LASER ALIGNMENT

FOCUS - REMOTE CONTROL (RED)

GLD-250-RC (Sagittal)

GLD-450-RC (Crosshair)

FOCUS
Remote Positioning Lasers

Gammex

Installation and User's Guide

GAMMEX LASERS®

Table of Contents

Dear Valued Customer

Congratulations on your recent purchase of a Gammex Laser Alignment System! This diode laser product is the result of over 25 years of continuous quality improvement of laser technologies. If, after carefully reading this manual, you have any questions, please contact our Sales and Service Department at 1-800-Gammex 1.

Introduction

This Installation and User's Guide includes the information you will need to safely and efficiently install, operate and maintain your medical alignment laser. This guide is only intended for use with Gammex *FOCUS - REMOTE CONTROL (Red) Diode Laser models GLD–450-RC (Crosshair) and GLD–250-RC (Sagittal)*.

Intended Use

These lasers are intended to be used for aligning patients to medical diagnostic imaging and radiation therapy equipment which utilizes ionizing radiation. They are intended to be used in medical clinic or hospital settings by trained medical staff. The lasers are not designed to be used around flammable anesthetics, which present a risk of explosion or fire. The lasers are not intended to be used in a sterile or corrosive environment. No other uses intended or implied.

Definitions

Symbols

Indicates user to consult accompanying document
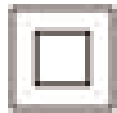
(safety) Class II equipment

This symbol indicates that when the end-user wishes to discard this product, it must be sent to a separate collection facilities for recovery and recycling.

General Safety

Signal words are used according to international standards.
The meanings of these signal words are:

DANGER - Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

WARNING - Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION - Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. Permitted for property damage only accidents.

Laser Apertures

Swivel Set Screw

2   *Introduction*
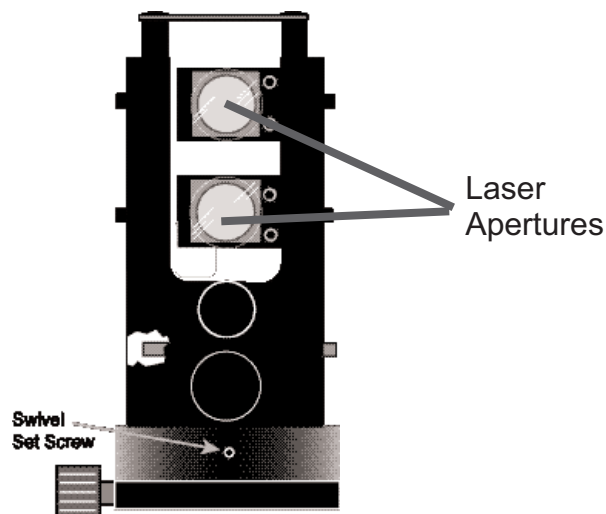
LASER SAFETY

WARNING - Risk of incorrect diagnosis or treatment. Isocenter of alignment lasers must coincide with isocenter of diagnostic or treatment equipment. Test alignment of lasers before use daily for first month of operation and weekly after first month. Newly installed equipment will shift as building walls and floor settle and as building materials dry out. Realign lasers to isocenter before use, if they have moved.

CAUTION - Laser Light, risk of eye damage.

• To prevent eye damage, do not stare into beam and do not allow patients to stare into beam. The normal blink reflex will prevent eye damage. If a patient is unable to blink normally the laser operator must prevent laser from shining in patient's eye. Laser is a class II laser.

• Replace laser diode only with assembly provided by Gammex to ensure that laser power levels do not exceed class II limits.

• Do not adjust sealed potentiometers as power levels could exceed class II limits and damage the laser diode.

GENERAL

• **Sagittal lase**r - Single vertical line projecting laser

• **Crosshair laser** - Crossed line projected from laser

• **Iso-center** - Center point where the X, Y, and Z planes coincide.

Storage and Transportation

• Do not drop

• Non-corrosive environment

• Storage Temperature: -20 - +75° C (-4 -167° F)

• Storage Humidity: 0 - 85% Relative Humidity (no dew condensation)

Environmental Limits:

• Temperature: 0-60° C (32 -140° F)

• Humidity: 0 - 85 % relative humidity (no dew or condensation)

• No flammable anesthetics

• No corrosives

Location of Labels

Safety labels are located in two places on the laser:

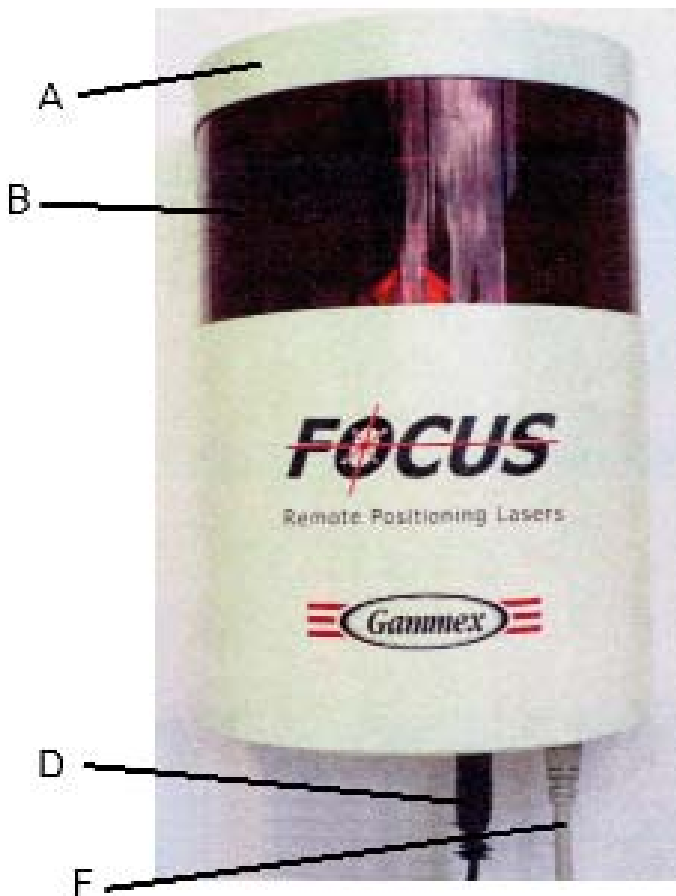1. inside on the laser baseplate.

2. bottom outside of housing

002741

002741 DECAL/CAUTION CLASS II DIODE LASER

CAUTION
LASER LIGHT
DO NOT STARE INTO BEAM

DIODE LASER
1.0 MILAWAT MAXIMUM OUTPUT
630-670nm WAVE LENGTH
CLASS II LASER PRODUCT

TOP

Operator Controls

A - Cover

B - Red Mylar Window

C - Power Supply Cord

D - Screw-on Power Plug

E - ON/OFF Switch (Push on/push off)

Lighted when on.

F - Remote Control Cable

• To turn the laser on: push the

ON/OFF button (E). The switch (E) will glow green and you will see the beam of the red laser on the window (B).

• To turn the laser off: push the On/Off

switch (E).The switch goes dark.

• Some facilities like to connect all the

lasers to one wall switch so all lasers

can be turned on and off from a

convenient location.

• Some facilities connect the lasers to a

timer so the lasers are automatically

turned off.

CAUTION - Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
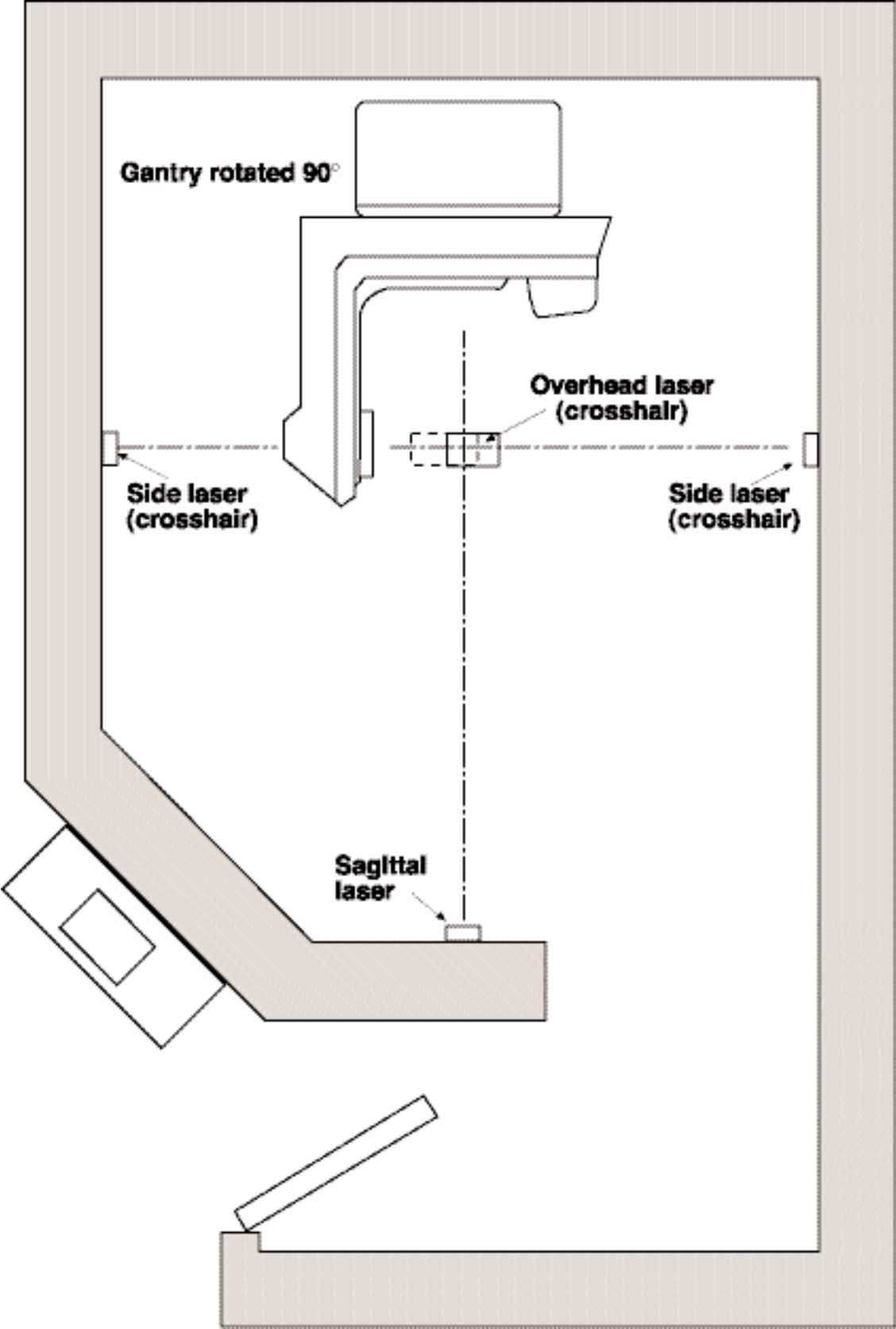
Figure 1

Introduction

GENERAL

All Gammex *FOCUS - REMOTE CONTROL (Red)* Laser Alignment Systems provide an optical aid for rapid and accurate patient positioning and repositioning for therapy and simulator machines.

TECHNICAL DESCRIPTION

Various combinations of the GLD-450-RC crosshair *FOCUS - REMOTE CONTROL (Red)* and the GLD-250-RC sagittal (straight line) *FOCUS - REMOTE CONTROL (Red)* are used with different systems. The GLD-450-RC lasers, mounted on each side, beam crosshairs along the X-axis. The crosshair GLD-450-RC laser, mounted on the ceiling, beams a crosshair vertically along the Z-axis. The sagittal GLD-250-RC laser beams a straight line in the Z-Y plane.

Installation Requirements

ELECTRICAL

Each laser is provided with a universal power supply (transformer) with an input of 100 to 240 volts at 50 to 60 Hz. The universal power supply plugs into a wall outlet with 4 interchangeable "snap-in" plugs to fit most outlets. A 1.2 meter (4 foot) power cord supplies 12 volt dc power to the laser with a screw-on power plug

TOOLS NEEDED

In addition to some basic tools, such as screwdrivers, hammer and ladder; you will need an electric hammer drill, plumb bob, level, water level, masking tape and 15M (50 feet) of string. (The mounting hardware, a 1/4-20 tap and tap drill, and 4 hex (Allen) wrenches (.050", 1/8", 3/32", & 5/64") are included with the lasers.)

CAUTION: The location of the lasers is determined in relation to the therapy machine's crosshair and isocenter. Before installing lasers, ask the physicist to verify that the field light aligns with the machine's isocenter. Figure 1.
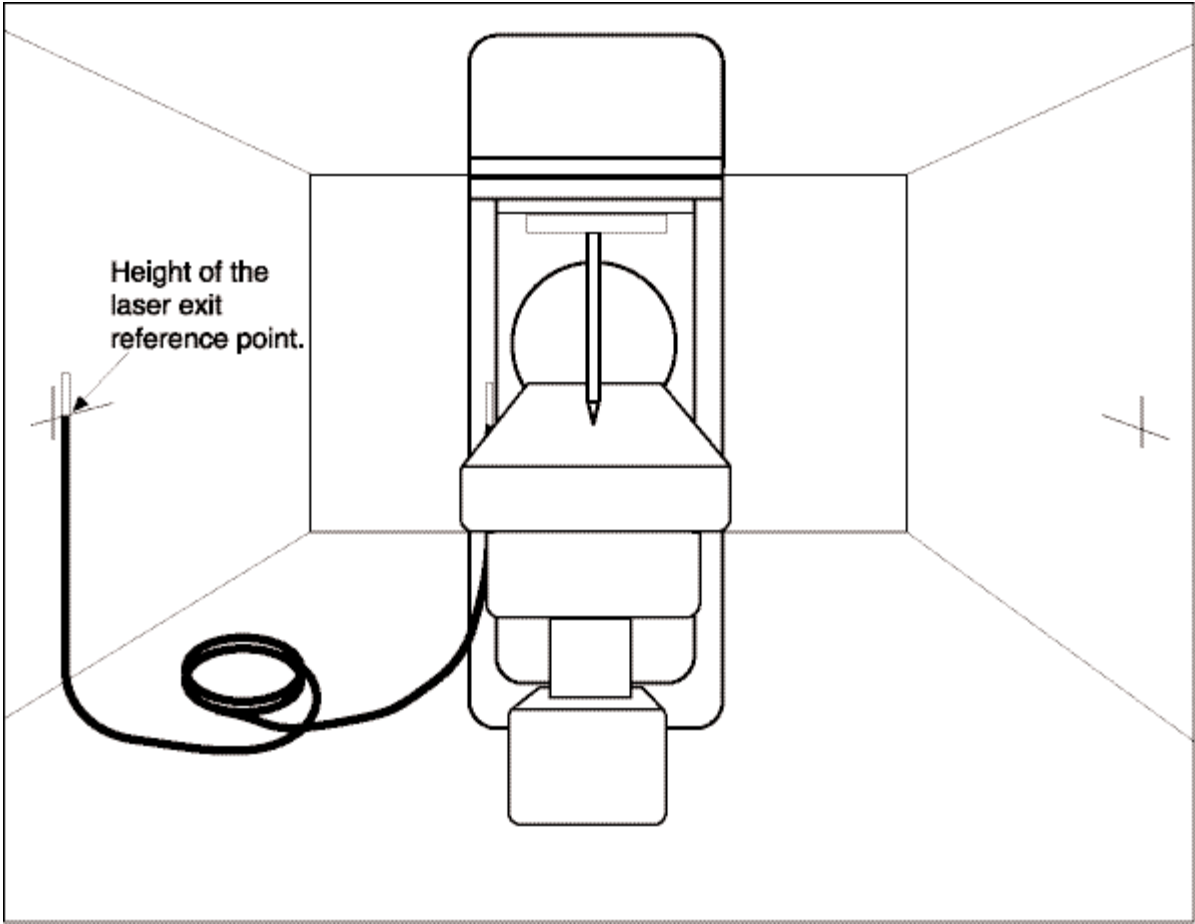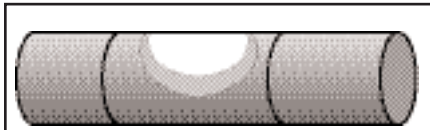
Figure 2

Use a water level to line up the laser exit reference point at the height of isocenter.

Pre-Installation

Use a water level, see Fig. 2, to line up the laser exit reference point at the height of isocenter.

PREPARING THE ROOM

1. Unpack each laser, add the cord and plug into a wall outlet.
2. Turn the linear accelerator lamp on.
3. Set gantry and collimator to 0° and level the collimator.
4. Lower the table as low as possible.

COLLIMATOR CROSSHAIR ACCURACY

The collimator-projected crosshair is used as a reference when determining the laser locations. The light field should coincide with isocenter, the gantry should be level and, if collimator crosshair displacement exists, it should be compensated for.

