

PRO SHOT™ *L4.7* & MAGNUM

Operations Guide



Guardian Warranty • **36 MONTHS** • Guardian Warranty

Laser
excellence
since 1991

Introduction

Thank you for purchasing a Pro Shot™ **L4.7** or **L4.7 MAGNUM** laser system. You now have the best performing, most accurate laser available, for all your projects.

Pro Shot™ laser models **L4.7** or **L4.7 MAGNUM** are rugged, reliable, high quality products, backed by the industry leading **Guardian** 36 month warranty. Warranty details are printed in the back of this manual.

Please take the time to thoroughly read this manual. It contains vital information on how to safely get the most from your investment in laser technology.

Contents

Getting Started	1
Controls and Displays • L4.7	2
Controls and Displays • L4.7 MAGNUM	3
Safety • L4.7 and L4.7 MAGNUM	4
Initial Setup Guidelines	6
Level Setup	7
Vertical and Layout Setup	8
Plumb and Layout Setups • L4.7 MAGNUM	9
Applications	10
Accessories	11
R9 Receiver	12
R8 Receiver	13
Checking & Adjusting Calibration	14
Maintenance and Troubleshooting	16
Guardian Warranty and Specifications	17

Getting Started

Case contents (will vary - may be ordered with different accessories and larger case)

Manual, placard, operator cards

Laser transmitter

Receiver

Battery charger (optional)

C-cell batteries



Battery installation

Always follow recycling directives for electronic waste

- 1 Release battery door with 1/4 turn of screw counter-clockwise

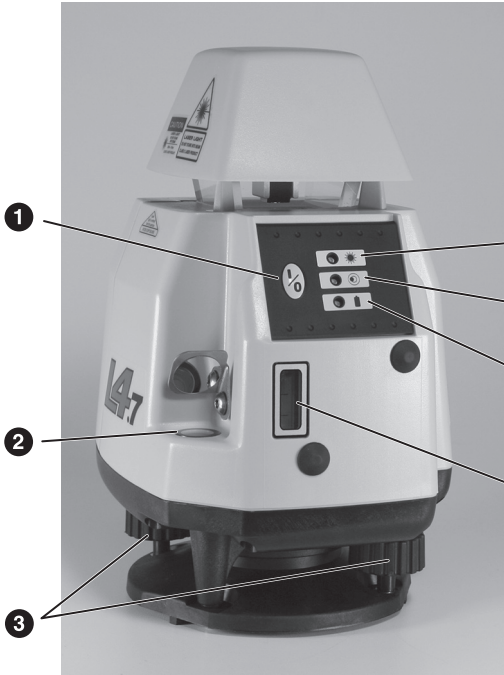


- 2 Install batteries according to the instructions molded on the battery holder



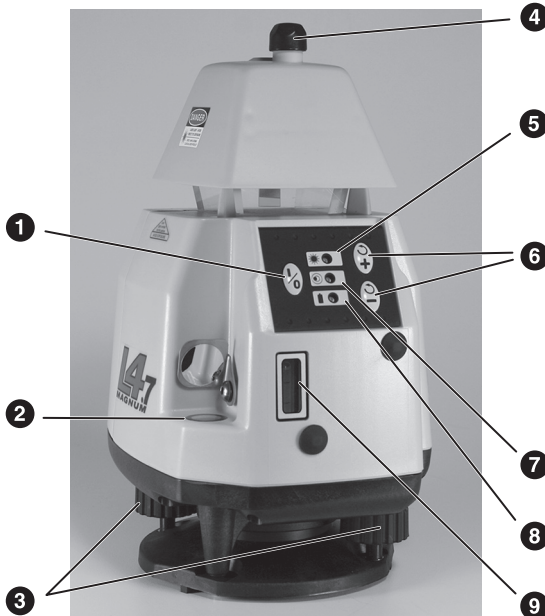
- 3 Secure battery door with 1/4 turn of screw clockwise

Charging jack for rechargeable batteries.
(see pg. 11 for information and **warning**)



Note: The leveling screws are at 90° to the leveling pivot point, which is directly below the circular vial. As you face the control panel and look down at the circular vial, the leveling screw on your right controls bubble movement from left to right. The leveling screw at the back, below the battery door, controls bubble movement from front to back. Turning the leveling screw on your right in a clockwise motion will move the bubble to the right and turning the back leveling screw in a clockwise motion will move the bubble to the back. Turning each screw counter-clockwise will have the opposite effect.

