separate electrical circuit should be provided for all Centralite lasers in the same system, and all outlets in that circuit should be controlled through a common switch.

A minimal warm-up period is required for DLL units; the diode laser assembly emits light immediately upon application of power. The laser assembly produces full power output in less than one minute following application of power.

The Centralite unit is certified to comply with Federal requirements for laser products, including the requirements for a light to indicate the “on” status of the laser and a switch to terminate laser emission. If you install this unit so that it is controlled by your own remote switch, then to maintain compliance with Federal requirements, the remote switch must be capable of turning the laser system “off” and must incorporate an indicator that will show when the laser is “on.” This arrangement allows the Centralite units to be operated independently of other equipment or lighting circuits in the same room. The lasers should be turned off during any extended period of inactivity such as at night or over weekends.



*Figure 4.1 Diacor Model DLL Series Control Panel*

#### 4.4 CHECKING BASIC OPERATION

We recommend that you check the basic operation of each laser before it is actually installed. The procedure for performing this check is as follows:

1. Set the power ON/OFF switch to position OFF (see figure 4.1).
2. Connect the AC-to-DC power converter to an appropriate power outlet and connect the cord from the converter to the laser assembly.

3. Set the power ON/OFF switch to position ON. The laser radiation emission indicator (figure 4.1) should light, and light beams should be emitted through the apertures in the protective plastic cylindrical lens cover. ***DO NOT STARE INTO THE BEAMS.***

4. Aim the beams at a light-colored, flat, perpendicular surface several meters away. The beams should form two lines of light that intersect at right angles near their midpoints. If this is not the case, the trimming magnets described in Section 2 or some other aspect of the alignment probably has been jarred during shipment. Realignment is simple and is described in Section 5.

## **4.5 INSTALLATION**

The Model DLL-2 or -2M laser may be mounted either horizontally or vertically. The Model DLL-4 or -4M sagittal laser should be mounted vertically as the single beam is directed downward 20 degrees from horizontal. The units should be mounted to the most stable surface available, preferably a concrete wall. If the units are to be installed in a simulator room that has lead-lined studded walls, mounting directly to the sheetrock should provide a sufficiently stable installation. However, it should be expected that more frequent adjustment of the beam-steering controls will be needed under such conditions.

For installations where the structural wall is covered by a sheetrock and frame wall, a custom-made standoff platform can be ordered to enable mounting to the structural wall. The standoff platform is discussed further in section 4.5.6.

The laser itself is designed to be used as an alignment tool for determining the mounting locations of any of the units. Tools required for installing a Centralite Model DLL series system are listed in section 4.5.1. Instructions for installing the system are provided in sections 4.5.2 through 4.5.9.

### **4.5.1 Tools Required**

9/64 inch hexagonal (Allen) wrench  
7/16 inch open-end wrench and nut driver  
Carpenter's level (or equivalent)  
Carpenter's square  
Plumb line  
Digital level, water level or transit (the first is preferable)

### **4.5.2 Clearance Requirements**

When installing the Centralite units, make sure there is enough clearance to allow removal of the laser assembly. Clearance requirements for the Model DLL series laser is 7 inches. When the units are mounted vertically, the clearance is required at the bottom of the units.

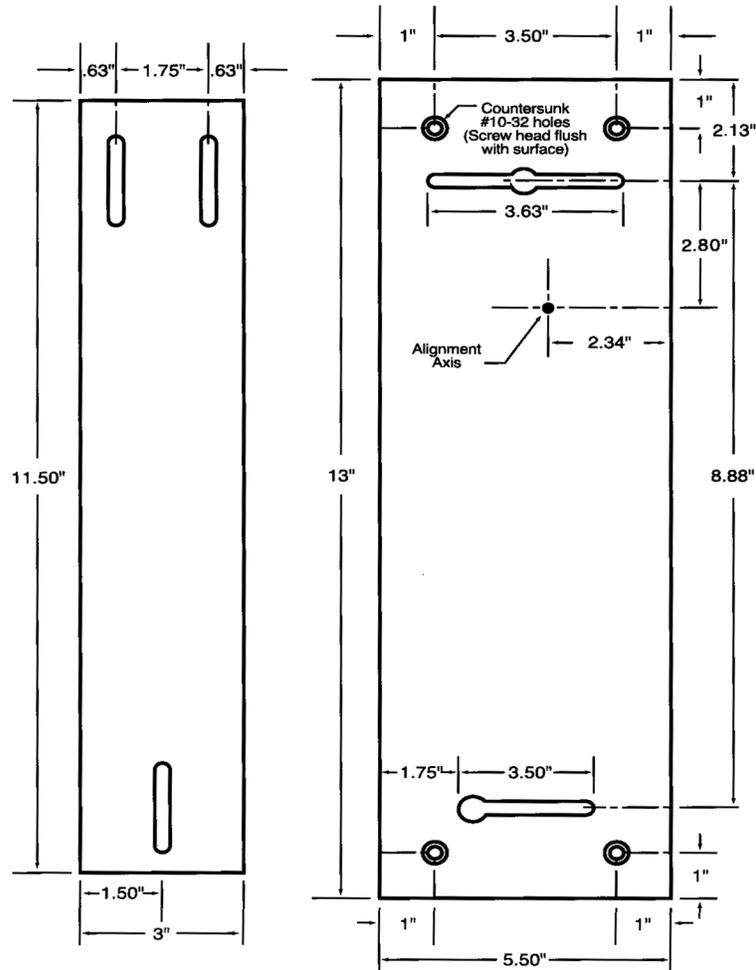
### **4.5.3 Determining the Mounting Location for Side-Wall Units**