1. Project a crosshair onto a piece of paper taped to the table and mark the center with a dot.
2. Rotate through 360° and mark the center again.
3. If there is a difference between the two dots, find the center of the distance between the two dots. Mark this point and use this point as the crosshair center reference point. Use this point to line up the laser.

USING THE WATER LEVEL

Use a water level, see Fig. 2, to determine the height of the laser exit reference point when installing lasers in a simulator room or in a room with angled walls. In standard treatment rooms, the water level should also be used to verify the laser location.

1. Raise the table to the front pointer (isocenter).
2. Remove caps on ends of water level and remove air bubbles.
3. Line up with the table edge and with the wall. Figure 2
4. The water line on the wall indicates the horizontal axis of the laser exit reference point.

Use a level to verify:

• Gantry is level each time it is rotated

• Template is placed accurately on wall

• Crosshairs on wall are at 90° angles

Pre-Installation **9**

Figure 3

Rotate the gantry 90° and project a crosshair onto the wall.

Rotate 90°

Use projected crosshair as laser exit reference point.
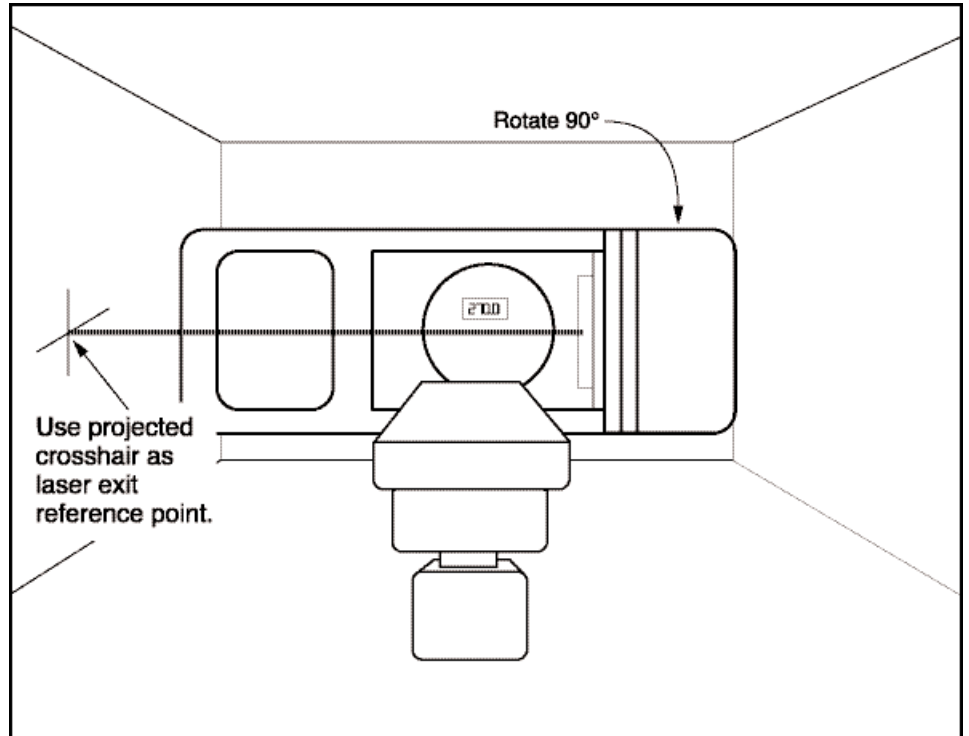
Figure 4

Use a string to verify the location of the side lasers.

1

projected crosshair

2

Hold the ends of the string at the laser exit reference points 1 and 2. The shadow from the string should be in line with the crosshair projected onto the table.
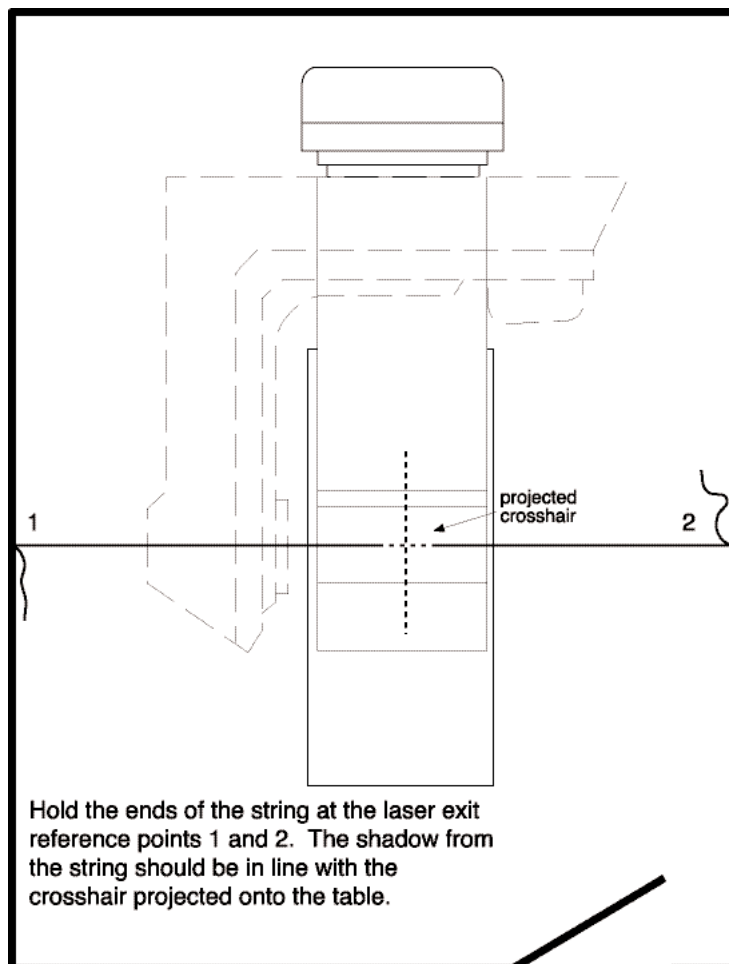
Installing Lasers
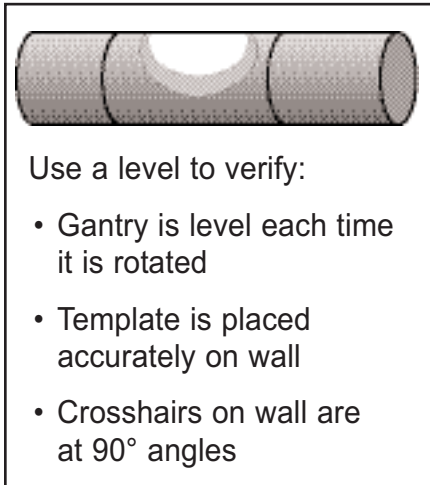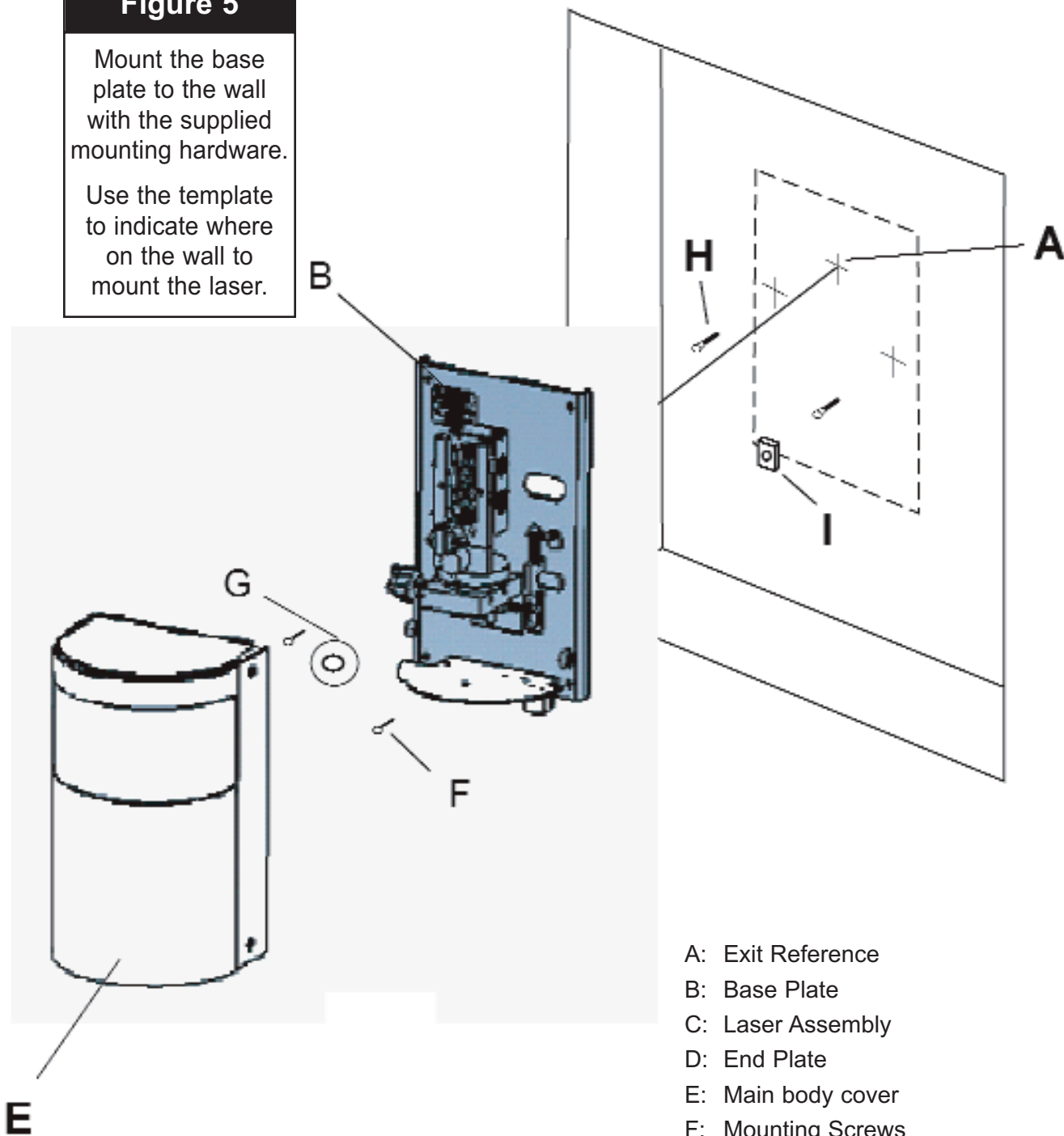
SIDE LASER INSTALLATION

For all GLD-450-RC (crosshair) installations.
For angled walls, refer to page 35.

1. Rotate the gantry 90° to the 270° position and project a crosshair onto the wall. *Figure 3*

2. Use a pencil and straight rule to trace the crosshair onto the wall.

3. Line up the template from page 56, so that the projected crosshair lines up with the laser exit point on the template. Use a level to line up the template.

4. Mark the outer edge of the template and also mark the mounting holes.

5. Rotate the gantry 180° to the 90° position and repeat steps 2-4 on the opposite wall.

6. Return the gantry to 0°.

7. Tape a piece of paper to the table.

8. Project a crosshair onto the paper, keep the field as wide as possible.

9. Hold the ends of a plumb bob on each wall until string shadow is in line with projected crosshair. *Figure 4*

10. The point at which the string hits the wall is the center of the laser exit point. Mark the center on the wall. Use the template to verify the location of the mounting holes.

11. Drill the mounting holes.

12. Remove the *FOCUS - REMOTE CONTROL (Red)* from its carton. Remove two screws at the top of the cover using a 5/64" hex (Allen) wrench. Slide the cover up, to disengage it, and lift the cover out. Remove the packing support from the optics and remove the plastic tie from around the optics.

Use a level to verify:

• Gantry is level each time it is rotated

• Template is placed accurately on wall

• Crosshairs on wall are at 90° angles

Figure 5

Mount the base plate to the wall with the supplied mounting hardware.

Use the template to indicate where on the wall to mount the laser.

A: Exit Reference

B: Base Plate

C: Laser Assembly

D: End Plate

E: Main body cover

F: Mounting Screws

G: Washers

H: Wall Anchors (Masonry)
Use 3/8" drill

I: Mounting Spacers

Installing Lasers

SIDE LASER INSTALLATION (continued)

13. Attach washers and screws with mounting spacers as shown in *Figure 5*. Mount the laser to the wall *Figure 5*. Laser must be firmly mounted. Oversized holes provide flexibility to line up the exit reference, Use suitable anchors. Wall anchors for masonry are provided in the mounting kit.

    Use a 3/8" diameter drill for the provided anchors.

14. Do not replace the cover at this time.

15. Plug in the universal power supply. Attach the threaded power plug to the bottom of the laser. Turn on the laser. The push switch will toggle on and off. The switch should light and the laser lines project.

16. Plug in the remote control receiver.

17. Rotate the gantry 90° (so that the crosshair is projected onto the laser) and tape a piece of paper to the gantry head, covering the projected light field.

18. Adjust the laser so that the laser crosshair lines up with the collimator cross hair. Refer to the following pages for the methods for making laser adjustments.

19. Place a piece of paper directly in front of the laser.

20. Verify that the center of the projected collimator crosshair is centered on the top laser lens.

21. Adjust for straight lines if necessary. Refer to the following pages.

22. Turn off the laser.

23. Place the cover on the laser. Slide it downward to engage the pins, then replace the screws at the top of the cover. Take care not to jolt or bang the laser.

24. Check the alignment of the laser several times. Use the remote control for minor adjustments.
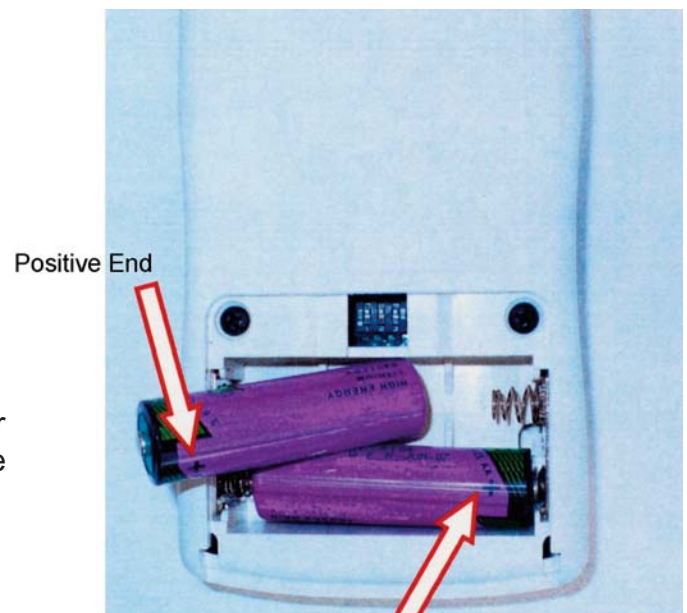
25. Return the gantry to 0°.

Remote Control

Remote control is a radio communication feature that allows the operator to align as many as five lasers with one hand-held controller. Each Focus laser has a separate wall mounted receiver that communicates with the operator's transmitter. The receivers and transmitter all have an ID switch. The ID switch sets the identification number for the system. This allows different rooms to operate remote control lasers in close proximity without interference. All remote control receivers in a room will have the same ID number. Different rooms will have different ID numbers. To communicate properly, the transmitter ID must be set to match the receiver IDs of all of the laser receivers in a system.
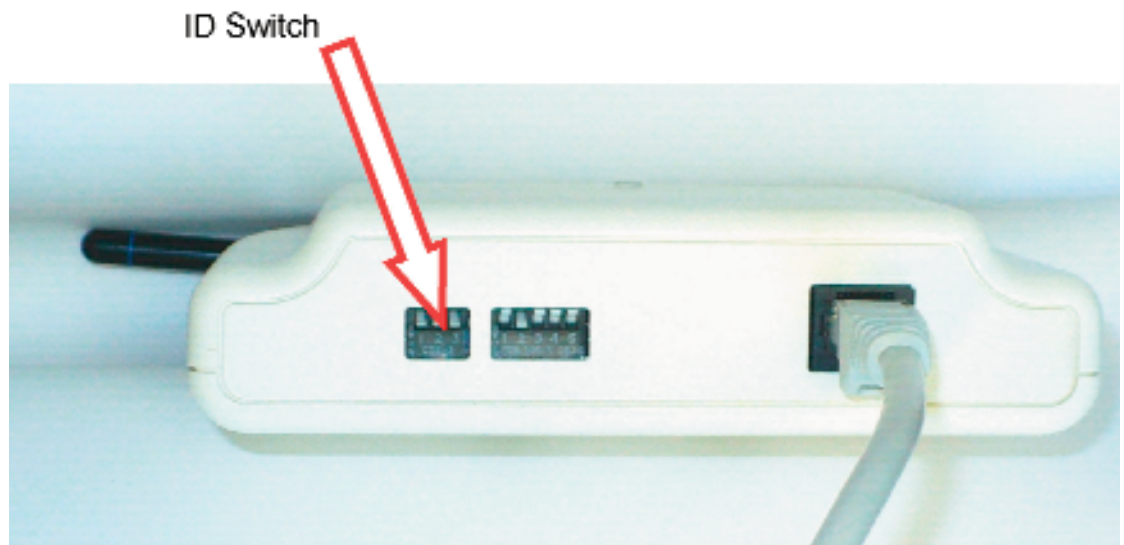
SETTING THE TRANSMITTER ID
The transmitter ID switch is accessible through the battery compartment. To set transmitter identification, remove the battery cover and locate the switch. It will have three small toggles labeled 1, 2, and 3. Each toggle has an "on" position and an "off" position. For ID one, set switch 1 "on" and all other switches "off". For ID two, set switch 2 "on" and all other switches "off". ID three has 1 and 2 "on" and 3 "off". ID four has 3 "on" and all other switches "off". This sequence can continue up to ID seven which has all switches "on". The following table gives all of the combinations.