- ❶ **Power button** • Press the power button to turn the laser on or off.
- ❷ **Circular level vial** • The circular level indicates when the laser is rough leveled enough to allow the automatic compensator to work.
- ❸ **Leveling knobs** • Use to center the bubble in the circular level vial. The leveling knobs are also used during vertical alignment (see page 8)
- ❹ **Power indicator** • Displays a green light when the laser is powered on
- ❺ **Leveling limit indicator** • If the laser is powered on, but is not level enough to automatically compensate, the limit indicator will flash, the rotating prism will not spin and no laser beam will be projected.
- ❻ **Low battery indicator** • Displays a red light when the batteries need to be replaced
- ❼ **Vertical vial** • Used to plumb the plane of laser light when the laser is in the vertical mode (see page 8). The laser is completely manual in the vertical mode and will not shut-off if the vertical vial is not centered.



Note: The **L4.7 MAGNUM** laser beam must be rotating with the rotation speed set to maximum when using a receiver.

Note: The leveling screws are at 90° to the leveling pivot point, which is directly below the circular vial. As you face the control panel and look down at the circular vial, the leveling screw on your right controls bubble movement from left to right. The leveling screw at the back, below the battery door, controls bubble movement from front to back. Turning the leveling screw on your right in a clockwise motion will move the bubble to the right and turning the back leveling screw in a clockwise motion will move the bubble to the back. Turning each screw counter-clockwise will have the opposite effect.

- 1 **Power button** • Press the power button to turn the laser on or off.
- 2 **Circular level vial** • Indicates when the laser is close enough to level to allow the automatic compensator to function.
- 3 **Leveling knobs** • Used to center the bubble in the circular level vial. The knobs are also used during vertical alignment (see page 8)
- 4 **Beam aiming knob** • When the rotation is stopped, push and turn this knob to aim the beam. Push the knob in and hold it in while turning.
- 5 **Power Indicator** • Displays a green light when the laser is powered on.
- 6 **Speed control buttons** • The (+) and (-) buttons adjust rotation speed. A single push will make the speed slightly faster or slower. If you push and hold the (+) button, the rotation will adjust to full speed. You will know that full speed has been reached when the green power indicator flashes. If you push and hold the (-) button, the rotation will slow and then stop.
- 7 **Leveling limit indicator** • If the laser is powered on, but is not level enough to automatically compensate, the limit indicator will flash, the rotating prism will not spin and no laser beam will be projected.
- 8 **Battery indicator** • A red light indicates the batteries need to be replaced.
- 9 **Vertical vial** • The vertical vial is used to plumb the plane of laser light when the laser is in the vertical mode (see page 8).

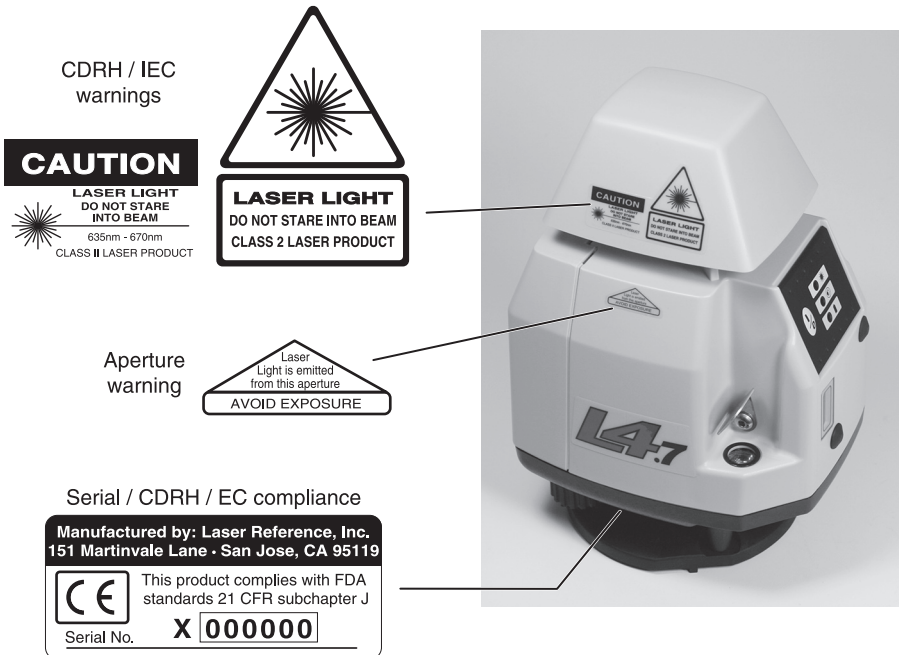
Precautions to follow when using any laser.