1. Place a DLL-2 laser on its flat side on the treatment couch. This unit is commonly referred to as the aligning unit.
2. Rotate the machine gantry to the horizontal position. Optimally, horizontal should be defined by a precise level, digital or bubble.
3. Move the couch and the DLL-2 laser as far from the gantry as possible to provide the longest optical-alignment distance possible.
4. Align the intersection of the laser beams from the laser with the central axis of the field light.
5. Place a piece of paper between the laser beams and the field light and move the paper back and forth along the axis of the field light. Move the aligning Centralite unit and the vertical position of the couch to adjust the alignment when the paper is near the Centralite unit. Move the Centralite unit and the beam steering controls when the paper is near the gantry. Do not lean on the couch or otherwise disturb the position of the couch during this or any of the following steps.
6. When the alignment is coaxial, move the gantry out of the way.
7. The intersection of the laser beam lines on the wall indicates the point on the wall from which the beam axis should originate after the Centralite unit is installed. This also corresponds to the small alignment axis point on the mounting plate (see figure 4.2).
8. Proceed with section 4.5.7 before disturbing the aligning laser.

### **4.5.4 Determining the Mounting Location for the Ceiling Unit**

The location for the ceiling-mounted unit is established in a manner analogous to that described for the side-wall units.

1. Rotate the gantry to the overhead vertical position.
2. Hang a plumb line from near the gantry and watch the overlapping shadows on the floor. When the shadow of the plumb line is coincident with the shadow of the cross-hairs of the field light, the gantry is in a true vertical position.
3. Place the aligning Centralite unit on its back on the floor so that the intersection of the laser beam lines is again made coaxial with the field-light central axis in a manner similar to that described for the side-wall units.
4. Rotate the gantry out of the way. The proper mounting position for the ceiling unit is determined from the intersection of the laser lines on the ceiling.



**Figure 4.2 Model DLL Series Housing and Mounting Plate Dimensions**

5. Proceed with section 4.5.7 before disturbing the aligning laser.

#### **4.5.5 Determining the Mounting Location for the Sagittal Unit**

1. Place the aligning Centralite unit in the position used for finding the mounting position of one of the wall-mounted units (section 4.5.3).
2. Rotate the gantry into the overhead vertical position.
3. Place a carpenter's square along the side of the Centralite unit so that the right-angle arm of the square extends between the field light central axis and the body of the gantry. Do not disturb the position of the couch during this or any of the following steps.
4. Without moving the square, move the aligning Centralite unit to a position along the opposite arm of the square so that the beam from the vertical aperture slot passes through the central axis of the field light, is directed along the center of the couch, and strikes the wall at the foot of the couch. *Do not change the position of the beam steering controls.*
5. Drop a plumb line through the vertical laser line on the wall. The position of the plumb line defines the vertical plane through which the sagittal line should pass.
6. The sagittal unit should be mounted near the ceiling so that the vertical line emanating from the lower aperture passes through the plane of the plumb line. The DLL-4 or -4M unit points the beam downward as part of the design.

#### **4.5.6 Mounting Plate, Standoff Platform, and Angle Brackets**

The standard mounting plate is generally adequate for most installations. However, an optional standoff platform is available for mounting the unit to concrete under sheetrock. Because the standoff platform is custom made for each installation, you should order this platform when you order your Centralite units.

When you order a standoff platform, you must specify the distance between the structural wall and the outside surface of the sheetrock (the surface on which the Centralite unit is to be mounted). This distance determines the depth of the standoff platform.