ID	SWITCH 1	SWITCH 2	SWITCH 3
0	OFF	OFF	OFF
1	ON	OFF	OFF
2	OFF	ON	OFF
3	ON	ON	OFF
4	OFF	OFF	ON
5	ON	OFF	ON
6	OFF	ON	ON
7	ON	ON	ON

Verify that the ID switch settings on all receivers in a system match the transmitter id switch setting.

SETTING THE RECEIVER LASER NUMBER

The other switch on the bottom of the receiver selects the number for the laser. This corresponds directly to the laser number selection on the hand held transmitter.

Each receiver has a switch with five positions. These positions represent the number of the laser that the receiver controls. If we move the first lever down and the rest up, then that makes the receiver number one, and the laser connected to it is also number one. The second lever stands for number two, and the third lever stands for number three. Only one lever may be in the down position for any given receiver. The other four switch levers must be up.
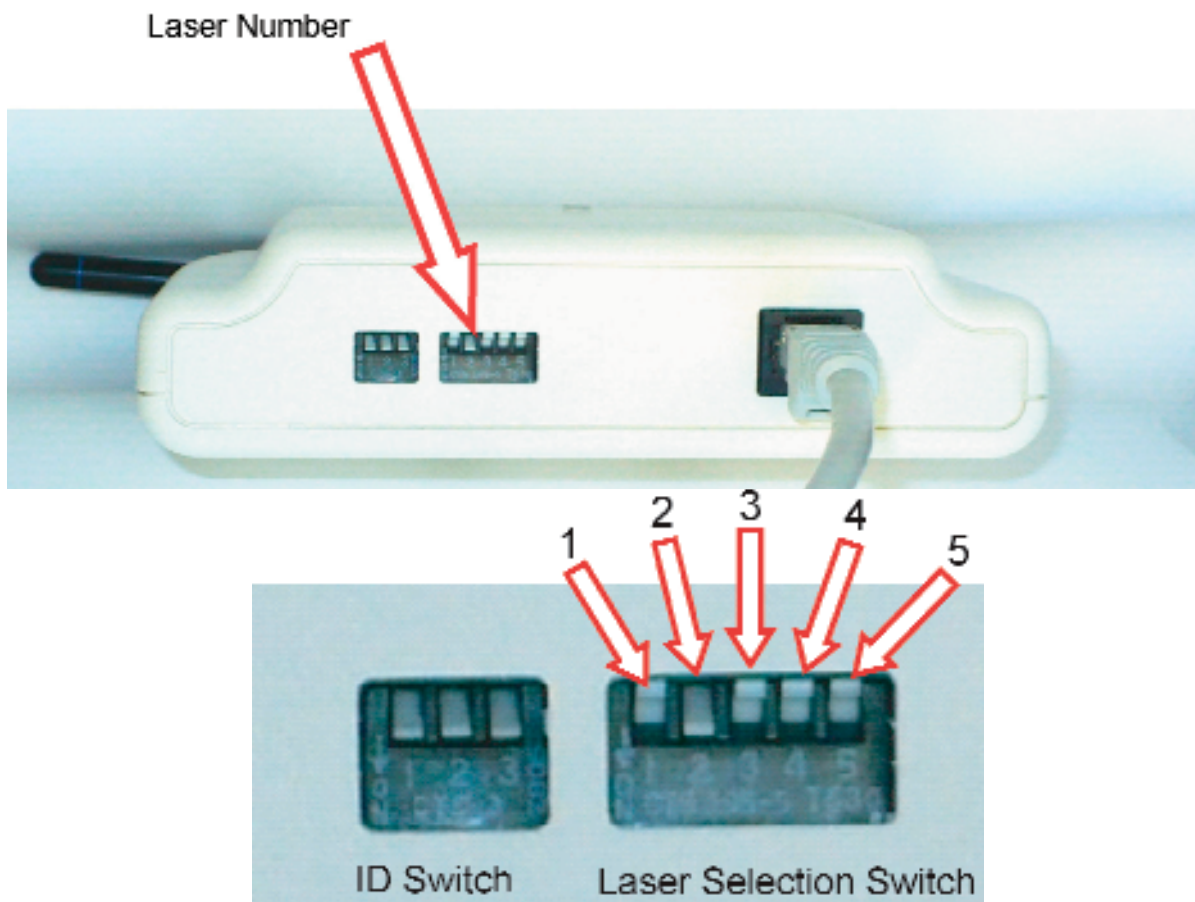
The remote control receivers can be mounted to a wall, ceiling or other appropriate surface using two #8 screws (not included), spaced 1.5" apart. Keyhole slots in the back of the receivers will then fit over the screw heads and hold the receivers in place. The receivers can be damaged by radiation and should therefore be mounted outside of the radiation field. Once mounted, connect each receiver to its corresponding laser with the included cable.
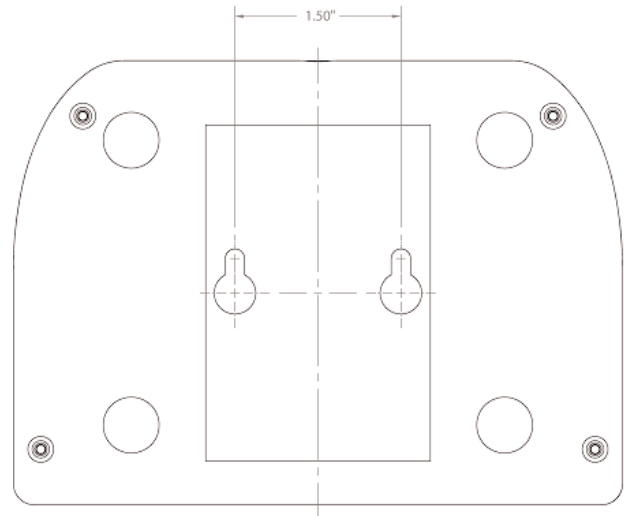
The remote control transmitter can be damaged by radiation and should not be left in the radiation field.

To Align the lasers using the Remote Control

1. Plug in the receiver if they are not already connected.

2. Push the unlock button to activate the transmitter. The transmitter light should turn on.
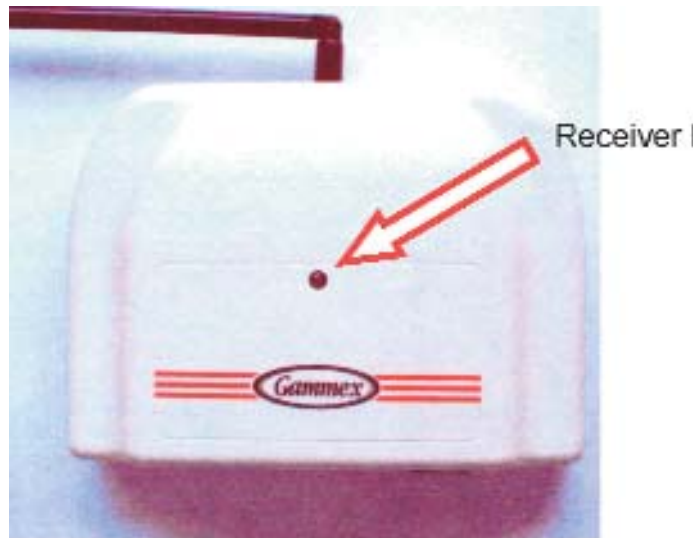
3. On the transmitter, select the number of the laser that you wish to align.

4. The corresponding receiver light should come on.

Receiver

5. Move the laser line to its correct position.

This button moves the laser line upward or toward the head

This button moves the laser beam downward or toward the feet

Laser Positioning Adjustments   *17*

This button moves the
laser beam to the left
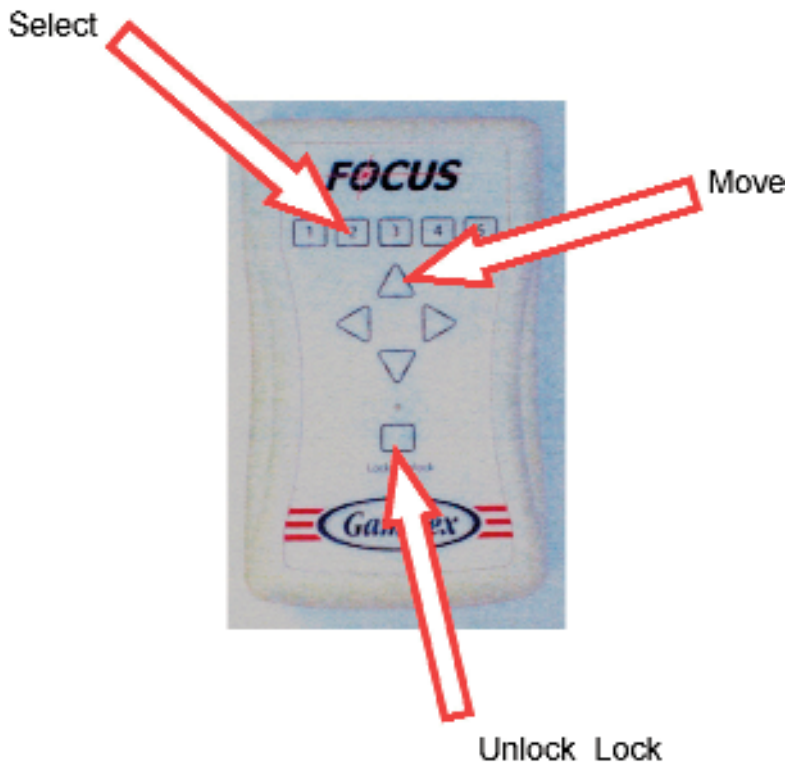
This button moves the
laser beam to the right.

Lock

6. When the line is correctly positioned, push the lock button to secure alignment.
   The transmitter light will go out. If the lock button is not pressed, the transmitter
   will automatically lock the lasers and go into hibernation after 90 seconds of
   inactivity.

8. Repeat the procedure for each laser that needs alignment
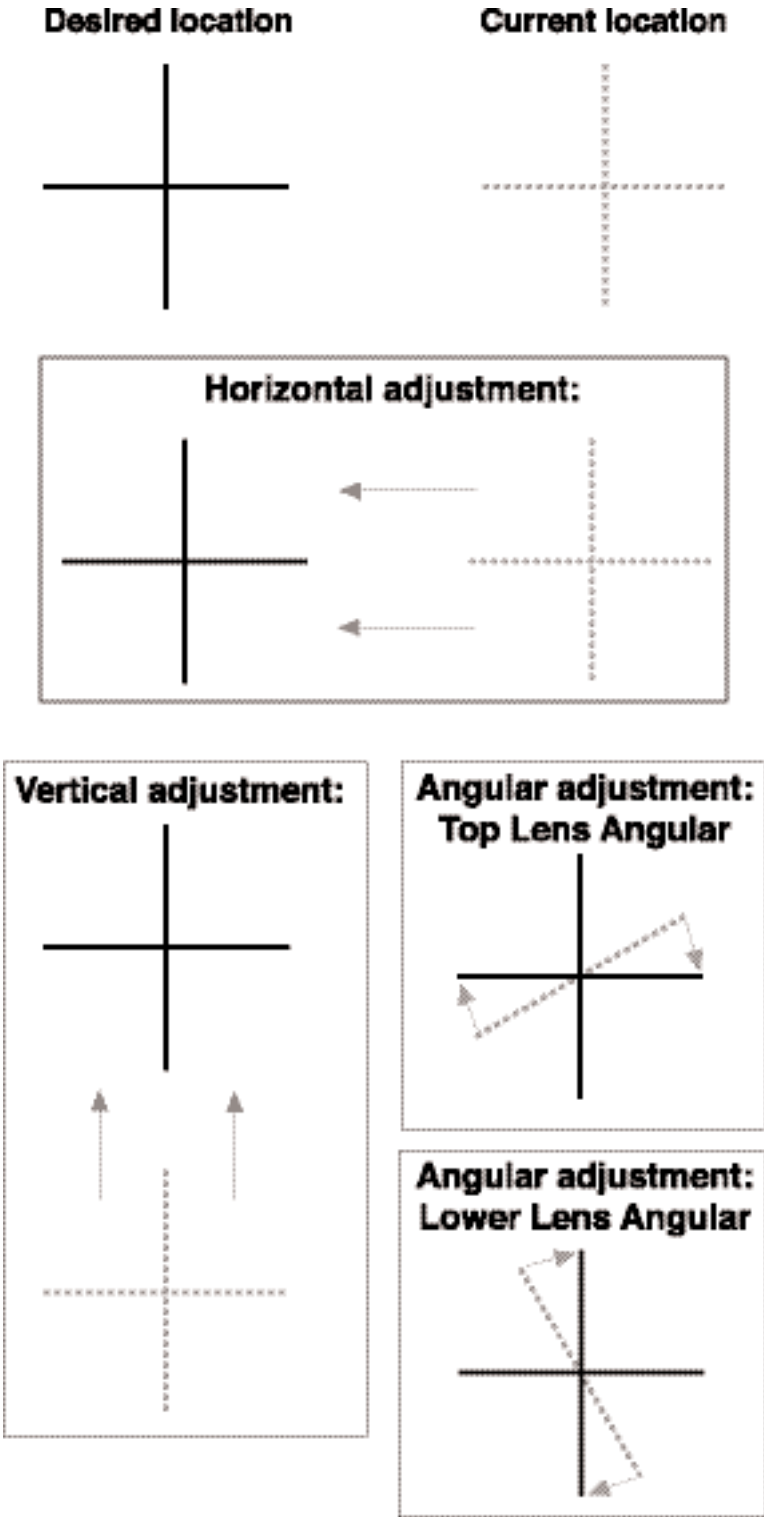
Movement of Crosshair and Sagittal Laser

Desired location　　　　**Current location**

Horizontal adjustment:

Vertical adjustment:

Angular adjustment: Top Lens Angular

Angular adjustment: Lower Lens Angular

Figure 6

Coarse Carriage Adjustments

The carriage on which the laser is seated can be moved both horizontally and vertically.