- Don't stare into the laser beam or view it directly with optical instruments.
- Don't disassemble the laser or attempt to service it.
- Don't use the laser until you have read the instruction manual and you are familiar with how to operate the laser properly.

U.S. OSHA requirements for operating visible lasers.

- Only qualified, trained employees may install, adjust and operate the laser.
- Laser operators must carry proof of qualification.
- The area of a job site where a laser is being used must be posted with a laser warning placard.
- The laser should be set up above eye level and never intentionally aimed at anyone.
- Turn the laser off when it is not being used, such as during lunch hour, at the end of the day, or during other long breaks in the work.

Caution and certification label locations - L4.7



Note: The L4.7 transmitter is a class II laser under the 1993 IEC 825-1 laser safety standard and the revised edition of the European norm EN60825. The L4.7 laser conforms to applicable EC directives regarding RFI and EMI.

The L4.7 complies with FDA performance standards 21 CFR sub-chapter J.

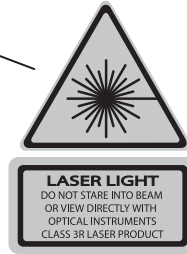
Caution and certification label locations - **L4.7 MAGNUM**



Warning, Class IIIa label for lasers sold in the U.S. and Canada



Warning, Class 3R labels for lasers sold where IEC standards apply

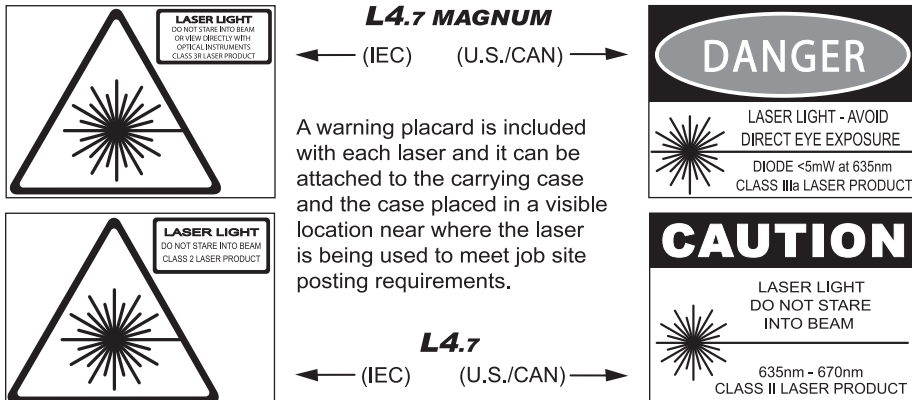


Serial / CDRH / EC compliance



Aperture warning

Note: The **L4.7 MAGNUM** transmitter is a class 3R laser under the 1993 IEC 825-1 laser safety standard and revised edition of EN60825. The **L4.7 MAGNUM** laser conforms to applicable EC directives regarding RFI and EMI. The **L4.7 MAGNUM** complies with FDA standards 21 CFR sub-chapter J.



Calibration should be checked from time to time.

Although the **L4.7** and **MAGNUM** are calibrated at the factory and are very rugged lasers, it is well worth the effort to check calibration before you first use them (after shipping) and then from time to time to ensure that you are doing the highest quality work possible. Always check calibration if the laser has been handled roughly. See "checking / adjusting calibration" page 14.

Check your setup.

