

# **AGL**

**CONSTRUCTION LASERS  
& MACHINE CONTROL SYSTEMS**



## **GradoPlane 10**

### **Multipurpose Laser Operator's Manual**

# GENERAL INFORMATION

Thank you for buying the GradoPlane 10 laser! Although the GradoPlane 10 is simple to use, we recommend that you read this manual before operating the laser.

## Description

The GradoPlane 10 is a visible universal laser that can be used for leveling, vertical alignment, squaring, and single and dual slope grade control.

It has a digital grade display and is ideal for machine control and other dual grade applications. It's totally waterproof and has a beam designed for pipelaying. It also has scanning and constant squaring for interior jobs.

Other advanced features include: totally automatic self-leveling in both horizontal and vertical modes; electronic calibration by the user; and a detachable keypad that can be used as a remote control.

## Specifications

Recommended use	1,000 ft. (300 m) diameter
Accuracy	$\pm 3/16''$ at 100 ft.
Leveling range	$\pm 10\%$
Grade range	-10% to +10% in X,Y & Z
Rotation speeds	60, 150, 300, 450, 600, 700 rpm
Scanning lengths	Short, medium, and long
Laser battery	NiMh rechargeable
Charging time	15 hours
Battery life	40 hours
Remote control batteries	2 AAA alkaline
Dimensions	5" x 4 _" x 8 1/2" 12.5 x 11.5 x 21.9 cm
Weight	7 _ lbs. (3.5 kg)
Tripod mount	5/8 - 11
Environmental	Laser is waterproof: IP67 Remote control is weather-resistant
Laser Diode	Visible 635 nm, <5mW
CDRH/IEC Classification	Class 3R

# Radio Frequency Interference

**WARNING:** This equipment complies with Part 15 of the FCC rules. Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of FCC rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there's no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

## Notice for Canada

This Class B digital device meets all requirements of Canadian Radio Standards Specification RSS-210.

Cet appareil numérique de la Class B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

## Location of FCC labels

FCC  
label  
(back of  
laser)



FCC label  
(back of  
detachable remote  
control/keypad)

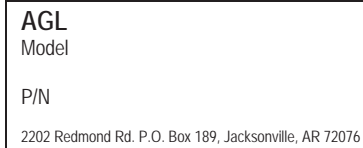
# Safety Labels

## Back of laser:

A CDRH label Warning Label



B Serial no. tag



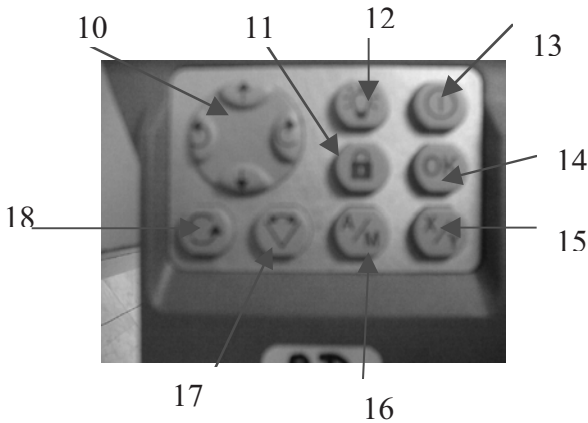
C Aperture label



## Laser overview



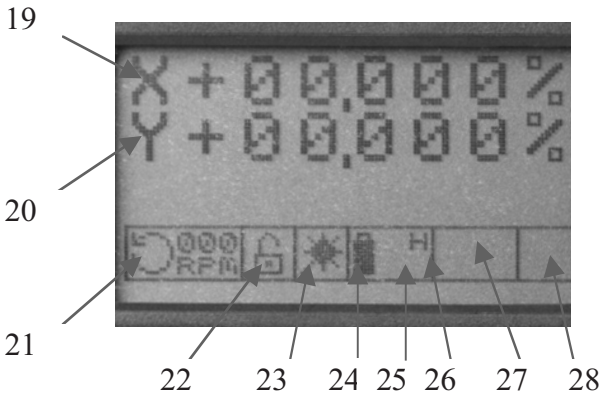
- 1 Rotating laser beam (head enclosed in glass lighthouse)
- 2 Non-rotating laser beam for plumb, squaring, or pipeline
- 3 Sighting notches for X & Y axes
- 4 Remote control with digital display
- 5 Detachable handle
- 6 Charger jack
- 7 Level vial for vertical setup
- 8 On/Off
- 9 Adjustable feet for vertical setup