**Coarse vertical adjustment
of the laser carriage.**

1. Loosen the hex head cap screws (B) with a 1/8" stubby hex wrench included in the calibration kit.

2. Now use the wrench to turn the setscrew (A), which moves the carriage vertically.

3. When vertical adjustment is satisfactory, tighten the hex head cap screws (B) firmly.

B

A

Vertical adjustment:

Laser Positioning Adjustments   *21*
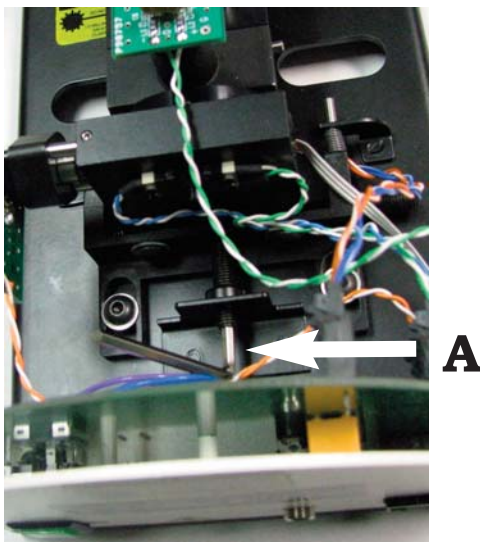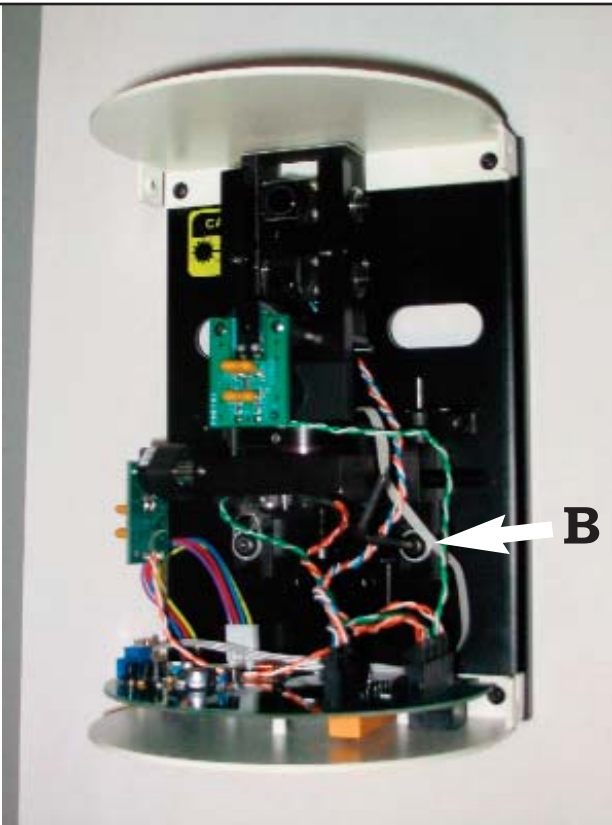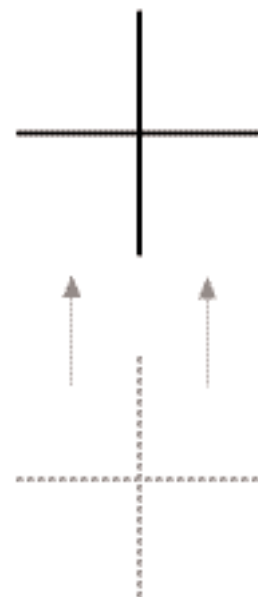
Coarse Carriage Adjustments

**Coarse horizontal adjustment
of the laser carriage.**

4. Loosen the hex head cap screws (D) with a 1/8" stubby hex wrench included in calibration kit.

5. Now use the wrench to turn the setscrew (C), which moves the carriage horizontally.

6. When horizontal adjustment is satisfactory, tighten the hex head cap screws (D) firmly.

**Fine Horizontal and Vertical
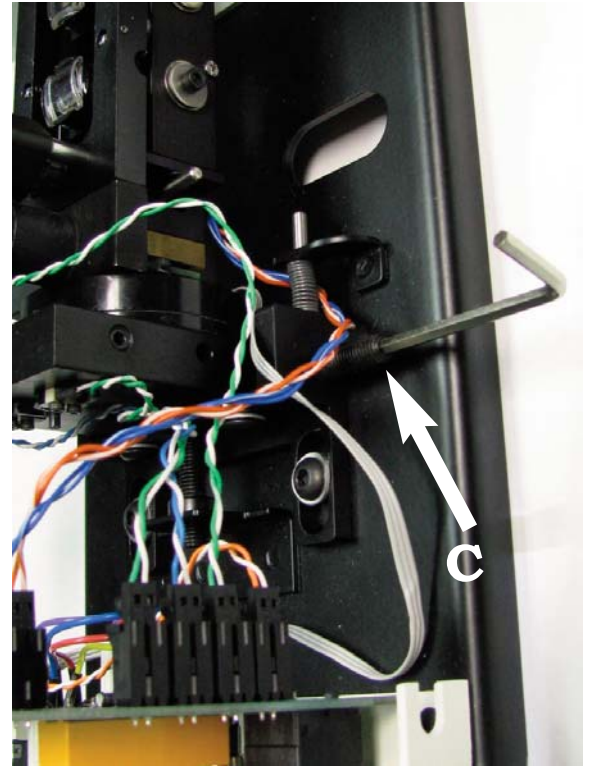   Adjustments**

7. Fine Horizontal and Vertical adjustments of the crosshairs and lines can be made using the remote control as shown on the following pages.

Horizontal adjustment:
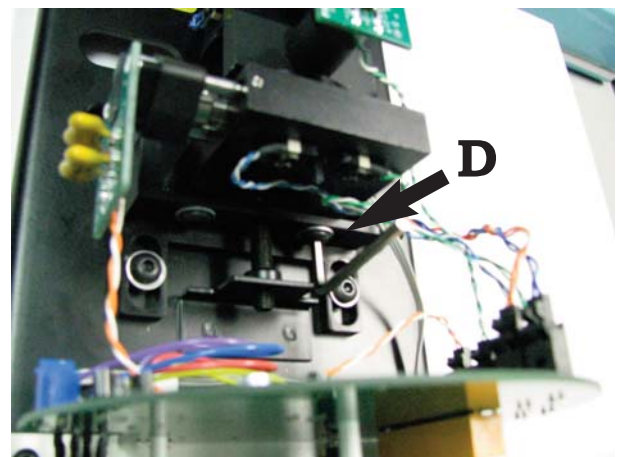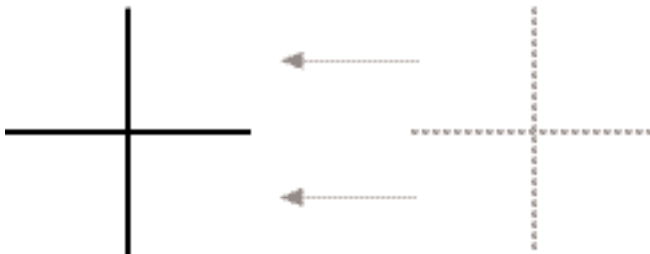
Focus - Remote Control (Red) Laser Positioning Adjustments

Figure 6 shows schematically the positioning adjustments available on the *FOCUS - REMOTE CONTROL (Red)*.

Figure 7 shows the different adjustments available on the
FOCUS - REMOTE CONTROL (Red). The *FOCUS - REMOTE CONTROL (Red)* has both coarse and fine horizontal position adjustments. The remote control fine adjustment has limited range and is factory set in the middle of the range. If the limit of the range is reached, run the remote control a short distance in the opposite direction. Then use the coarse adjustment to move close to the desired position.

Finally use the remote control fine adjustment to accurately position the crosshair.

Focus, angularity, and line curvature are factory set and should not
require adjustments at installation. Adjustments are available, if
required, and are explained on the following pages.

Laser Coarse Rotational Positioning

The *FOCUS - REMOTE CONTROL (Red)* optics can be rotated for coarse horizontal positioning. To make this adjustment, loosen the setscrew as shown using a .050 hex wrench. The entire optics assembly can be rotated by hand, left or right, to move the crosshair horizontally. This is a very coarse adjustment. The setscrew must then be re-tightened. A fine-tuning adjustment can then be used to accurately position the crosshair.
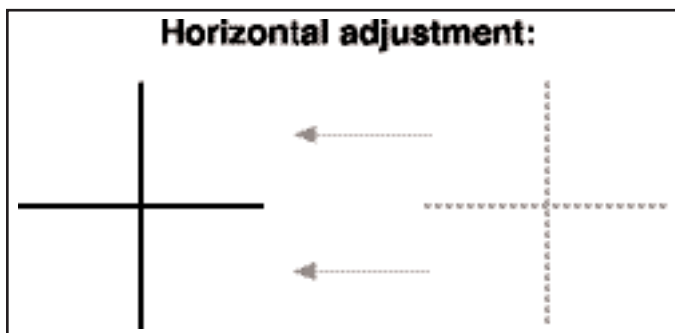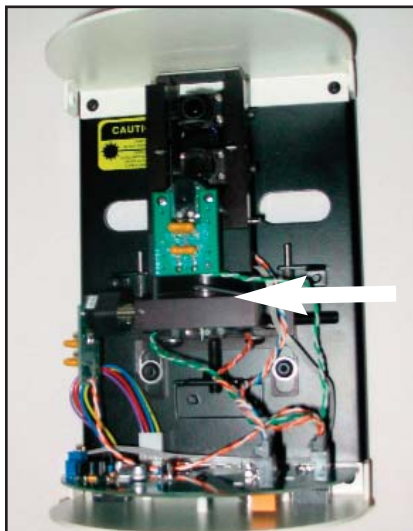
Curvature Adjustments

The line curvature is factory set. Adjustment should not be necessary. If needed, the 2 adjustments on the right hand side of the optics are used to straighten either line of the crosshair. Use a 3/32" hex wrench. *Figure 7*
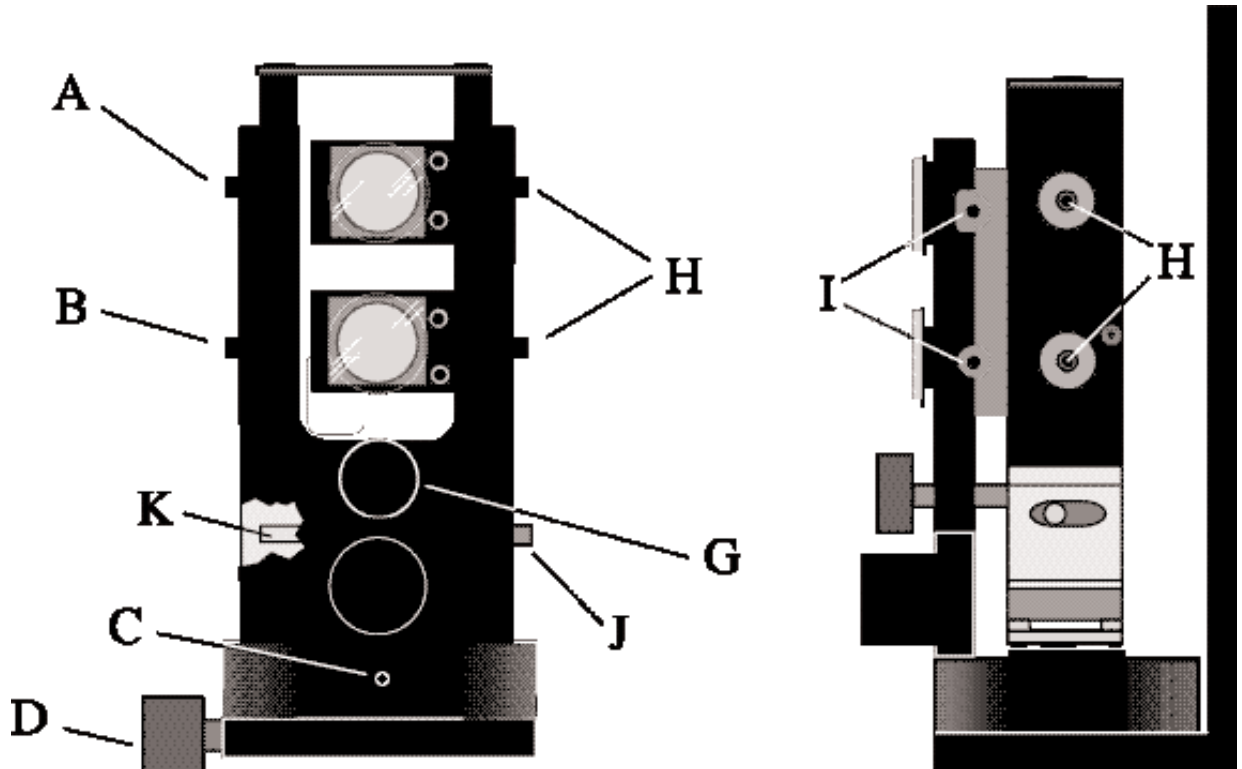
Figure 7	
A. Mirror adjustment screw: Move horizontal line	G. Vertical motor
B. Beam splitter adjustment: Move vertical line	H. Curvature adjustment screws
	I. Lens angle adjustment screws
C. Locking setscrew: Coarse rotational adjustment	J. Line focus adjustment knob
	K. Focus lock screw
D. Horizontal motor	

Laser Fine Positioning

Both of the following adjustments must be made with the cover on.

FINE HORIZONTAL POSITIONING

After positioning the crosshair close to the proper location with the coarse adjustment, use remote control to finely position the crosshair horizontally. Push the left or right arrow button to move the crosshair left or right.

Horizontal adjustment:
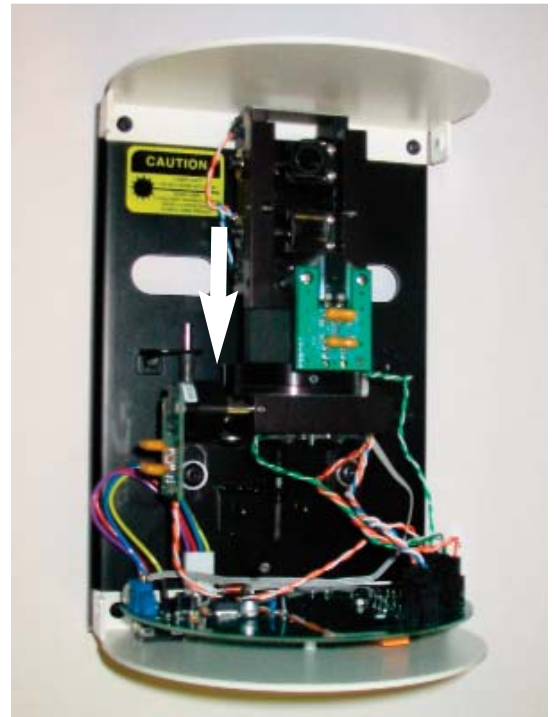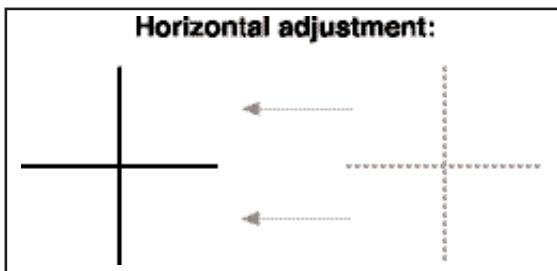
FINE VERTICAL POSITIONING

After positioning the crosshair close to the proper location with the coarse carriage adjustment, Use remote control button to finely position the crosshair vertically. Press the up arrow to move the cross hair upward and the down arrow to move the crosshair downward.

Vertical adjustment:
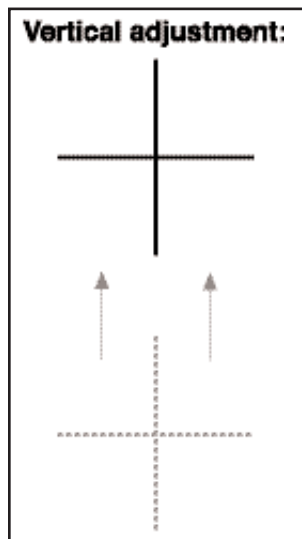
Figure 8
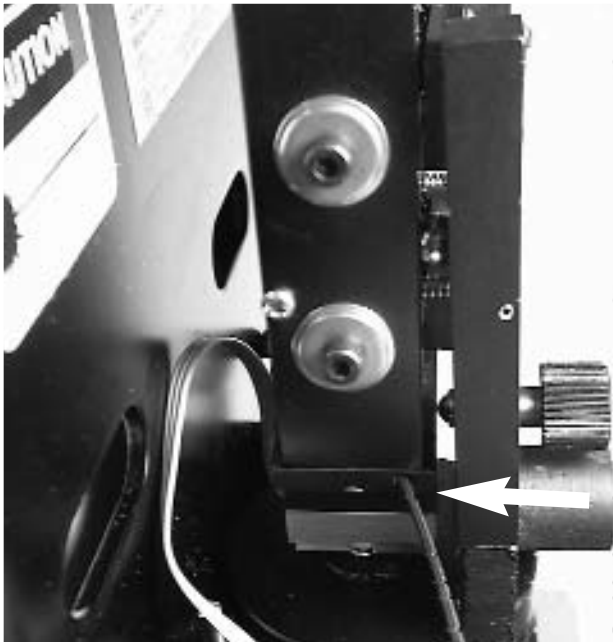
Laser Fine Positioning

LASER FOCUS ADJUSTMENT

The following adjustments must be made with the cover removed (see page 39)

The focus of the *FOCUS - REMOTE CONTROL (Red)* can be adjusted as follows:

The focus adjustment is a silver colored lever on the operators right hand side of the optics. On the opposite (left hand) side of the optics is a set screw in a deep angled hole. Loosed the locking set screw using a 0.050 hex wrench. Figure 8

Focus the crosshair by moving the lever up and down to concentrate the crosshair into fine lines.

Re-tighten the setscrew.

Replace the cover and check the crosshair alignment.
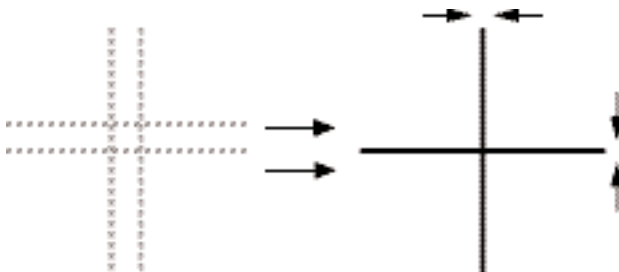
Laser Positioning Adjustments **27**

Laser Fine Positioning

Figure 9

Both of the following adjustments must be made with the cover removed. (see page 39).