Adjustable angle brackets also are available for use in installations where the wall is angled

with respect to the treatment couch. Vertical adjustment slots are provided in the back plate of the Centralite case and horizontal adjustment slots are provided in the mounting plate (see figure 4.2). After the mounting plate has been installed, the nuts attaching the case to the mounting plate can be loosened to allow both horizontal and vertical adjustment of the case. The case and mounting plate have been designed in this manner to permit fine adjustment of the position of the unit after it has been installed.

#### **4.5.7 Determining the Mounting Location for the Mounting Plate**

After you establish the locations of the origins of the laser beam axis, you then determine the locations for the mounting plates and attach the plates to the mounting surfaces. Ceiling units are generally mounted above a false ceiling. If you are using a standoff platform, attach the platform to the wall instead of the mounting plate (the plate connects to the platform). If the walls are not orthogonal with respect to the Centralite system, angle brackets may be required.

Unless the room was specifically designed with a non-orthogonal relationship to the machine, the walls are probably sufficiently close to orthogonal that angle brackets will not be required. The beam steering controls alone will be sufficient to compensate for any deviation from strictly right angle mounting.

If angle brackets are required for any of the units, the brackets must be connected between the DLL series case and the mounting plate. The mounting location of the plate is determined by the relationship between mounting plate, the angle brackets, and the laser case. For orthogonal relationships, proceed as follows:

1. Each mounting plate has a punch mark on the front surface that corresponds to the position of the laser-beam axis origin. Hold the plate against the wall or ceiling so that the aligning laser beams intersect on this punch mark.
2. Use a carpenters level to make sure the mounting plate is vertical and then mark the position of the mounting plate. For the ceiling laser, use the machine field light with the collimator angle set at an orthogonal position to define the angle of the mounting plate.

NOTE: Where angle brackets are required, proceed as follows using the assembled Centralite-mounting plate unit (if a standoff platform is being used, remove it from the mounting plate):

1. Plug in and turn on the unit to be mounted.

2. Hold the unit in the approximate mounting position and adjust the angle brackets and the mounting plate position so the emitted beams are coaxial with those of the aligning unit (the beam intersections should center in the apertures parallel to the housing for the DLL series units).
3. Use a carpenter's level to adjust the angle of the mounting plate and mark its position.

#### **4.5.8 Attaching the Mounting Plates**

The recommended method for attaching the mounting plates to any relatively smooth surface is to drill and tap a steel plate imbedded in the concrete or placed there specifically for installation of devices such as the Centralite units. Flat-head screws should be used to secure the mounting plate to the steel plate.

Alternatively, masonry anchors may be used if the steel plate is not available. Standoff washers also are used to prevent the mounting plate from bending against surface irregularities when the fasteners are tightened. If no standoff platform is needed and the mounting plate is to be mounted directly, the countersunk screw holes near the corners of the mounting plate may be used for the fasteners. You will need to drill holes in the standoff plate if a standoff is required and masonry anchors are used.

### **WARNING**

*Because of the uncertainties of application in specific installations, no guarantee of this method of attachment, or any other method, can be made by Diacor, Inc. Proper attachment of the ceiling laser is particularly important since dislodgment could cause injury to a patient or hospital personnel.*

### **WARNING**

*Do not use the Top Cover Plate on the ceiling unit as it could fall and cause injury.*

#### **4.5.9 Attaching the Centralite Unit to the Mounting Plate**

The following instructions assume that the Centralite unit used for determining the mounting location is still in place. If it is not, reposition it.

1. Insert the three special 1/4 inch flat-head mounting bolts in the slots of the mounting plate (two in the long slot and one in the short slot).

2. Place a flat washer over each bolt.
3. Position the Centralite unit on the mounting bolts.
4. Place a flat washer, locking washer and nut on each bolt and tighten each nut finger tight so that the Centralite unit can still be moved.
5. Position the Centralite unit so that the aligning laser beams intersect in the aperture nearest the end of the housing containing the beam-steering controls, and then tighten the mounting bolts to secure the unit in position. The most accurate method is to turn on the laser in the unit being mounted and align it so that the beams from the two units overlap.



# SECTION

# ADJUSTMENTS

# 5

## 5.1 GENERAL

Each Centralite laser is adjusted so that the beams and their intersecting midpoints are orthogonal with respect to the case before the unit is shipped from the factory. As part of the installation process, minor readjustment of the beam steering controls are necessary. However, other adjustments will probably not be necessary, unless changes occur during shipment. The position of the Centralite case on the mounting plate also is adjustable. Instructions for positioning the case on the mounting plate are provided in Section 4.