- 10 Multifunction key
- 11 H.I. Alert
- 12 Backlight for display
- 13 On / Off for remote
- 14 Enter settings for grade
- 15 X or Y axis (or Z axis)
- 16 Automatic / manual mode or (left & right adjustment)
- 17 Scanning
- 18 Rotation

## Remote Control Keypad

## Remote Control Display



- 19 Grade display for X axis
  - 20 Grade display for Y axis (Z axis when in vertical mode)
  - 21 Rotation direction & speed / Scanning
  - 22 H.I. Alert safeguard
  - 22/23 Manual mode (hand symbol)
  - 23 Indicates when level or grade is reached
  - 24 Battery / Charging
  - 25 Out-of-leveling-range indicator
  - 26 Horizontal / Vertical
  - 27 Calibration mode (or Z axis  $\leftrightarrow$  left / right adjustment)
  - 28 Communication status between laser & remote control  
(Or backlight indicator)
- $\Psi$  : radio frequency mode  
 $\uparrow$  : infrared mode

# HOW TO USE THE GRADOPLANE 10

## Setup

### Horizontal

The laser can be used on a 5/8-11 tripod, on a wall mount, or directly on a solid, stable surface.

### Vertical

The laser can be placed directly on a solid, stable surface. If you are using it in a pipe or other confined space, you can detach the handle with a 3mm Allen wrench so it has a narrower profile.

Place the laser on the side with the two adjustable feet (9). Rough level the laser by using the feet to center the bubble in the vertical vial (7).

### Setup range

When the keypad is turned on, an “H” for horizontal mode or a “V” for vertical mode will appear on the display (26). The GradoPlane 10 has a wide self-leveling range; however, if the laser is set up out of the leveling range, a triangle with an exclamation point will appear on the display (25).

## Turning on the laser

Turn on the laser with the On / Off key (8). It does a self-test and beam blinks while laser is self-leveling. After it's leveled, the head rotates and keypad symbol (23) stops blinking.

## Remote control / keypad

Turn on the remote control / keypad with the On / Off key (13). The keypad can remain attached to the laser, or it can be detached and used as a remote control. Push up on the remote to remove it from the laser.

The remote will automatically turn off if it is idle for a length of time. Reactivate by pressing the On / Off key (13).

The display can be backlit; press key (12) to activate. A light bulb symbol will appear on the display (28).

The remote is not waterproof. Detach it from the laser before submersing laser in water.

## **Choice of transmission**

There is two-way communication between the laser and the remote control. If the remote is within range and properly communicating with the laser, a symbol ( $\Psi$  or  $\uparrow$ ) will appear on the display (28).

The remote signal can be either radio frequency (RF/ $\Psi$ ) or infrared (IR/ $\uparrow$ ). RF is the default when the laser is turned on.

All laser functions will work in RF or IR mode.

## **Radio frequency**

Turn on the remote control / keypad with the On / Off key (13). An antenna  $\Psi$  (28) indicates it is in RF mode.

## **Infrared**

To switch to IR transmission:

- 1 Turn off the remote control and the laser.
- 2 Turn on the laser again, pressing the On / Off for at least 3 seconds until the head rotates and the beam comes on.
- 3 Turn on the remote control, holding the On / Off key (13) for at least 3 seconds until the display is lit.
- 4 An arrow  $\uparrow$  on the display (28) indicates it's in IR mode.

If the symbol does not appear, verify there's a clear line-of-sight between the laser and remote control when using IR transmission.

Although the IR mode has less range than RF, it may be desirable to use IR if there are multiple lasers on the job site.

## **Automatic / Manual Mode**

The laser is in automatic self-leveling mode when turned on. To put in manual mode, hold down the A / M key (16) for a few seconds. A blinking hand symbol will appear on the display (between 22 & 23), indicating that you're in manual mode.

You *cannot* enter manual mode if you're using H.I. Alert.

CAUTION: In manual mode, the beam rotates even if the laser is not leveled.



## H.I. Alert

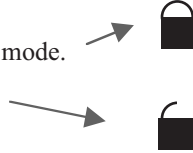
H.I. (height of instrument) Alert stops the laser automatically if the laser is disturbed or moved, preventing inaccurate readings.

It will function only when selected. To activate this safeguard feature, press the “lock” key (11). A lock is also shown on the display (22).

If the lock is closed, it's in the H.I. Alert mode.

If the lock is open, the H.I. Alert option

has not been selected.