Outdoors: Although not required, it is good jobsite practice when using any laser or optical instrument to check your setup from time to time. Use engineered benchmarks on the jobsite to assure that your setup is correct and matches the design of the job. On very large sites, or where accuracy is critical, taking a few minutes to verify the elevation marks you have been given to work from makes sense. Even engineered benchmarks may not be perfect and enough verification must be done to be confident you are properly set up. If there are not suitable benchmarks on the site, you can set your own by driving stakes and recording their elevations, or by marking the laser beam height on stable objects such as telephone poles, concrete walls, etc. The benchmarks should be 90° apart for greatest accuracy. Having benchmarks to check is of great value for jobs where setups need to match day after day. If you will only be using the setup for a brief time, this may not be needed.

Indoors: The same logic applies, if you will need to setup the laser more than once for a particular operation, make reference marks, preferably 90° apart, along the plane of beam travel once you have set the laser up either horizontally or vertically. Check your setup from time to time using the marks as a guide. Use the marks as a guide for later setups.

Work as close to the laser as possible.

You can work up to 750 feet (230 meters) away from the **L4.7** with the R9 receiver, or 1000 feet (305 meters) away from the **L4.7 MAGNUM** with the R8 receiver. As with all instruments, however, the further away you work, the more any error can add up. Set the laser in a safe place, as close to your work as possible for best results.

Maintain your equipment.

Keeping tripod and mount hardware tight, and being sure grade rods are in good condition, can prevent errors and performance problems.



Be sure to read the “Initial setup guidelines section (pg6).

Using the two leveling knobs, center the bubble in the circular level vial (see procedure on pages 2 or 3 if you have any difficulty). Facing the laser control panel and looking down at the circular level vial, when you turn either leveling screw clockwise, the bubble will move toward that leveling screw. Once the bubble is centered, start the laser by pressing the power (0/1) button.

If a large site is being worked, the laser can be setup in the middle of the site, covering a total diameter of: **L4.7** - 1500ft (460m) or **L4.7 MAGNUM** - 2000ft (610m) with their system receiver.

Periodically check your setup against existing benchmarks, or set and check your own benchmarks.

Attach the laser to the W1 wall/vertical mount, adjusting the flat edge of the base, where the laser mounts, to the red L4 "vert" mark. Remove the receiver from the rod clamp, turn it on and set it on a far point. With the beam window facing the laser, use the beam center notch for alignment.

Return to the laser/mount assembly and set the edge of the mount that is just below the laser's beam exit slot over a near point. Note that the surface the W1 is resting on should be reasonably level. Rough align the assembly by holding the edge on the near point and sliding the base of the assembly until the receiver's audio tone begins. Use the Y-axis leveling screw (now at the bottom of the laser) to rough center the vertical vial (visible through the small window now at the top of the laser).

The X-axis leveling knob (now near the top of the laser) is used as a fine mechanical line control to center the beam plane on the receiver. The receiver's audio tone will become constant when the beam is centered on the receiver. Make a final adjustment of the vertical axis vial after the alignment is done and re-align to the receiver if necessary. Note that the laser is completely manual when in the vertical mode and you will have to check the bubble from time to time to insure accuracy. Draw a line along the edge of the W1 to allow you to verify that the mount has not been moved.

The W1 can also be tripod mounted for vertical setups.

- ***Check the vertical vial and your benchmarks regularly to be sure your work is accurate. The L4.7 and L4.7 MAGNUM are designed for vertical alignment up to two stories high.***

Shown on optional W1 mount see page 11 for accessories.