## 5.2 MODEL DLL SERIES DIODE RED LASER

Normally, only adjustment of the beam steering controls should be required on a regular basis to maintain precise alignment of the beam locations. Other adjustments such as beam orientation (beam orthogonality adjustment) and beam length (beam trimming magnets) are made at the factory. These adjustments may need to be performed during installation if changes occur during shipment, but should not be required during normal operation.

### 5.2.1 Beam Steering Controls

The beam steering controls provide a simple and convenient method of achieving precise positioning of the light planes. The beam steering assembly includes two beam steering adjustment wheels, one for each diode laser assembly (see figure 2.1). These adjustment wheels protrude through the side of the Centralite case, one on each side. On manual models, the adjustment wheels can be rotated with light fingertip force.

By rotating an adjustment wheel, the associated beam is moved either up or down or side to side, as applicable. The adjustment wheel closest to the horizontal beam moves that beam up and down. The other adjustment wheel moves the vertical beam from side to side. The two beam adjustments are nearly independent; that is, adjusting one beam has only a slight effect on the other beam.

In the motorized units, the adjustment wheels cannot be moved manually. Instead, the adjustment wheels are moved by internal stepper motors. The stepper motors are controlled by the receiver unit, which is mounted in close proximity to the Centralite unit. The receiver unit, in turn, receives its commands from the hand-held transmitter unit (refer to section 2.2.3 for further discussion of the transmitter and receiver units).

### 5.2.2 Adjusting Beam Orientation

The two diode laser assemblies in the Centralite side-wall and ceiling units are identical

and are mounted so that the two resultant beams are oriented at 90 degrees to each other. The two diode laser assemblies are mounted behind two holes in a mounting bracket that is connected to the beam steering platform. A spring-loaded detent presses against the barrel of each diode laser assembly. This detent provides enough force to hold the laser securely in the position to which it has been adjusted.

The holding load generated by the detent is low enough to allow the orientation of the diode laser to be adjusted as required to make the two beams orthogonal to each other. A small rotational adjustment knob is clamped securely to the barrel of the diode laser assembly. Thus, the diode laser orientation can be adjusted simply by turning the adjustment knob to rotate the diode laser in one direction or the other.

### **5.2.3 Adjusting Beam Length**

The length of the projected light planes can be adjusted approximately  $\pm 30$  degrees by means of two small permanent magnets (trimming magnets) mounted beneath the protective plastic cover plate (see figure 2.1). To gain access to the trimming magnets, remove the protective plastic cover plate.

The trimming magnets, which are held in position by magnetic force, control the length of the light plane by intersecting the edges of the beam. To shorten the length of the light plane, move the two magnets closer together; to increase the length of the light plane, move them farther apart.

# SECTION SERVICING

# 6

## 6.1 GENERAL

This section contains servicing information for the Diacor Centralite Model DLL series Red Diode patient positioning laser.

## 6.2 LASER ASSEMBLY FAILURE

Diode lasers are susceptible to static electricity and may cease to operate suddenly or may grow dimmer with time. If a failure is suspected, first check the power converter by exchanging it with another unit. If the laser assembly still does not function, replacement of the Diode Laser Assembly is required.

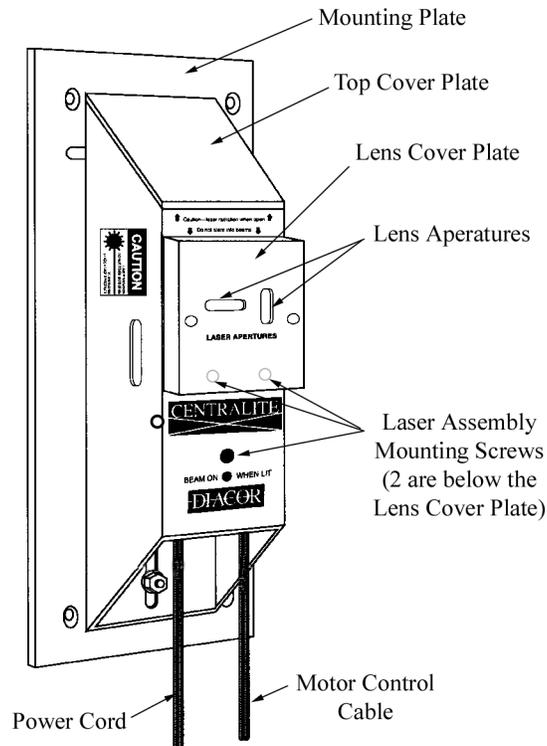
## 6.3 REMOVING AND REPLACING THE DIODE LASER ASSEMBLY

Centralite DLL units are designed to allow you to remove and replace the diode laser assembly and the beam steering assembly as a unit. To remove and replace these assemblies, there must be enough clearance at the bottom of the Centralite case, as described in section 4.5.2. If there is insufficient clearance, disconnect the Centralite case from the mounting plate before attempting to remove the diode laser assembly.