If the laser is disturbed while in H.I. Alert mode, the head will stop rotating, the beam will turn off, and the lock symbol (22) will blink on the display.

To start the laser rotating again, press key (11) for 3 seconds (the lock symbol should stop blinking). The head may have relevelled itself to a new position. Check to see if the beam elevation has changed from its original benchmark position.

The laser is no longer in H.I. Alert mode. Press key (11) to return to H.I. Alert.

## Rotation

### Rotation Direction

The rotation symbol (21) on the display shows the direction the head is rotating. To change direction, press the left ← or → right arrows on the multifunction key (10).

### Rotation Speed

The head rotates at 6 speeds: 60, 150, 300, 450, 600, and 720 rpm. 300 rpm is the default setting. You can also stop the rotation (0 rpm).

To change speeds, press the rotation key (18). RPM will blink on the display. Press the ↑ up or ↓ down arrows on multi key (10). The speed selected is shown on the display (21).

The laser beam is more visible at slower rotation speeds. The faster speeds (600 and 720 rpm) are required for many machine control receiver applications.

## Scanning

Scanning mode allows you to see the beam easier at a distance. To switch from rotation to scan, press the scanning key (17). A scanning symbol appears on the display (21).

The scanning beam has three lengths, shown as 1, 2, or 3 on the display. Use the  $\uparrow$  up or  $\downarrow$  down arrows on the multi key (10) to change scan lengths.

Hold down the  $\leftarrow$  or  $\rightarrow$  arrows to move the scan left or right.

To stop scanning, press the rotation key (18).

## Setting Horizontal Grade



The two horizontal axes (X and Y) are marked near the base of the laser. The ends of the axis are designated as + or - to indicate opposite sides of the axis.

Do not confuse this with + (positive) or - (negative) grade.

You can select a single grade (X axis) or dual grade (both X and Y axes) from -10% to +10%.

## Positioning laser in direction of the grade

It is **very important** to position the laser correctly, facing the direction of the grade. Serious errors will occur if the laser's axis of grade is not placed in the proper position.

Before turning the laser on, sight along the notches (3) on top of the laser to position the axis in the direction of grade desired.

For a single grade, the X axis should be perpendicular to the plane of the grade: +X should face toward the grade and -X (by the laser On/Off button) will face away. For dual grade, both X and Y axes need to be placed in the proper orientation.

# Calculating Percent of Grade

Percent of grade is the change in elevation from Point A to Point B over a 100 ft. distance. To calculate %, divide the difference in elevation between A and B by the distance and multiply by 100.

## Example 1 –

### Positive Grade:

Close point A and far point B are 300 ft. apart

Rod reading at A is 6 ft.; at B, 2 ft. Difference in elevation: 4 ft.

Divide 4 by 300 = .01333 x 100 = 1.333.

Percent of grade is + 1.333%

(B is 4 ft. higher than A, so it's a positive grade.)

## Example 2 – Negative Grade:

Close point A and far point B are 120 ft. apart

Rod reading at A is 5 ft.; at B, 6 ft.

Difference in elevation: - 1 ft.

Divide -1 by 120 = -.00833 x 100 = -.833%

(B is lower than A, so it's a negative grade.)

# Selecting Percent of Grade -- X & Y axes

1) Turn on the laser and remote control.

Note: If the laser was used previously with a grade entered in the Z axis, the Y axis will automatically be at that same grade.

2) To select a grade for the X axis, press the X / Y key (15).

The X symbol will blink on the display.

3) Use the four arrows on the multi key (10) to select grade:

➔ positive grade in percent (+ 1%, + 2%, etc. up to + 10%)

⬅ negative grade in percent (- 1%, - 2%, etc. up to - 10%)

⬆ positive grade in thousandths of a percent (+ .001%, etc.)

⬇ negative grade in thousandths of a percent (- .001%, etc.)

4) Press the OK key (14) to enter your selection, or enter a second grade (Step 5). After pressing OK, wait for laser to level to desired grade. The numbers on the display will blink and the head will stop rotating until laser has reached the selected grade.

5) Change to the Y axis by pressing the X / Y key (14). The Y symbol will blink on the screen. Use the arrows on the multi key to select the grade, and press OK to enter both X and Y grades. Laser has reached grade when display stops blinking.

When the laser is turned off, it retains the last grade entered.