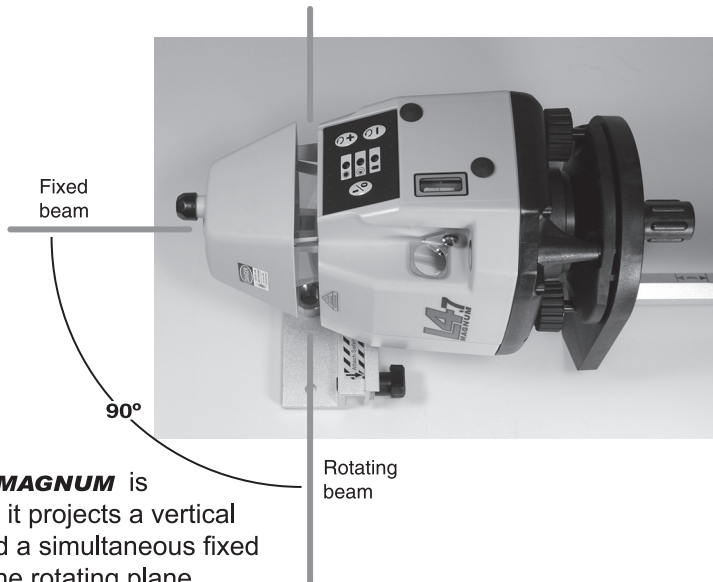


Note: The *L4.7 MAGNUM* laser beam must be rotating with the rotation speed set to maximum when using a receiver.



To transfer a point from floor to ceiling, use the optional P1 plumb plate.

- Set the P1 over the point
- Set the Laser on the P1
- Rough level the laser
- Switch the laser on
- A plumb beam is projected from the top of the laser, directly over the point.



When the **L4.7 MAGNUM** is in vertical mode, it projects a vertical plane of light and a simultaneous fixed beam at 90° to the rotating plane.

Refer to page 8 for complete instructions on aligning the vertical plane of light. The 90° beam provides a convenient way to define right angle intersections for interior layout.

Both **L4.7** models provide a precise reference for level alignment jobs such as:

- Setting concrete forms
- Setting grout pads
- Checking grades
- Checking base material
- Digging footers and basements
- 4ft (or 1m) marks

Level Alignment



Vertical Alignment



Along with the ability to project a level reference plane, both **L4.7** models have a built-in, manually leveled vial, for aligning the plane of light vertically. The optional W1 mount is used for this application.

The vertical plane can be used for:

- Aligning bolts and wall plates
- Layout work
- Plumbing walls and panels
- Transferring lines from floor to ceiling
- Aligning and plumbing posts and tall forms



W1 Wall and Vertical mount

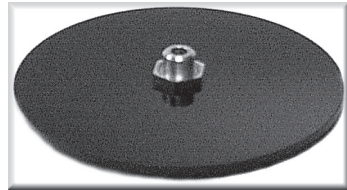
The W1 is an available option to allow vertical setups for layout work or plumbing walls or posts in a plane. The W1 is also designed to mount on T-bar wall angle for suspended ceiling work.

See page 9 for vertical setup information.

P1 Plumb Plate

The P1 allows quick and easy setups for getting the **L4.7 MAGNUM** over a point to transfer points from floor to ceiling.

See page 9 for setup information.



Rechargeable Battery Kit

The kit provides four industrial grade Ni-Mh rechargeable batteries and a charger that plugs into the charging jack at the rear of the laser.

The NiMh batteries typically last 60 hours in the **L4.7** or 30 hours in the **L4.7 MAGNUM**.

A full recharge takes about 20 hours.

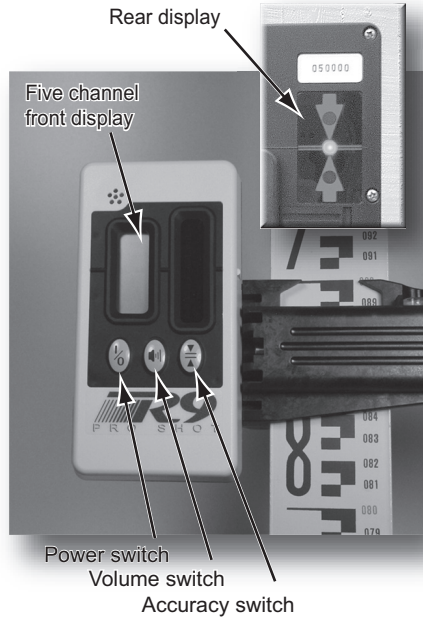


⚠ WARNING! Use only the Laser Reference factory supplied battery charger. Use of any other charger may cause damage to the laser.