SINGLE LINE ADJUSTMENTS

The two adjustments on the left hand side of the optics move either line of the crosshair up or down with respect to the other line. Use a 3/32" hex wrench.

MIRROR ADJUSTMENT SCREW

This upper screw moves the horizontal line up and down. Figure 9
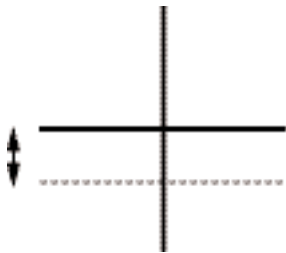
BEAM SPLITTER ADJUSTMENT SCREW

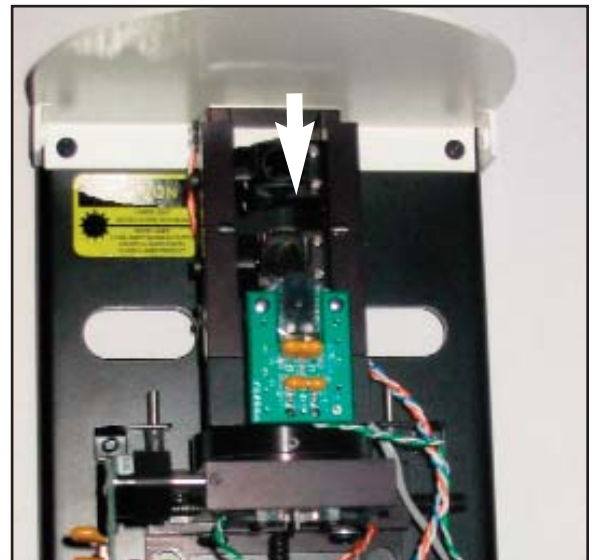This lower screw moves the vertical line up and down. Figure 10
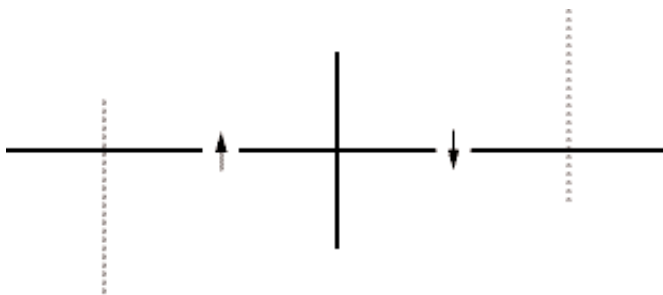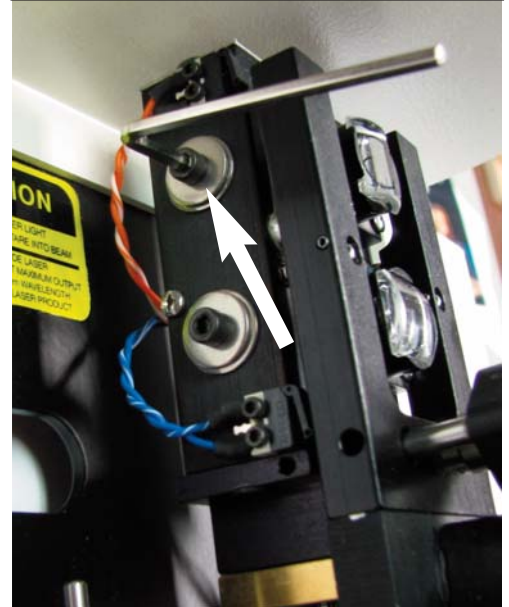
Figure 10

Figure 14
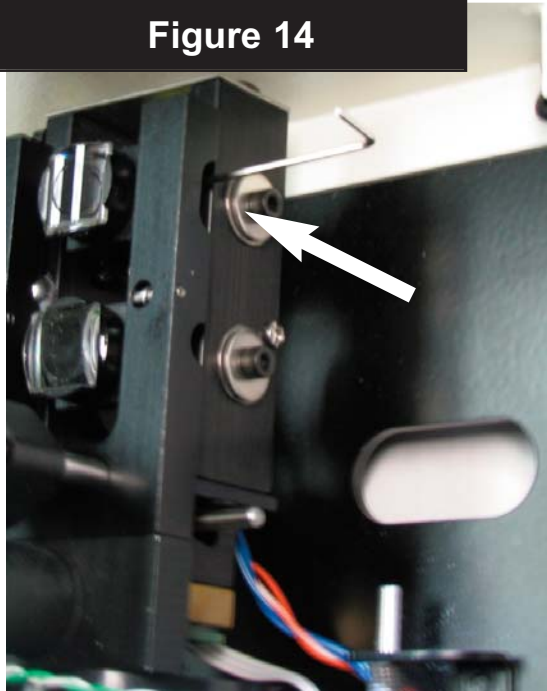
Laser Fine Positioning

Both of the following adjustments must be made with the cover removed. (see page 39).

ROTATE HORIZONTAL LINE

The horizontal line of the crosshair can be rotated as follows. Loosen the locking set screw, as shown, on the right side of the upper lens holder. Use a .050" hex wrench. Rotate the lens holder by hand. Use care not to touch the lens or upset the factory calibration of the lens or the mirror.

Figure 11A

Angular adjustment:
Top Lens Angular
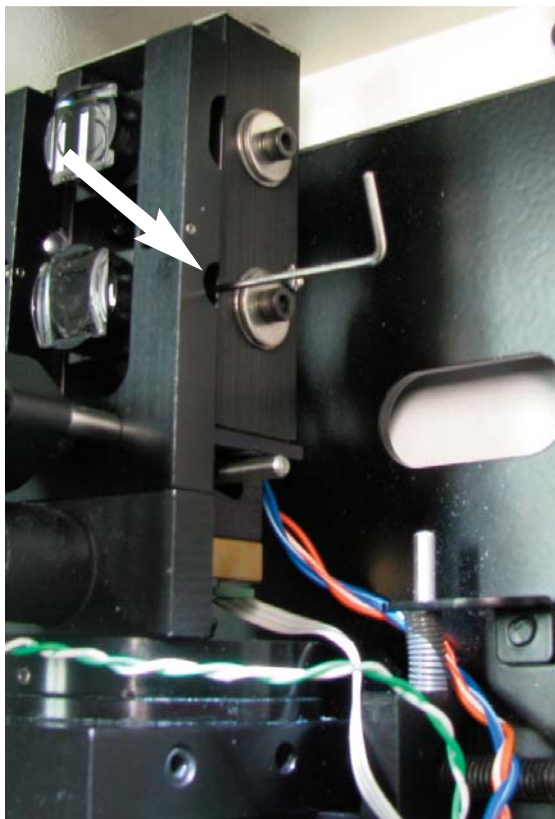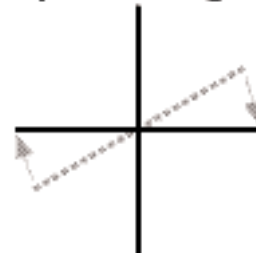
ROTATE VERTICAL LINE

The vertical line of the crosshair can be rotated as follows. Loosen the locking set screw, as shown, on the right side of the lower lens holder. Use a .050" hex wrench. rotate the lens holder by hand. Use care not to touch the lens or upset the factory calibration of the lens or the mirror.

Figure 11B

Angular adjustment:
Lower Lens Angular

Laser Positioning Adjustments   **29**

Notes

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Laser Positioning Adjustments

Sheet of typing paper
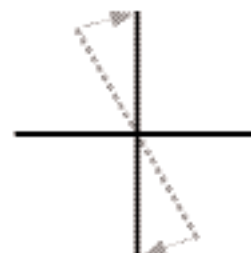
Figure 12

Use a sheet of typing paper to verify the placement of the side lasers.

Verify that the side laser crosshairs line up. They should overlap each other.
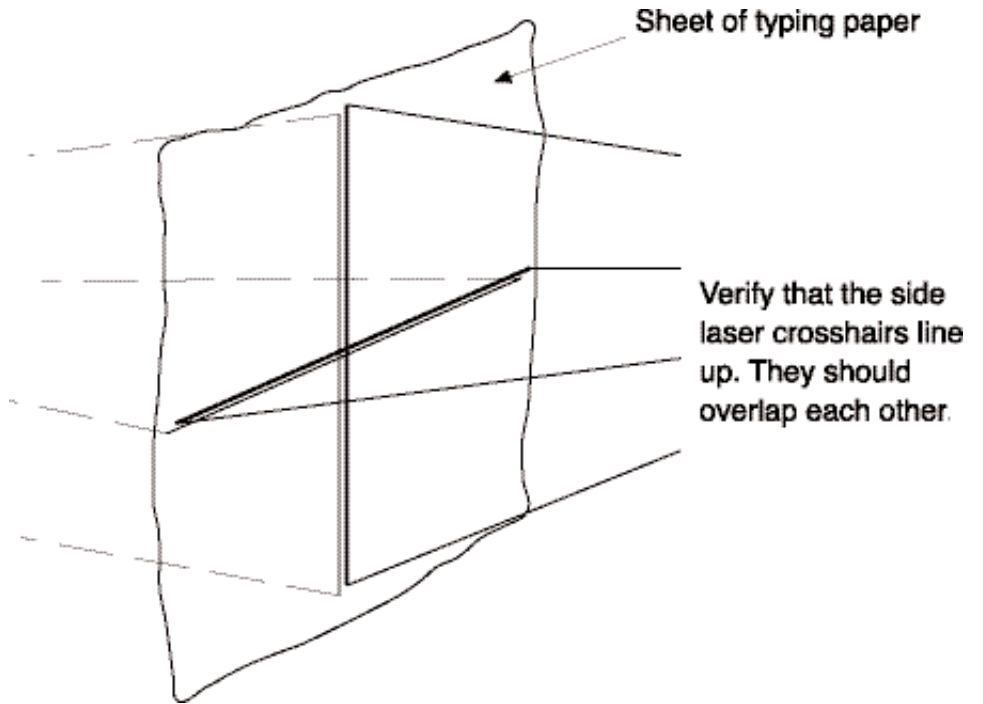
Figure 13

Use a front pointer to verify that the side lasers hit isocenter.
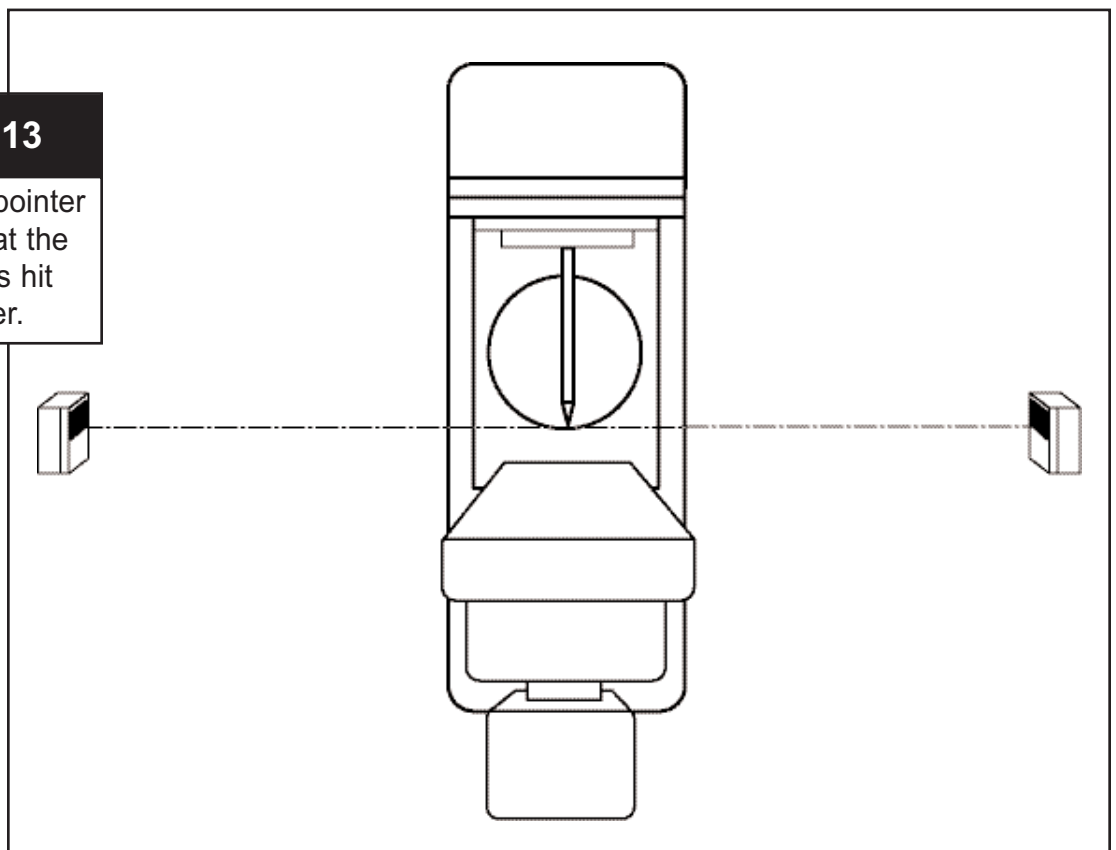
Second Side Laser Installation
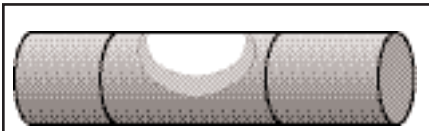
1. Repeat the process, on the opposite wall, used to mount the first laser. Pencil a crosshair on this wall to determine the exit reference point (center of the laser upper lens) and use the mounting template to identify the mounting holes.

2. Drill the mounting holes.

3. Unplug laser and remove the cover.

4. Attach washers and screws and mount the laser to the wall.

5. Plug in and turn on laser.

6. Place paper in path and verify:

   • laser lines overlap

   • front pointer (isocenter) lines up with the laser lines

   • lines are straight up and down

   • lines are level on the horizontal axis

   • lines are sharp and focused at isocenter.

NOTE: If there is no front pointer, raise the table to isocenter and align the lasers with the table edge. Line the second laser with the first.

Use a level to verify:

• Gantry is level each time it is rotated

• Template is placed accurately on wall

• Crosshairs on wall are at 90° angles

QUICK 🗐

☐ laser lines overlap

☐ front pointer lines up with the laser lines

☐ lines are straight up and down

☐ lines are level on the horizontal axis

☐ lines are sharp and focused

---

projected
crosshair

Hold the ends of the string at the laser exit
reference points 1 and 2. The shadow from
the string should be in line with the
crosshair projected onto the table.

Figure 14

Use a string to verify the
location of the side lasers

Installation on Angled Walls

1. When mounting on Angled Walls, Cut out, fold and tape to the mounting template the strip of paper provided with the template. This strip approximates the distance to the center of rotation of the top lens of the laser optics.

2. Use a water level to determine the height of the laser exit reference point. (Refer to Pages 9 & 10).

3. Set gantry at 0°, tape a piece of paper to the table.

4. Project a crosshair onto the paper, keeping the field as wide as possible.

5. Hold the ends of a string on each wall until the string shadow is in line with the projected crosshair. Several people may be needed. See *Figure 14*.

6. On each wall use the template with its extension. Move the template until the string touches the **X** on the extension. That is the center of the laser exit reference point. Level the template and mark the mounting holes.

7. Drill the mounting holes.

8. Mount the laser. Adjust the turret of the laser by loosening the setscrew as shown on page 24 and rotating the optics until the laser crosshair lines up with the gantry pointer. Tighten the setscrew. Use the fine adjustments to make any additional corrections horizontally.

9. Repeat the process on the other side laser.

10. Laser should form a continuous plane.

11. Place a piece of paper in the path (*Figure 12*) and verify and correct as needed:

NOTE: If there is no front pointer, raise the table to isocenter and align the lasers with the table edge.