## Checking the Grade

It is recommended that you check if the grade you selected is correct and that the laser is positioned correctly in relation to the grade. Use a detector to pick up the beam. A +1% grade will have a 1 ft. rise in elevation over 100 ft. (10 cm rise over 10 meters of run). A -1% grade will have a fall of 1ft. over 100 ft.

## Setting Vertical Grade – Z axis

Follow vertical setup on page 3. If the laser will be submerged, remove the remote control (which is not waterproof).

### Selecting Percent of Grade

Note: If the laser was used previously with a grade entered in the Y axis, the Z axis will automatically be at that same grade.

- 1) To enter a grade in the Z axis, press X / Y key (15). The Z symbol will blink on the display.
- 2) Use the arrows on the multi key (10) to select a grade (see Step 3 in "Selecting percent of grade -- X & Y axes").
- 3) Press OK to enter your selection.
- 4) After pressing OK, wait for the laser to level to the desired grade. The numbers on the display will blink and the head will stop rotating until the laser has reached the selected grade.

## Adjusting Beam Left or Right

After placing the laser in vertical position, the plumb beam out the top of the head can be moved to the left or right. This is necessary to line up on a pipeline target, or to do squaring for installing walls and partitions.

When the laser is first placed in vertical, two arrows ⇔ blink on the display (27), indicating left/right adjustment is available. Hold down left ← or right → keys (10) to move plumb beam.

If a grade has been entered, the ⇔ arrows disappear. Press A / M key (16) to put back in left/right adjustment ⇔ mode.

*It is important to check while you're using the laser that it has not been moved and that your setting is still accurate.*

# **Batteries**

## **Laser Battery**

The GradoPlane 10 has a NiMh rechargeable battery that should be charged for 15 hours before first use.

A battery symbol on the display (24) indicates the battery charge.

**Important:** If the battery charge is weak or the battery is discharged, you cannot select a grade setting.

## **Charging the Battery**

1) Remove the cap on the jack located on the side of the laser. Insert the charger plug.

2) Plug the charger into an electrical outlet (110 volts or 220 volts, depending on charger and country).

3) Charge for 15 hours.

There are two charging indicators: when the laser is turned off, a green light blinks in the center of the laser On / Off key (8). When the laser and remote control are turned on, a symbol of a plug will blink on the display (24).

The GradoPlane 10 can be charged while working. If electricity is available on the job site, simply plug in the charger and keep on working.

For optimum life of the battery, it is recommended to charge the battery after fully discharged. To assure battery life, do not charge over 20 hours.

Although the GradoPlane 10 is waterproof, do not charge it while it is in water or submerged.

## **Remote Control Battery**

If the remote control batteries are weak, the display will blink.

Replace the 2 AAA alkaline batteries, using a Phillips screwdriver to open the compartment on the back of the remote.

# Checking and Adjusting the GradoPlane 10

THIS CHAPTER IS VERY IMPORTANT: Here are a few simple instructions to check your GradoPlane 10 for calibration. Remember that the laser is a precision instrument and that it is important that you keep it calibrated and in proper condition. The accuracy of your work is completely your responsibility and you should regularly check your instrument especially prior to important jobs.

## How to Check and Calibrate

The laser has 3 axes: X and Y (horizontal) and Z (vertical).

The two horizontal axes (X and Y) are marked near the base of the laser. The sides of the axis are designated as + or - to indicate opposite ends of the axis. Do not confuse this with + (positive) or - (negative) grade or tilt.



Each end of each axis must be checked for calibration. If needed, the axis can be calibrated using the remote control. You can also take the laser to a service center for calibration.

Check and Calibrate in this order:

Check both sides of X axis.

-- If X is within spec, proceed to check both sides of Y.

-- If X needs calibration, calibrate X.

Check both sides of Y axis.

-- If Y is within spec, proceed to final X to Y check

-- If Y needs calibration, calibrate Y; proceed to X to Y check

Final X to Y check: compare +X, -X, +Y, -Y

Check Z and calibrate if necessary.

## Checking X Axis

- 1) Place the laser on a flat surface or tripod 50 or 100 ft. (30 m) away from a wall. Position so that -X is facing the wall (this is the side of the laser with the On/Off key).
- 2) Turn on the laser and remote control. There must be no grade set in the laser. Both X and Y grade displays must be at 0%.
- 3) Mark the location of the center of the beam. If it's too bright to see the beam, use a detector, or put in scan mode.
- 4) Rotate the laser 180 degrees so that +X faces the wall.
- 5) Mark the location of the center of the beam near the first mark so that both marks are in line, one above the other.
- 6) This has to be within the stated accuracy of  $\pm 3/16''$  at 100 ft. ( $\pm 0.015\%$ ).
- 7) If the marks are close enough, X axis is within calibration. The second axis (Y) must then be checked (see later section).