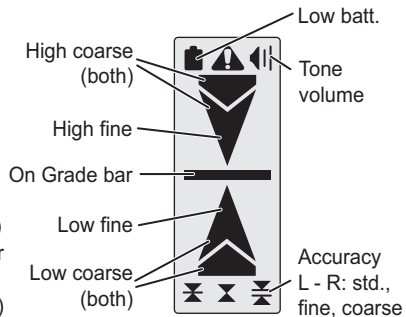
The R9 senses the plane of laser light and indicates a height position relative to the plane (high, low, or on grade). The R9 displays height information on a five channel front LCD and a three channel rear LED display. In addition to the visual displays, an audio tone indicates high, low, or on grade. When the R9 is centered at the beam height, an on grade "bar" indication is displayed. If the R9 is high or low, "arrows" show the proper direction to move the R9, in order to get an on grade indication.

The R9 has three control switches, power on/off, tone high/low/off and on-grade accuracy select. Press the power switch to activate the R9. The audio sounds and the LCD displays the tone and accuracy icons. The R9 is ready to operate in standard accuracy and loud tone. Pressing the volume switch once changes to low tone, twice turns the tone off. When the tone is off, there will still be a single tone the first time the R9 senses a laser signal. Pressing the accuracy switch once changes to the coarse setting, twice changes to fine. The R9 automatically turns off if no laser strikes are received for twelve minutes. The R9 is powered by a 9 volt battery that lasts approximately 60 hours. When the battery is nearly used up, the low battery indicator will be displayed on the LCD. To replace the battery, locate the battery door on the back of the housing and slide the door toward the bottom of the receiver. Remove the battery from the compartment (you may need to tap the R9 on your palm to free the battery). Replace the battery following the diagram molded on the battery door.

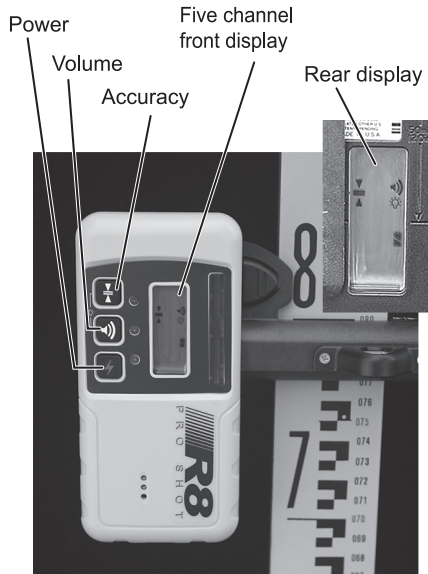


Specifications and display icons

Reception Height	2 inches (50mm)
Reception Angle	120 degrees
Standard mode accuracy	±1/16 in. (±1.6mm) nominal
Coarse mode accuracy ...	±1/8 in. (±3.2mm) nominal
Ultra-fine mode accuracy	±1/64 in. (±.4mm) nominal
Power Supply	9 volt battery
Battery life (alkaline)	60 hours continuous
Automatic Shut Off	After 12 min. (no laser strikes)
Environmental	Sealed against dust and water
Rotation Compatibility ...	250 to 1200 R.P.M.
Mount Clamping Range	5/8in to 2-1/2in (16mm-65mm)



The R8 senses the plane of laser light projected by the AS2 MAGNUM and indicates a height position relative to the plane (high, low, or on grade). The R8 uses five channel front and rear LCDs to display height information. Along with the visual displays, an audio tone also indicates when the receiver is high, low, or on grade. When the R8 is exactly centered at the beam height, an on grade "bar" indication is displayed. If the R8 is high or low, an "arrow" shows the direction to move the R8 in order to get an on grade indication.

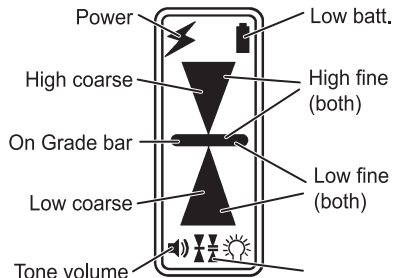


The R8 has three control switches, power on/off, tone high/low/off and on-grade accuracy select. Pressing the power switch activates the R8. The audio tone will sound and the LCD display will show the power, tone and accuracy icons. The R8 is ready to operate in standard accuracy with loud tone. Pressing the volume switch once turns the volume off, twice changes to low volume. When the volume is off, there will still be a single tone the first time the R8 senses a laser signal. Pressing the accuracy switch once changes to the coarse setting (note: display is 3 channels in coarse), twice changes to fine. The R8 automatically turns off if no laser beam strikes are received for 30 minutes. The R8 is powered by two AA cell batteries that last approximately 70 hours. When the battery is nearly used up, the low battery indicator will be displayed. To replace the batteries, locate the battery door on the lower back of the housing and open the latch using a coin. Replace batteries following the + diagram on the housing.