Use a level to verify:

• Gantry is level each time it is rotated

• Template is placed accurately on wall

• Crosshairs on wall are at 90° angles

QUICK 📄

☐ laser lines overlap

☐ front pointer lines up with the laser lines

☐ lines are straight up and down

☐ lines are level on the horizontal axis

☐ lines are sharp and focused at the isocenter

Laser exit reference point

Plumb line

Table at isocenter height
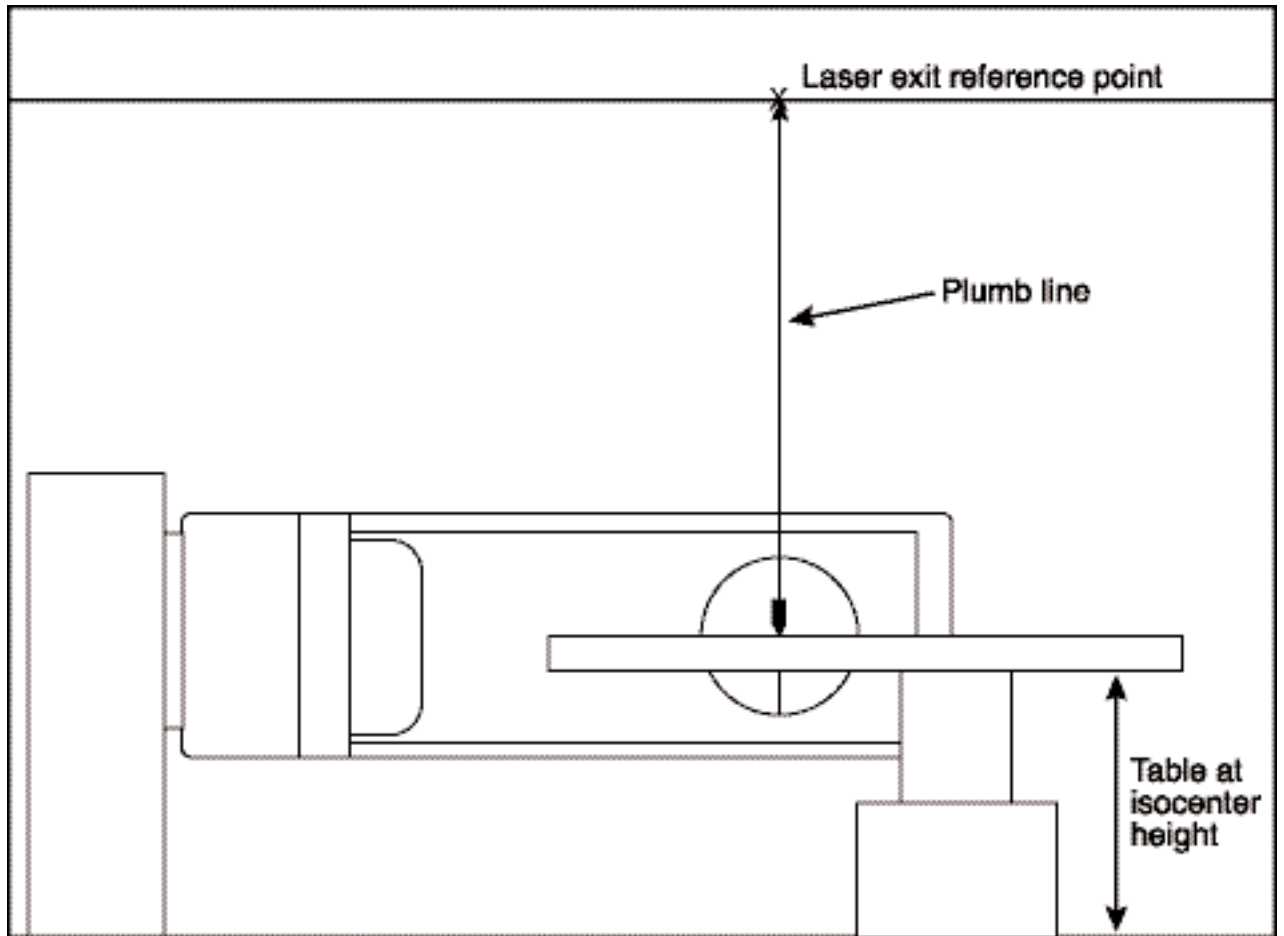
Figure 15

Use a plumb bob to determine the placement of the ceiling laser.
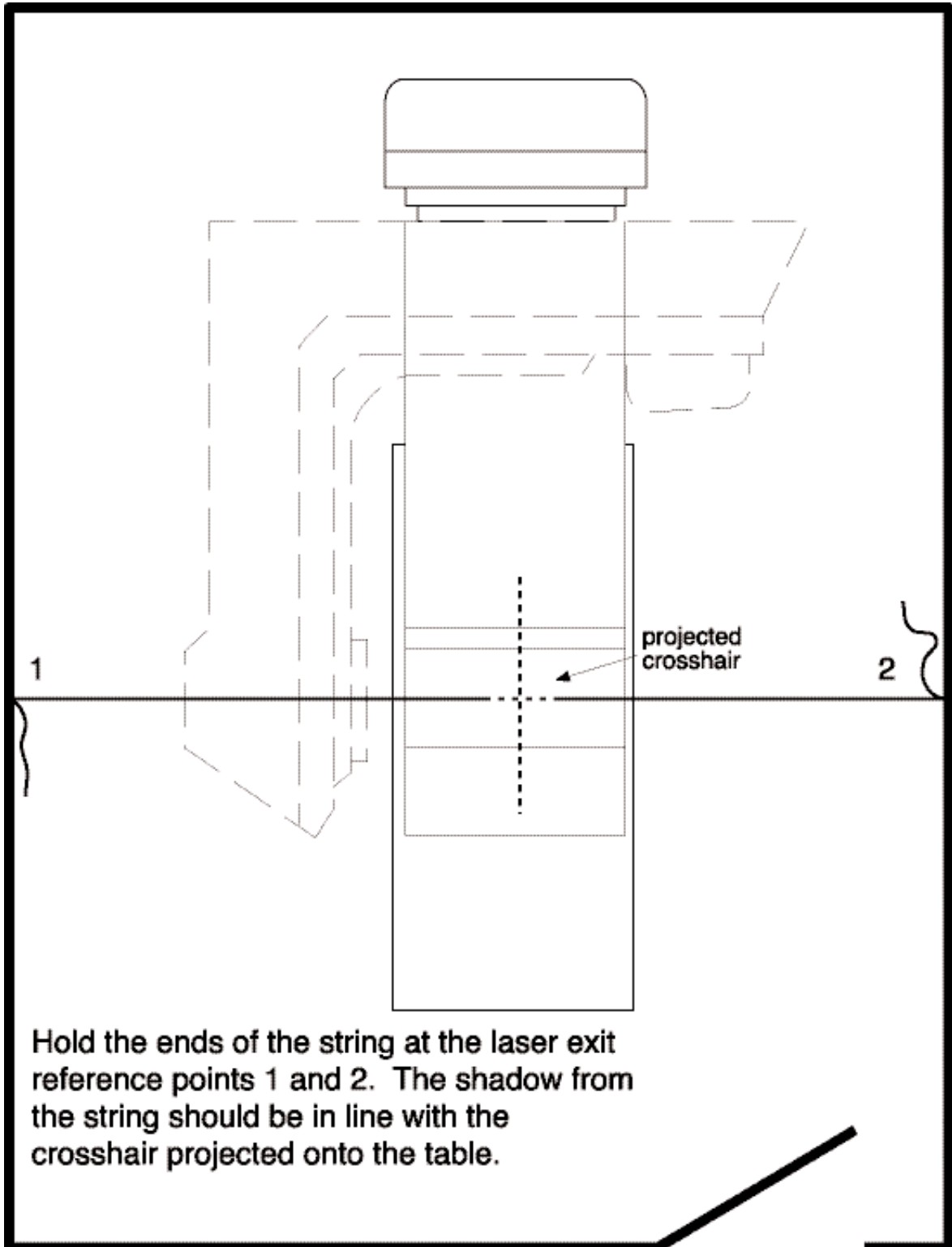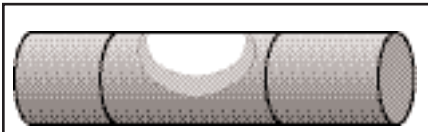
Ceiling Laser Installation
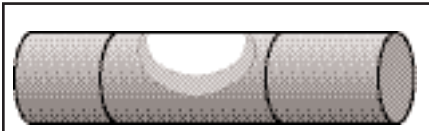
Use a level to verify:

- Gantry is level each time it is rotated
- Template is placed accurately on wall
- Crosshairs on wall are at 90° angles

1. Level gantry at 0° and place the table at isocenter height.

2. Tape a piece of paper to the table.

3. Project a crosshair and mark the center point with a pencil.

4. Move collimator out of the way.

5. Hold a plumb bob from the ceiling so that the bottom weight hits the dot on the table. The point at which the string hits the ceiling indicates the laser exit reference point. Mark this with a pencil. *Figure 15*

6. Use the template to mark the location of the mounting holes.

7. Drill the mounting holes.

8. Unplug the laser and remove the cover.

9. Attach washers and screws and mount the laser to the ceiling.

10. Plug in and turn on laser.

11. The center of the laser crosshair should correspond with the dot on the table.

12. Raise and lower the table. The crosshair should align for the entire course. Refer to Laser Positioning Adjustments on pages 20 through 29.

NOTE: If mounted in a recess, cut a hole in the ceiling tile large enough to allow the entire cross to be projected.
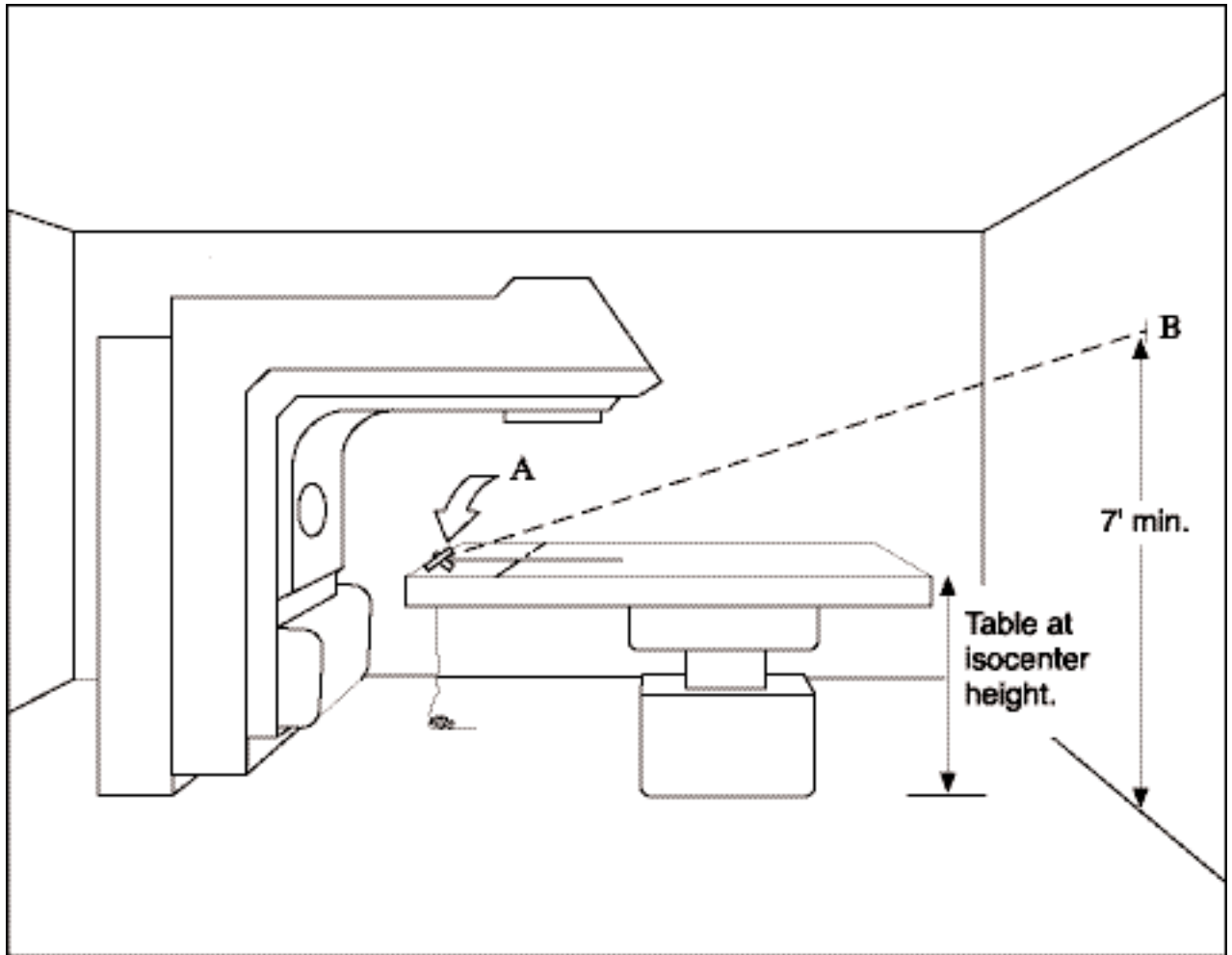
Figure 16

Use a string and the ceiling laser crosshair to determine the placement of the sagittal laser.

Use a level to verify:

• Gantry is level each time it is rotated

• Template is placed accurately on wall

• Crosshairs on wall are at 90° angles

QUICK 📄

☐ laser lines overlap

☐ front pointer lines up with the laser lines

☐ lines are straight up and down

☐ lines are sharp and focused

Sagittal Laser Installation

The Sagittal Laser is mounted high on the wall (room layout). Minimum height: 7', the higher the better.

1. Set the table to isocenter height.

2. Use the crosshair from the ceiling laser as a reference and tape a plumb bob string to the center of the table so that the string shadow aligns with the crosshair. (Point A in *Figure 16*)

   If your system does not contain a ceiling laser, use the collimator-projected crosshair. Be sure to check for collimator accuracy. (Refer to page 9).

3. Move the table up and down to verify tracking of the string shadow.

4. The point at which the string hits the wall indicates the center of the vertical laser exit reference point. (Point B in *Figure 16*)

5. Use the template to determine the location of the mounting holes.

6. Drill the mounting holes.

7. Unplug the laser and remove the cover.

8. Attach washers and screws and mount the laser to the wall.

9. Plug in and turn on laser.

10. Verify that the laser line tracks the crosshair projected onto the table.

Calibration and Adjustments – *FOCUS - REMOTE CONTROL (Red)*

Warning - Risk of incorrect diagnosis of treatment.

• Isocenter of alignment lasers must coincide with isocenter of diagnostic of treatment equipment. Test alignment of laser daily, before use, for first month of operation and weekly after first month. Newly installed equipment will shift as building walls and floor settle and as building materials dry out. Re-align lasers to isocenter before use, if they have moved.

• The laser must be aligned with the diagnostic or therapy equipment to be safely useful. Only a GAMMEX service technician, Medical Physicist, Biotech Engineer or Service Technician should perform alignment.

Caution - Laser Light Risk of eye damage. Do not stare into beam.

• Alignment procedures need to be performed with laser on.

• Look only at laser light reflected from a diffuse surface (like paper or a wall).

See Simplified Room Layout for general concept of laser alignment.

Removing the Cover

FOCUS - REMOTE CONTROL (Red) routine adjustments can be made with the remote control. Some adjustments and repairs require the removal of the cover. Remove this cover, as follows: First, turn off the laser. Unplug the power cord from the main socket. Remove two screws at the top of the bottom cover using a the 5/64" Allen wrench. Slide the cover up, to disengage it, and lift the cover out.

Plug in the power cord and on laser for adjustments.

To replace the cover after making adjustments, reverse the process. Turn off the laser. Unplug the power cord. Tilt the top of the cover slightly away from the wall. Slide the two bottom fasteners into slots in the bottom end plate. Tilt the top of the cover toward the wall so that two holes in the top corners align with holes in the top end plate. Secure the cover with two side screws at the top corners.

Take care not to jar the laser.

Plug in the power cord.

Calibration and Adjustments – *FOCUS - REMOTE CONTROL (Red)*

GENERAL

Test the alignment of the lasers daily, before use, for the first month after installation. After the first month test the system at least weekly. Isocenter of the alignment lasers must coincide with the isocenter of the diagnostic or treatment equipment.

CEILING AND SAGITTAL LASERS

Tape a piece of typing paper to the table under the gantry (Leveled and Set at 0°). Project a crosshair on the paper from the gantry. Mark the center point. Move the gantry out of the way. Project the Ceiling laser crosshair on the paper. Raise and lower the table. The center of the crosshair should align with the dot on the paper. In the same way the Sagittal line should pass through the dot on the paper.

SIDE LASERS

Turn on both side lasers. Use a piece of typing paper held perpendicular to the laser light. The two-projected laser crosshairs should line up on the paper (*Figure 12)*.

With the gantry at 0° (Leveled and Set at 0°) use a front pointer *(Figure 13)* to verify that both side lasers hit isocenter. If there is not a front pointer, raise the table to isocenter and project a crosshair on the table to verify that the side lasers hit isocenter.

ADJUSTMENTS

In a new installation some building movements can be expected. In most cases the fine adjustments made by pushing the remote control buttons as shown on pages 16 to 19 should be sufficient to make any adjustments.

The remote control adjustments have limited range. If the remote control adjustment is at the end of the range, run it a short distance in the opposite direction. Use a coarse adjustment to come close to the desired position and use the remote control adjustment to zero in.