If the marks are not close enough, the X axis needs to be calibrated (see below).

## Calibrating X Axis

The laser must be calibrated to bring the beam to the center of the two X marks. Calibration is electronic, using the keys on the remote control.

Follow the directions carefully, as once you move the beam while in the calibration mode, you cannot cancel and return to the original position.

- 1) To put the laser in calibration mode, simultaneously press the backlight key (12) and X / Y key (15). A blinking symbol H over a point appears on the display (27) to indicate that you are calibrating a horizontal axis.
- 2) Press the rotation key (18) and choose a rotation speed with the multi key (10). If it's too bright to see the beam, use a detector, or put in scan mode. Note that the H symbol (27) has stopped blinking.
- 3) Press the X/Y key (15) to re-activate the calibration mode. The H symbol will blink again.

4) If you have not moved the laser, use the X marks made in Steps 3 & 5 of “Checking X axis.” Mark the spot that’s halfway between the two marks.

5) Use the left ← and right → arrows on the multi key (10) to move the beam to the halfway mark. If +X is facing the wall, the right arrow moves the beam up and the left arrow, down.

**CAUTION: Do NOT use the up or down arrows.**

This will change the settings of the Y axis.

6) After completing the X calibration, simultaneously press the backlight key (12) and X / Y key (15) to exit calibration mode. This will also turn the laser off.

Turn the laser on again and check the Y axis; if Y is not within spec, calibrate Y.

## Checking Y Axis

1) Rotate the laser 90 degrees so that -Y is facing the wall (this is the side of the laser with the keypad).

2) Mark the location of the center of the beam.

3) Rotate the laser 180 degrees so that +Y faces the wall.

5) Mark the location of the beam center near the first mark.

6) This has to be within the stated accuracy of  $\pm 3/16$ ” at 100 ft. ( $\pm 0.15\%$ ).

7) If the marks are close enough, Y axis is within calibration. Proceed to “Final X to Y Check.”

If the marks are not close enough, Y axis needs to be calibrated.

## Calibrating Y Axis

The laser must be calibrated to bring the beam to the center of the two Y marks. Calibration is electronic, using the keys on the remote control.

Follow the directions carefully, as once you start moving the beam while in the calibration mode, you cannot cancel and return to the original position.

1) To put the laser in calibration mode, simultaneously press the backlight key (12) and X / Y key (15). A blinking



symbol H over a point appears on the display (27) to indicate that you are calibrating a horizontal axis.

- 2) Press the rotation key (18) and choose a rotation speed with the multi key (10). Note that the H symbol (27) has stopped blinking.
- 3) Press the X/Y key (15) to re-activate the calibration mode. The H symbol will blink again.
- 4) If you have not moved the laser, use the Y marks made in Steps 2 & 5 of “Checking Y axis.” Mark the spot that’s halfway between the two marks.
- 5) Use the up ↑ and down ↓ arrows on the multi key (10) to move the beam to the halfway mark. If +Y is facing the wall, the up arrow moves the beam up, the down arrow, down.

**CAUTION: Do NOT use the right or left arrows.**

This will change the settings of the X axis.

- 6) After completing the Y calibration, simultaneously press the backlight key (12) and X / Y key (15) to exit calibration mode. This will also turn the laser off.

Turn the laser on again and do “Final X to Y Check.”

## **Final X & Y Check**

As a final check of the horizontal axes, compare X and Y axes to each other to be sure that your adjusted calibration is within the specs of  $\pm 1/8$ ". The marks for +X and -X, +Y, and -Y should be no more than  $1/4$ " apart. If X and Y are within spec, proceed to checking Z axis.

## **Checking Z Axis**

- 1) Place the laser in vertical mode, on a solid, stable surface about 20 ft. away from a plumb line (plumb bob or heavy object hanging on a string, at least 8 ft. high). You will be comparing the rotating beam to the plumb line. If you need to calibrate, the beam will be easier to see in a darkened room.
- 2) Rough level the laser using the adjustable feet to center the bubble in the vertical vial.
- 3) Turn on the laser and remote control. There must be no grade set in the laser. The Z grade display must be at 0%.