Note: The L4.7 MAGNUM laser beam must be rotating with the rotation speed set to maximum when using a receiver.

Specifications and display icons

- Reception Height 2 inches (50mm)
- Reception Angle 90 degrees
- Standard mode accuracy ±1/16 in. (±1.6mm) nominal
- Coarse mode accuracy ... ±1/8 in. (±3.2mm) nominal
- Ultra-fine mode accuracy ±1/32 in. (±.8mm) nominal
- Power Supply 2 AA cell batteries
- Battery life (alkaline) 70 hours continuous
- Automatic Shut Off After 30 min. (no laser strikes)
- Environmental Sealed against dust and water



Calibration should be checked from time to time.

Although the **L4.7** and **MAGNUM** are calibrated at the factory and are very rugged lasers, it is well worth the effort to check calibration before you first use them (after shipping) and then from time to time to ensure that you are doing the highest quality work possible. Always check calibration if the laser has been handled roughly or dropped.

Calibration procedure.

1. Attach the laser to a stable tripod or stand approximately 100 feet (30m) from a wall or other stable vertical surface. We will call the vertical surface the target. Make the tripod head level enough to allow the laser to be aimed in different directions with minimal re-leveling of the circular level vial.
2. Turn the entire laser so that either direction of the x-axis (picture below) is aimed at the target. *Note: the axes are the same for both models.*



3. Center the circular level vial and turn the laser on.

4. Take the receiver to the target and find the height of the laser beam. All receivers have a "deadband" at their center. The most precise way to take a reading is to make two marks. Slowly move the receiver from above until you get an on-grade display and make a mark. Next, slowly move the receiver from below until you get an on-grade display and make a second mark. Half way between these two marks is the exact reading.

5. Return to the laser and rotate it 180 degrees. The opposite X-axis direction should now be aimed at the target. Re-center the bubble in the circular level.

Find and mark the laser beam height at the target.

6. The difference between the two marks (if any) is double the difference between how the laser is calibrated and true level for the X-axis. Half way between these two marks is true level. Make a long mark at true level. If the difference between either outer mark and true level is within your working tolerance, go on to step 9. If not, continue with the next step.

7. Remove the upper black rubber plug below the control panel. Using a 3/32" hex driver, adjust the X-axis calibration. Turning the screw clockwise will raise the beam in the -X-axis (see opposite page). One full turn of the screw will make approximately a 3/4"(19mm) change at 100'(30m) **turn the screw a little at a time** until the beam matches the true level mark. Do not move the laser or platform during this adjustment.
8. Check the X-axis adjustment: rotate the laser back to the first direction and re-center the bubble. Check that the reading is within the needed tolerance of the true level mark.
9. Rotate the laser 90 degrees to aim the +Y-axis (control panel) at the target. Re-center the bubble. Check the reading at the target. If the reading is on, or within tolerance of the true level mark, calibration is complete. If not, continue on.
10. Remove the lower black rubber plug. Using a 3/32" hex driver, adjust the Y-axis calibration. Turning the screw clockwise will raise the beam in the +Y-axis (see opposite page). One full turn of the screw will make approximately a 3/4"(19mm) change at 100'(30m) **turn the screw a little at a time** until the beam matches the true level mark. Do not move the laser or platform during this adjustment.
11. Rotate the laser 180 degrees. The -Y-axis is now aimed at the target. Re-center the bubble.
12. Compare the elevation of this axis to the true level mark. If the difference between this reading and true level is within your working tolerance, calibration is complete. If not, use the procedure in step 10 to balance this axis with the +Y-axis.

Calibration is now complete.

Calibration • There is no set interval for calibrating the **L4.7** or **MAGNUM**, but calibration should be checked from time to time in order to ensure that the highest possible quality of work is being done. Calibration should always be checked if the laser has been handled roughly or shipped.