Pages 20 through 29 outline various adjustments available on the *FOCUS - REMOTE CONTROL (Red)*. In most cases only the remote control horizontal and vertical adjustments will be needed.

Troubleshooting

PROBLEM	POSSIBLE CAUSE	POSSIBLE REMEDY
NO LASER LIGHT	Wall switch not on.	Check switch by turning laser off and on.
	Wall switch not in full on position.	Verify switch lever is in the full on position.
	Plug/connector not plugged in. Plug partially plugged in.	Verify plug is in the fully plugged in position.
	Power supply not functioning.	Use voltmeter to measure the voltage output of the power supply wall plug. If voltage less than 11 or greater than 13 VDC, the power supply will need to be replaced. Call Gammex Sales and Service for assistance.
INTERMITTENT LASER		Use voltmeter and check power supply. See above.

Repair

Warning - Use only repair parts specified by Gammex. Some parts may be similar, but may result in unit drifting out of alignment, early failure or being out of compliance with laser regulations.

See pages 43 through 51 for *FOCUS - REMOTE CONTROL (Red)* repair instructions.

Maintenance & Cleaning

Once installed, Gammex Lasers require no maintenance other than cleaning of mirrors, beam splitters, and lenses according to standard optical practices. Occasional outside dusting of the red plastic window in the cover may be necessary. The window is very delicate. Use only a camera lens brush or other soft brush for this purpose. Clean other outside surfaces of the laser, receiver and transmitter with a soft cloth slightly moistened with water or a mild detergent solution, then wipe the surface with a dry cloth. Do not use any type of abrasive pad, scouring powder or chemical solvent such as thinner, benzene, alcohol or disposable wipes as these may damage the finish. Should a laser fail to function properly, contact Gammex Sales and Service.

Laser Diode/ Electronics Replacement

Laser Apertures

Detent
Set Screw

Front View

Nameplate

Optics Module

Focusing Mechanism

A

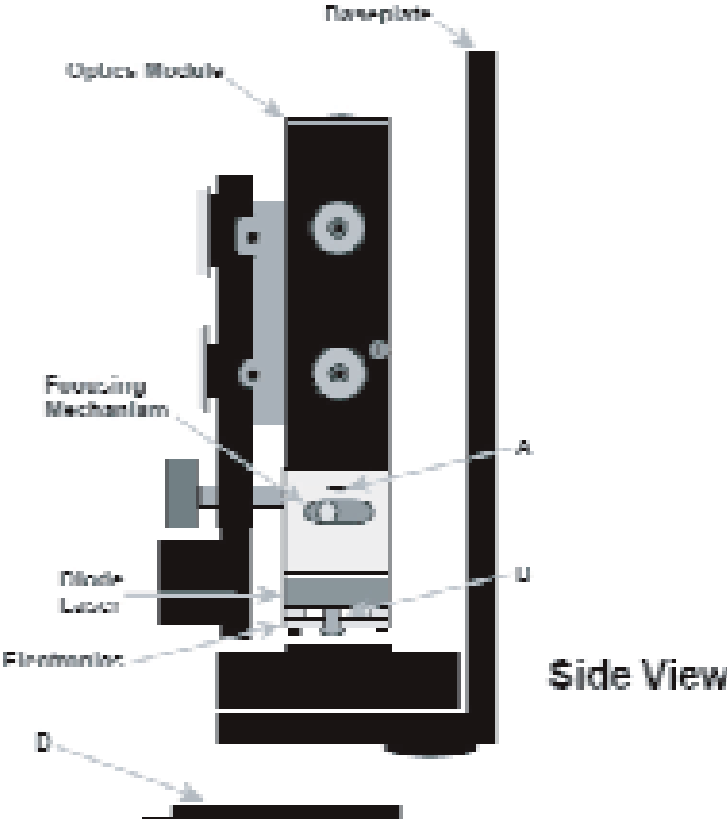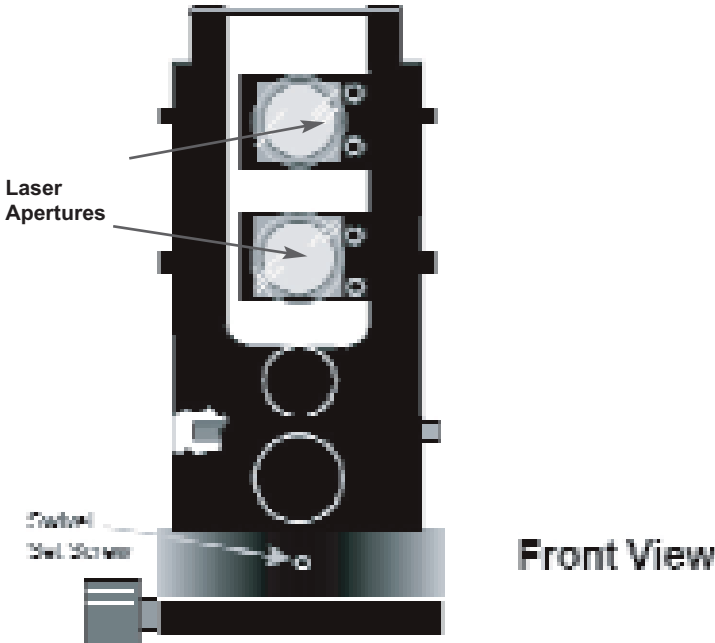Diode Laser

U

Electronics

Side View

D

Repair

Warning - Use only repair parts specified by Gammex. Some parts may be similar, but may result in unit drifting out of alignment, early failure or being out of compliance with laser regulations.

REPLACING THE WINDOW

*   Remove old window.

*   Clean inside of cover with alcohol to remove oils

*   Remove adhesive backing from window and install new window being careful to prevent wrinkles by starting at one side and slowly working to other side.

REPLACING CIRCUIT BOARD AND LASER DIODE ASSEMBLY

Caution Laser Light. Risk of eye damage.

*   Lasers must be less than 1 mw to meet Class II power levels. The laser diode and circuit board must be replaced as a set since they are adjusted at the Gammex factory to meet the Class II power limits.

*   Do not dismantle the laser diode assembly as this could cause exposure to laser radiation exceeding class II limits. No user repairable parts are inside this assembly.

*   If the laser diode or circuit board fails, they can be easily replaced with a new assembly.

Tools Required:
0.050", 1/16" & 5/64" Hex Wrenches (Allen Wrenches).

1. Turn the power off. Remove the 12-vdc power plug. Remove the power plug cord by unscrewing the bushing. Remove the cover by unscrewing two screws near the top of the cover and lifting it up and out to clear the end plates.

2. In performing this replacement, handle the materials carefully and take care not to lose the hardware.

3. Loosen the swivel screw using a 0.050" hex wrench and rotate the optics module 90° to either side.

4. Remove the flat head screw (A) using a 5/64" hex wrench. *It is easier to remove these screws, and slide out the focus module, if the tension on the optics has been released. To release the tension, press the top of the optics module toward its support between the thumb and forefinger. It will rotate against the spring tension.*

Repair and Parts Information   *43*

REPLACING CIRCUIT BOARD AND LASER DIODE ASSEMBLY (continued)

5. Rotate the optics module to the 90° position on the other side (Rotate 180°).

6. Remove the second flat head screw (A) using a 5/64" hex wrench. This will free the focus module (with the small circuit board). Slide this module out to the side where the cable comes out. Take care not to disrupt the optics module.

7. Remove the two button head screws (B), using a 1/16" hex wrench, that hold the laser diode/circuit board assembly to the focus module. Remove the laser/circuit board assembly.

8. Remove the three #4 button head screws, using a 3/32" hex wrench, that hold the large circuit board to the end plate. The complete laser/electronics assembly has now been removed.

9. Replace the two circuit boards and laser assembly.

10. Reassemble the unit reversing the dis-assembly process. Do not put the cover on, at this time. Plug in the power cord and turn on the laser.

11. Focus the laser and check alignment and make adjustments (See the Calibration and Adjustments Section.).

12. Adjust the brightness to match the other lasers. Lasers are shipped with brightness at the maximum allowed. Turning up the brightness over that level will burn out the laser. The brightness is controlled on the large circuit board by the silver screw on a potentiometer. This screw has a single slot and points perpendicular to the circuit board.
WARNING!   POTENTIOMETERS SEALED WITH RED GLYPTAL ARE FACTORY ADJUSTMENTS ONLY!

   Breaking any glyptal seal attempting to change a factory setting voids warranty and risks excessive laser intensity.

13. Turn off the *FOCUS R*. Unplug the power cord. Replace the cover. Re-attach the power cord and turn the *FOCUS R* on. Check the alignment again.

Do not dispose of the old Laser diode/PCB assembly.
Return this assembly to GAMMEX.
Call GAMMEX Sales and Service at 1-800-GAMMEX-1

Repair

REPLACING THE TRANSMITTER BATTERIES

The transmitter has a battery compartment on the back that can be opened by pushing down on the catch and sliding it toward the end of the case. The cover may be tight. It may be necessary to very carefully pry the opening apart at the parting line
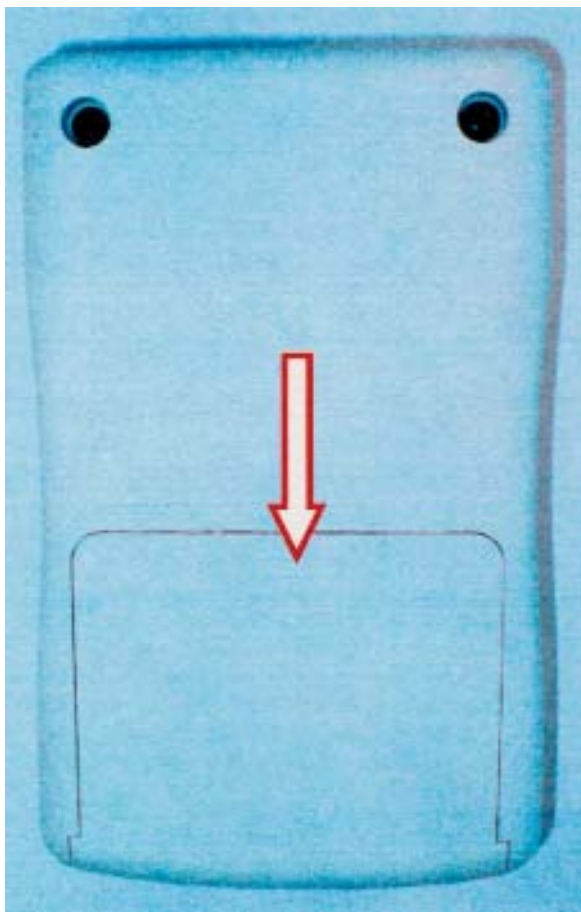
REPLACING THE TRANSMITTER BATTERIES (continued)

Positive End

Positive End
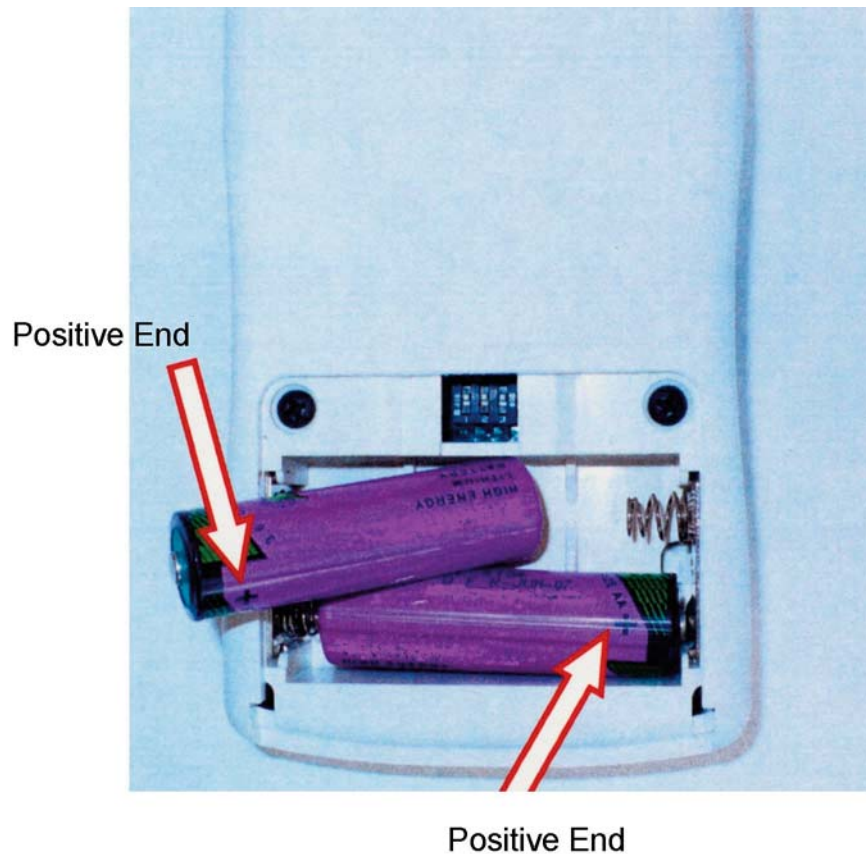
It is very important to replace the batteries with the proper polarity in the right direction as shown. The spring contact always matches the negative (-) end. These batteries are not rechargeable. Do not try to recharge them. They are long life lithium batteries. Transmitter batteries will not often require replacement, but when they do, they are available from Gammex Sales Department.
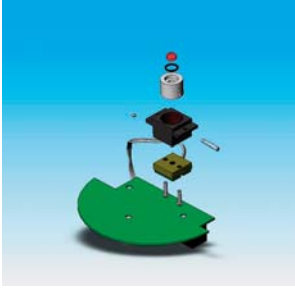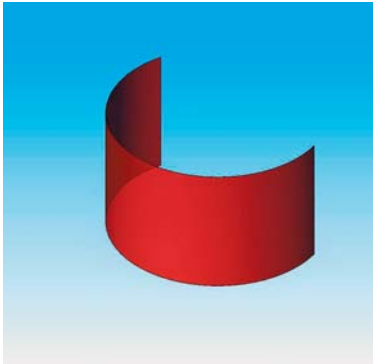
DISMANTLING

The *FOCUS - REMOTE CONTROL (Red)* can be removed from the wall by following the reverse of the installation instructions.

DISPOSAL

The *FOCUS - REMOTE CONTROL (Red)* laser contains steel, aluminum, lead, lead alloys copper, glass, brass, lead-free paint and plastic. Recycle according to your applicable laws.

Parts List

PART NO.	DESCRIPTION	
602403	PCB DIODE	
007589	POWER SUPPLY 12VDC Universal Medical Grade POWER SUPPLY PLUGS Set of 4	
007557	WINDOW: RED LENS	
007575	LITHIUM BATTERY	

Specifications

Laser Beam Output
Maximum Power ....0.5 mW (each beam)
Range ....Up to 6.0 m(20 ft.)
Line Width..< 0.8 mm @ 3 m (7 ft.)
Beam (Line) Divergence ....15-17°
Drift...No measurable drift
WaveLength ....6350Å (635 nm) visible red
Visibility ....Clearly visible in strong ambient light
Intensity ....User adjustable to desired levels
Pulse Duration and Repetition Rate.............................Continuous (No Pulse) Output

Laser Beam Adjustment
Horizontal Range of Vertical Projection..330 cm @ 3.05 m
Vertical Range of Horizontal Projection ....Plus 100 cm /minus 300cm @ 3 m
Line angle adjustment range ....±180 degrees
Mounting Turret... adjustable to ±45°

Laser Dimensions
Length..20 cm (8.0 in.)
Width..14.0 cm (5.5 in.)
Depth. ....12.0 cm (4.7 in.)
Weight..1.8 kg (4.0 lbs.)

Universal Power Supply................includes adapters for U.S. and international use.
Power Requirements..100 VAC - 240 VAC. 50-60 Hz, 0.4 A

Environmental Conditions

Operating Temperature:...0 - +60°C

Storage Temperature:..-20 - +75°C

Operating Humidity: ....0 - 85% Relative Humidity (no dew condensation)
Storage Humidity:..........................0 - 85% Relative Humidity (no dew condensation)

Certification
Complies with Center for Devices and Radiological Health regulations for Class II Lasers.

Compliance Information
Complies with 21 CFR 1040.10 and.11:April, 2008 for Class II visible lasers.
Complies with IEC 60825-1:2007 for Class II visible lasers.
Complies with IEC 61140:2001 for Class II equipment
CE marked.
Power supply UL, cUL, GS and CE marked.
FCC ID: WXY-GLDRC
IC: 8084A-GLDRC
This device complies with part 15 of the FCC Rules. Operation is subject to the following
two conditions. (1) This device may not cause harmful interference, and
(2) this device must accept and interference received, including interference that
may cause undesired operation.

WARNING: No modifications may be made to the remote control without the expressed written consent of Gammex, Inc.