4) Use either scan or rotation mode. Using the scanning beam is easier, but if you cannot see the beam, work in rotation mode with a detector.

To change from rotation to scan mode: press scan key (17) and choose the widest scan length – 3 – with the up ↑ arrow of the multi key (10).

5) Move the scan to the wall over the plumb line, using the left ← and right → arrows. You can also slide the laser left or right to line up the beam over the plumb line.

6) Move the scan up and down the entire length of the plumb line. If the beam is slanted, and not vertical like the plumb line, the Z axis needs to be calibrated.

## Calibrating Z axis

The laser must be calibrated to bring the rotating Z beam parallel to the plumb line. Calibration is electronic, using the keys on the remote control.

Follow the directions carefully, as once you start moving the beam while in the calibration mode, you cannot cancel and return to the original position.

1) To put the laser in calibration mode, simultaneously press the backlight key (12) and X / Y key (15). A symbol V over a point appears on the display (27) to indicate that you are calibrating the vertical axis.

2) Choose either scan or rotation mode. Using the scanning beam is easier, but if you cannot see the beam, work in rotation mode with a detector.

To scan: Press scan key (17) and choose the widest scan length – 3 – with the multi key (10). Move the scan so that it's over the plumb line.

To rotate: Press rotation key (18) and choose a rotation speed with the multi key (10).

3) Press the X/Y key (15) to re-activate the calibration mode. The V symbol will blink.

4) Use the up and down arrows on the multi key (10) to move the beam until it's perfectly vertical and parallel to the plumb line. Move the laser slightly so that the beam is over the plumb line for the final check.

CAUTION: Do NOT use the left or right arrows.

5) After completing the Z calibration, simultaneously press the backlight key (12) and X / Y key (15) to exit calibration mode. This will also turn the laser off.

## Cone error checking

1) Set up the laser about 2 feet away from a wall (a) or pole and 100 feet from another wall (b) or pole.

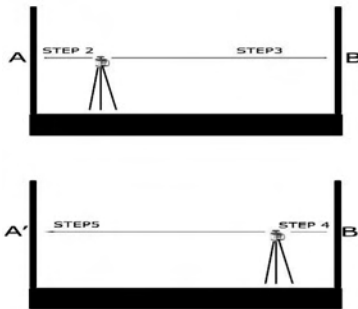
2) Turn the laser on. After it has self-leveled, mark the location of the beam on the near wall (a). Always mark the center of the beam. If it's too bright to see the beam, use a detector.

3) Rotate the laser 180°. Mark the location of the beam on the far wall (b).

4) Now set up the laser about two feet away from the far wall. Mark the beam (b') near the first mark (b).

5) Rotate the laser 180°. Mark the location of the beam on the other wall (a'), near the first mark (a).

6) Compare the two sets of marks on the walls. If the difference between aa'-bb' exceeds 1/4", contact your local service center.



# Care and Handling

## CAUTION

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

- 1) The GradoPlane 10 is a precision instrument that must be handled with care. Avoid shock and vibrations.
- 2) After use, it's recommend that you wipe the laser dry and store in a dry place. Do not store the laser in its case if the laser or the case are wet.
- 3) Do not store the laser at temperatures below  $-4^{\circ}\text{F}$  ( $-20^{\circ}\text{C}$ ) or above  $176^{\circ}\text{F}$  ( $80^{\circ}\text{C}$ ), because the electronic components could be damaged.
- 4) To maintain the precision of your laser, check and adjust it regularly.
- 5) Keep the glass lighthouse of the laser clean with a soft cloth and glass cleaner.

## Warranty

Your GradoPlane 10 laser is guaranteed to be free of manufacturing defects for a period of one year. Any abnormal usage, or if the instrument has been subjected to shock, will void this warranty. Under no circumstances will the liability of the manufacturer exceed the cost of repairing or replacing the instrument.

Disassembling the laser by other than qualified technicians will void the warranty. Specifications are subject to change without notice.

The manufacturer warrants its measuring instruments against all manufacturing defects for a period of one year from date of purchase. If during the warranty period, the product is considered as defective by the manufacturer, the latter will decide whether to repair or exchange the product. The only obligation and sole recourse of the buyer will be limited to this repair or exchange. The manufacturer, the distributor, or the retailer will in no case be responsible for any incident or consequence, damage, etc. relative to the use of those instruments.

**LIMITS AND EXCLUSIONS:** The warranty will not apply to any damage resulting from negligence, accident, misuse, repair, or storage, or in case of abnormal use.



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