Batteries • Occasionally remove the batteries and check the contacts for corrosion. Alkaline batteries will last far longer than carbon batteries. When using rechargeable batteries, be careful not to charge alkaline or carbon batteries. The Ni-Mh batteries in the optional factory kit need to be charged after about 60 hours (**L4.7**) or 30 hours (**MAGNUM**) of use. Never run the laser from the charger unless there are rechargeable batteries installed. Keep a spare set of batteries in the carrying case to avoid down time.

Laser output windows • Regularly check the output windows for dust and dirt. Dust can be removed with a camera brush or clean compressed air.

Control panel and exterior • Clean the control panel and the other exterior surfaces of the laser with a soft damp cloth.

Caution • Never store the laser in a carrying case that is wet inside. Moisture can get inside the laser this way. Should this happen, remove the battery cover and place the laser in a warm area until it is completely dry.

Troubleshooting

The laser will not operate, there is no obvious damage • If the low battery indicator is on, or you suspect the batteries may be dead, replace the batteries. Check the battery contacts to be sure that they are clean.

The receiver shows an on-grade at two different heights • Check the jobsite for windows or mirrored surfaces that might be reflecting the laser and causing the other reading. Check for others on the site using a rotary laser.

The laser was knocked over • Visually check the optics for damage. Inspect the laser for any other physical damage. Use the receiver to check that the laser is transmitting. Check the calibration and adjust as needed. Check to see that the laser displays the "limit" light when the circular level vial bubble moves approximately half way outside the circle.

The laser only works at short distances • Check the output windows for heavy dust or moisture. Remove dust with a camera brush or blow off gently with clean compressed air. Allow moisture to dry.

The receiver does not indicate "on grade" at long distance • Be sure you are within the max distance specification from the laser. Check the windows that surround the rotating mirror on the laser for dust or moisture. Remove dust with a camera brush or blow off gently with clean compressed air. Allow moisture to dry.

Guardian 36 month warranty coverage

The **L4.7** or **L4.7 MAGNUM** laser transmitters, and the **R9** receiver, are warranted for thirty-six (36) months from the date of new equipment purchase from an authorized dealer. The R8 receiver is warranted for 24 months. During the warranty period, Laser Reference, or its authorized service center, will repair or replace, at Laser Reference's sole discretion, laser transmitters or receivers, free of charge, (except for transportation costs) if the products are found by Laser Reference, or its authorized service center, to be defective in either materials or workmanship. The **Guardian** 36 month warranty also covers the internal leveling mechanism and internal optics against damage from any cause. Maintaining the calibration of the product is not the responsibility of Laser Reference or its authorized service centers. If service is needed, the product(s) must be sent **FREIGHT PREPAID** to the nearest authorized service center or to Laser Reference.

Specifications

Accuracy	±7 arc seconds (±1mm per 30m) (±.040" per 100')
L4.7 Range (receiver)	750' rad./1500' dia. (230m/460m)
MAGNUM Range (receiver)	1000' rad./ 2000' dia. (305m/610m)
Rotational Coverage	360 degrees
Self-Leveling Range	±10 arc minutes
Vertical Capability	Built-in vial, optional mount
Power Supply	Four C-Cell batteries
Run Time on New Batteries ..	L4.7 : 110 hours (alkaline) MAGNUM : 50 hours (alkaline)
Automatic Shut-off	If off-level for more than 3 min.
Rechargeable Batteries	Optional kit (NiMh)
Dust and water sealed	To international standard IP56
Rotation Speed	L4.7 : 600rpm / MAGNUM : 0 to 450rpm
Operating Temperature	-4°f to +122°f (-20°c to +50°c)
Storage Temperature	-40°f to +140°f (-40°c to +60°c)
Classification - L4.7	CDRH Class 2 • IEC 825-1 Class 2
Classification - MAGNUM	CDRH Class 3a • IEC 825-1 Class 3R
Height	9in (23cm)
Weight	4.1lbs (1.86kg)



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Web www.proshotlaser.com

Email sales@proshotlaser.com

Customer information

Laser Serial number _____

Receiver S/N _____

Date of purchase _____

Version 4.2

Part No. 010-9060