### 6.3.1 Removing the Diode Laser Assembly

1. Set the power ON/OFF switch to position OFF.
2. Disconnect the AC-to-DC power converter cable from the diode laser assembly.
3. Remove the plastic Lens Cover Plate (see figure 6.1).
4. Use a medium Phillips head screwdriver to remove two of the three laser assembly mounting screws. Use a 3/32 inch Allen wrench to remove the third screw. Before removing the last screw, support the laser assembly from the bottom with one hand to prevent the assembly from falling out the bottom of the case when the last screw is removed. When the two top mounting screws are removed, the beam trimming magnet support plate will no longer be attached to the case. Place the support plate and the trimming magnets in a safe storage place until the Diode Laser Assembly is to be reinstalled.
5. If the unit is to be returned to Diacor for repair, package the Diode Laser Assembly adequately to protect it from damage during shipment. Re-

fer to section 6.4.2 for instructions on returning items to Diacor.



*Figure 6.1 Model DLL Series*

### 6.3.2 Installing the Diode Laser Assembly

1. Hold the laser diode assembly at the bottom where the ON/OFF switch is located. Slide the assembly, laser end first, into the bottom of the Centralite case until the holes for the three laser assembly mounting screws (figure 6.1) in the laser assembly line up with the corresponding holes in the Centralite case.
2. Install the bottom laser assembly mounting screw to temporarily hold the assembly in position.
3. Position the beam trimmer magnet plate in position over the two upper laser assembly mounting screw holes and then install these two screws. Tighten all three screws.
4. Connect the control cable (if applicable) and the power converter cable.

5. Test the unit for proper operation, as described in section 4.4.

### **6.3.3 Realigning the Centralite Unit**

If the Centralite case has been removed from the mounting plate, follow the directions in Section 4 to reposition the Centralite unit so that the beams are properly aligned. In most cases, simple adjustment of the beam-steering controls is all that is necessary to realign the unit. If the beam orthogonality or beam length also need to be adjusted, follow the directions in sections 5.2.2 and 5.2.3, respectively.

## **6.4 WARRANTY**

The Centralite Model DLL series Red Diode Patient Positioning Laser and all the associated parts for these models are warranted by Diacor for a period of two (2) years from the date of shipment.

The Diacor warranty coverage is limited to defective materials or workmanship. The warranty is void if the Centralite unit has been damaged by accident, unreasonable or improper use, neglect, or other causes not arising out of defects in material or workmanship.

### **6.4.1 Warranty Disclaimers**

The express warranty provided herein is in lieu of any and all implied warranties arising out of the sale of the Centralite unit, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Diacor shall not be liable for loss of use of the Centralite unit or other incidental or consequential costs, expenses, or damages incurred by the customer or other user.

### **6.4.2 Warranty Performance**

During the stated warranty period, the Centralite unit assembly will be repaired or replaced, at the option of Diacor, Inc., with a new or reconditioned Centralite unit when the unit is returned postage prepaid to Diacor, Inc., 2550 Decker lake Blvd., Suite 26, West Valley City, Utah 84119. Please contact Diacor, 800-342-2679 or 801-467-0050, for a Return Material Authorization (RMA) prior to sending the defective unit to us. The replacement of a Centralite unit will not extend the expressed warranty stated herein beyond the original warranty period. The same warranty performance as stated for the Centralite unit applies to the diode laser assembly.



**SECTION**  
**APPENDIX 1**



Transmitter/Receiver Settings

Slide switches determine the control of the Transmitter over the Receiver for the Motorized lasers. Unless directed otherwise, each Receiver is programmed to respond to Transmitter switch position 1. To change the Receiver to match a different Transmitter position, open the receiver and adjust slide switches 7 and 8 to the following positions.

1	2	3	4	5	6	7	8	Switch number (LED to left)
on	on	Position 1						
on	on	on	on	on	on	off	on	Position 2
on	on	on	on	on	on	off	off	Position 3
on	off	Position 4						

RECEIVER PC BOARD