Making unauthorized changes will void authority to use this equipment.

Guidance and Manufacturer's Declaration – Emissions		
The GLD450-RC, GLD500-RC & Remote Control is intended for use in the electromagnetic environment specified below. The customer or user of the GLD450-RC, GLD500-RC and Remote Control should ensure that it is used in such an environment.		
Emissions Test	Compliance	Electromagnetic Environment Guidance
RF Emissions CISPR 11	Group 1	The GLD450-RC, GLD500-RC & Remote Control uses RF energy only for its internal function. There for its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF Emissions CISPR 11	Class B	
Harmonics IEC 61000-3-2	Class A	
Flicker IEC 61000-3-3	Compliance	The GLD450-RC, GLD500-RC & Remote Control is suitable for use in all establishments, including domestic, and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.

Guidance and Manufacturer's Declaration – Immunity

The GLD450-RC, GLD500-RC & Remote Control is intended for use in the electromagnetic environment specified below. The customer or user of the GLD450-RC, GLD500-RC and Remote Control should ensure that it is used in such an environment.

Immunity Test	EN/IEC 60601 Test Level	Compliance Level	Electromagnetic Environment Guidance
ESD EN/IEC 61000-4-2	$\pm$6kV Contact $\pm$8kV Air		
EFT EN/IEC 61000-4-4	$\pm$2kV Mains $\pm$1kV I/Os		
Surge EN/IEC 61000-4-5	$\pm$1kV Differential $\pm$2kV Common		
Voltage Dips/Dropout EN/IEC 61000-4-11	>95% Dip for 0.5 Cycle 60% Dip for 5 Cycles 30% Dip for 25 Cycles >95% Dip for 5 Seconds		
Power Frequency 50/60 Hz Magnetic Field EN/IEC 61000-4-8	3A/m		

Guidance and Manufacturer's Declaration – Emissions
The GLD450-RC, GLD500-RC & Remote Control is intended for use in the electromagnetic environment specified below. The customer or user of the GLD450-RC, GLD500-RC and Remote Control should ensure that it is used in such an environment.

Immunity Test	EN/IEC 60601 Test Level	Compliance Level	Electromagnetic Environment Guidance
Conducted RF EN/IEC 61000-4-6 Radiated RF EN/IEC 61000-4-3	3 Vrms 150 kHz to 80 MHz 3V/m 80 MHz to 2.5 GHz	(V1) Vrms (E1) V/m	Portable and mobile communications equipment should be separated from the GLD450-RC, GLD500-RC and Remote Control by no less than the distances calculated/listed below: D=(3.5/V1)(Sqrt P) D=(3.5/E1)(Sqrt P) 80 to 800 MHz D=(7/E1)(Sqrt P) 800 MHz to 2.5 GHz Where P is the max power in watts and D is the recommended separation distance in meters. Field strengths from fixed transmitters, as determined by an electromagnetic site survey, should be less than the compliance levels (V1 and E1). Interference may occur in the vicinity of equipment containing a transmitter.

Recommended Separations Distances for the GLD450-RC, GLD500-RC and Remote Control

The GLD450-RC, GLD500-RC and Remote Control are intended for use in the electromagnetic environment in which radiated disturbances are controlled. The customer or user of the GLD450-RC, GLD500-RC and Remote Control can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF Communications Equipment and the GLD450-RC, GLD500-RC and Remote Control as recommended below, according to the maximum output power of the communications equipment.

Max Output Power (Watts)	Separation (m) 150kHz to 80 MHz $D=(3.5/V_1)(\sqrt{P})$	Separation (m) 80 to 800 MHz $D=(3.5/E_1)(\sqrt{P})$	Separation (m) 800MHz to 2.5 GHz $D=(7/E_1)(\sqrt{P})$
0.01	.1166	.1166	.2333
0.1	.3689	.3689	.7378
1	1.1666	1.1666	2.3333
10	3.6893	3.6893	7.3786
100	11.6666	11.6666	23.333

Technical Support

Technical support is available from Gammex Service Representatives who are available to work with facility planners, architects and hospital personnel throughout the planning and installation process.
Contact the Gammex Service department at 1-800-232-9699.

Product Warranty

Gammex Inc. warrants its patient positioning equipment to be free from defects in materials and workmanship under normal use and service for 1 year from the date of shipment. The sole obligation of Gammex Inc. under this warranty is to repair or replace without charge or to refund the purchase price, at the option of Gammex Inc., of any parts which its examination shall have disclosed to be defective, provided that Buyer shall have given to Gammex Inc., a written notice of the claimed defect no later than 7 days after the end of the warranty period (one (1) year of the date of shipment of such equipment to Buyer). At the request of Gammex Inc., Buyer, at its expense, shall return the claimed defective part to Gammex Inc.

<div align="center">

THIS CLASS II LASER PRODUCT COMPLIES
WITH DHHS REQUIREMENTS PURSUANT TO
21 CFR, SUB-CHAPTER J.

</div>

DISCLAIMER OF OTHER WARRANTIES

The aforesaid warranty rights are buyer's exclusive remedies and are in lieu of any other remedies, obligations, or rights, including, without limitation, any other warranties, expressed or implied (e.g., implied warranties of merchantability or fitness for a particular purpose). Under no circumstances shall Gammex Inc. be liable for any incidental, indirect, special or consequential damages or for any other loss, damage, penalty or expense of any kind, including, without limitation, loss of profits or overhead, reimbursement, personal injury or property damage. The aforesaid warranty obligation of Gammex Inc. constitutes its sole liability, and under no circumstances, shall the maximum liability of Gammex Inc., under any legal theory(e.g., contract, warranty, negligence, promissory estoppel, strict liability, misrepresentation, tort) and for any reason whatsoever(e.g., defect, delay or otherwise) exceed the purchase price of the defective part regardless whether the claim is asserted by buyer or any other person or entity. The liabilities of Gammex Inc. as above set forth, shall not be extended because of advice given by it in connection with the design, installation or use of the equipment or parts therefore.

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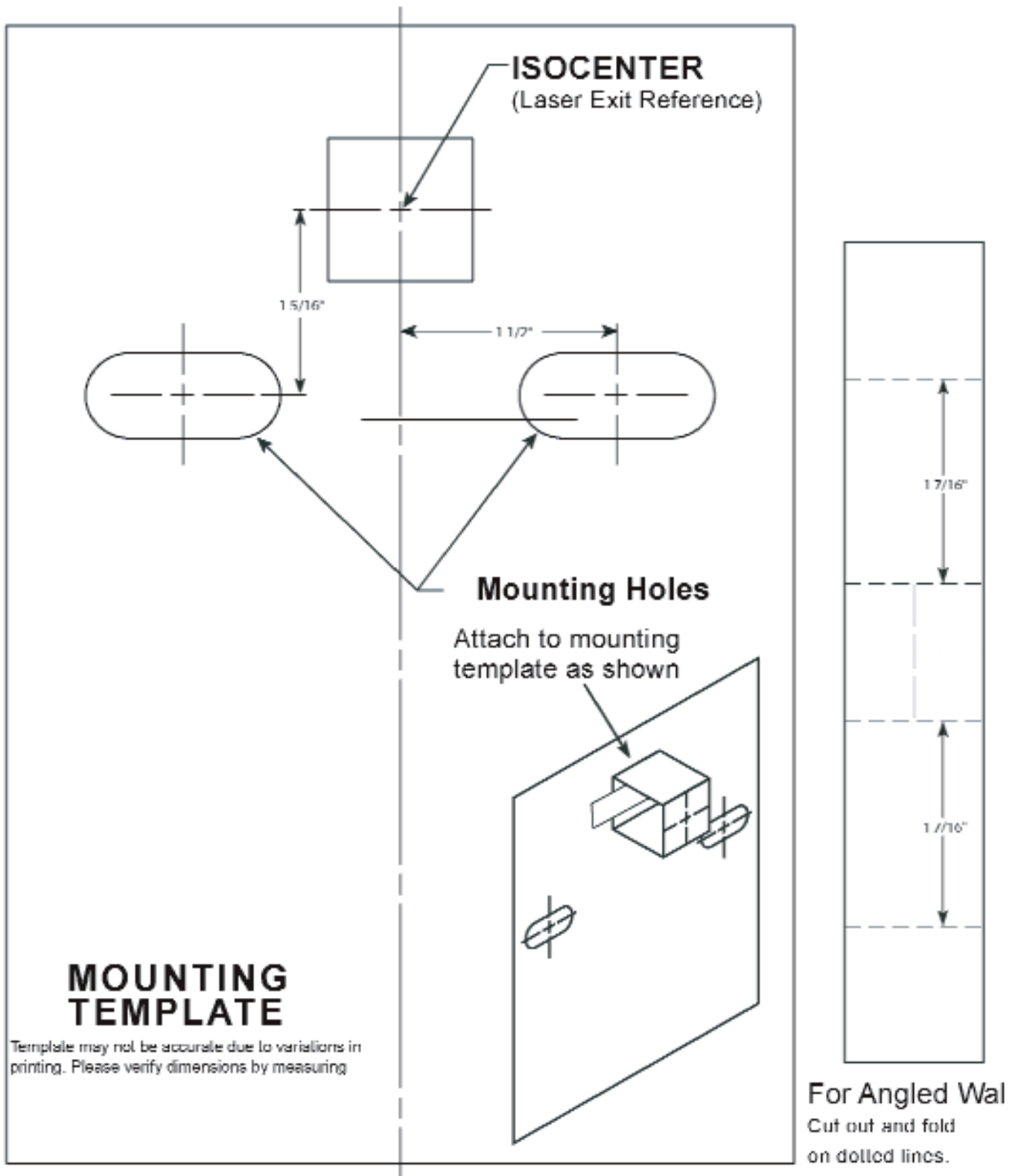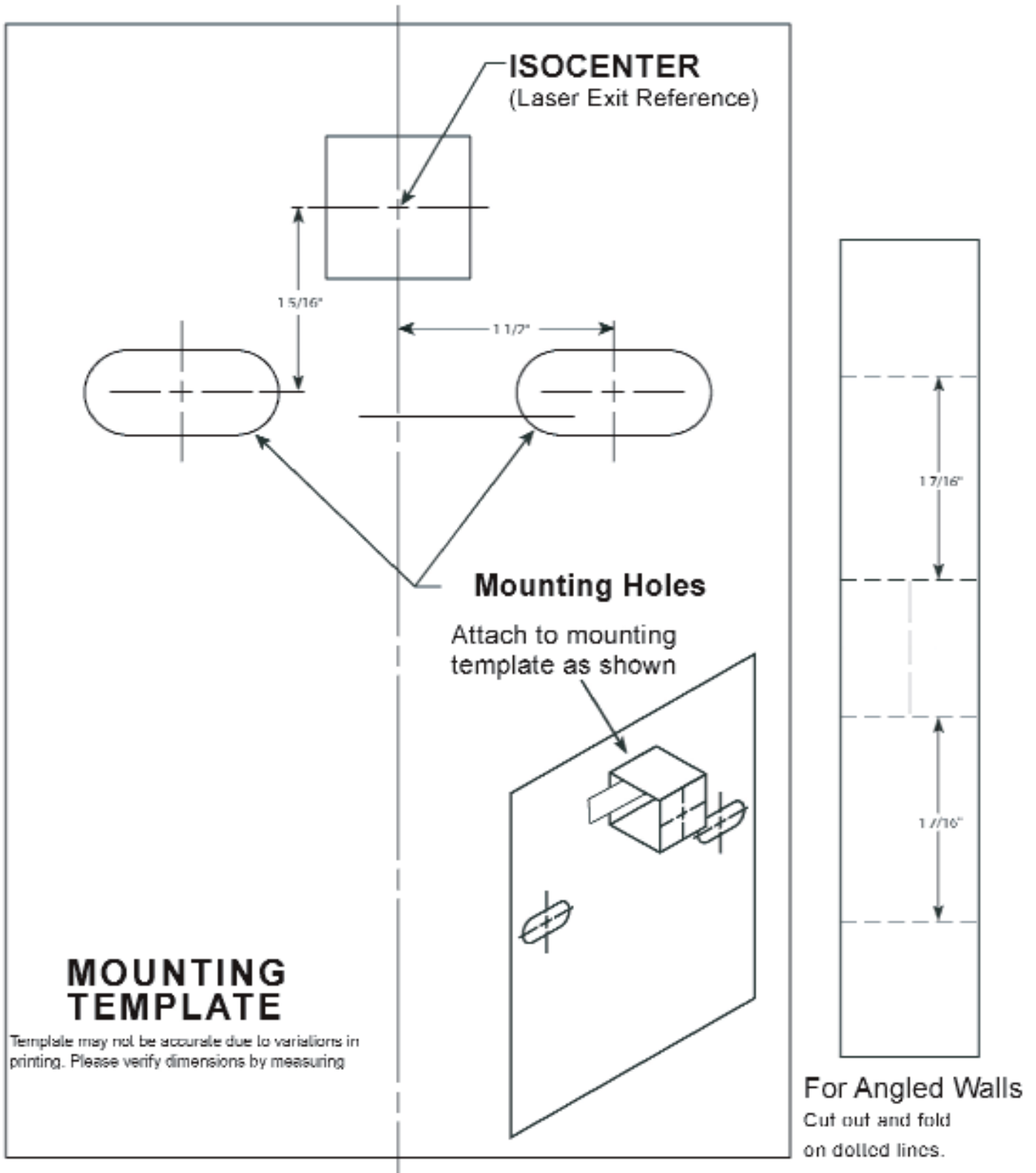
ISOCENTER
(Laser Exit Reference)

1 5/16"

1 1/2"

Mounting Holes

Attach to mounting
template as shown

**MOUNTING
TEMPLATE**

Template may not be accurate due to variations in
printing. Please verify dimensions by measuring

1 7/16"

1 7/16"

For Angled Wal
Cut out and fold
on dotted lines.

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ISOCENTER
(Laser Exit Reference)

1 5/16"

1 1/2"

Mounting Holes

Attach to mounting
template as shown

17/16"

1 7/16"

**MOUNTING
TEMPLATE**

Template may not be accurate due to variations in
printing. Please verify dimensions by measuring

For Angled Walls
Cut out and fold
on dotted lines.

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Product Ordering Information and Customer Service

Gammex is committed to satisfying our customers' needs. If you have any questions, comments or suggestions regarding our products and service, please call or fax us. Please contact a GAMMEX dealer or representative for a quotation or for a detailed description of our ordering policies, warranties, delivery policy, conditions of sale, damaged goods policy, and returned goods policy.

In the United States, Sales Department hours are:
7:30 a.m. through 5:30 p.m. (Central Time).

SALES/CUSTOMER SERVICE:	608-828-7000
TOLL FREE (U.S. and Canada only):	800-426-6391
FAX:	608-828-7500
Sales e-mail:	sales@gammex.com

In the United States, Service Department hours are:
7:30 a.m. through 4:30 p.m. (Central Time).

SERVICE DEPARTMENT:	608-828-7000
TOLL FREE (U.S. and Canada only):	800-232-9699
FAX:	608-828-7500
Service e-mail:	support@gammex.com

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P.O. Box 620327
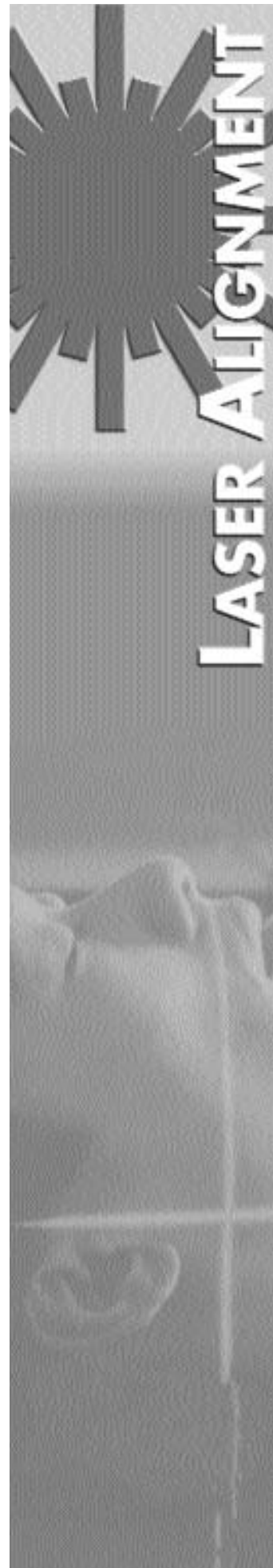Middleton, WI 53562-0327   USA

On the internet at: www.gammex.com

VISA, MasterCard and American Express accepted.

VISA **MasterCard** **AMERICAN EXPRESS Cards**

GAMMEX LASERS®

LASER ALIGNMENT

All products and specifications are subject to change without notice.

LASER ALIGNMENT

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