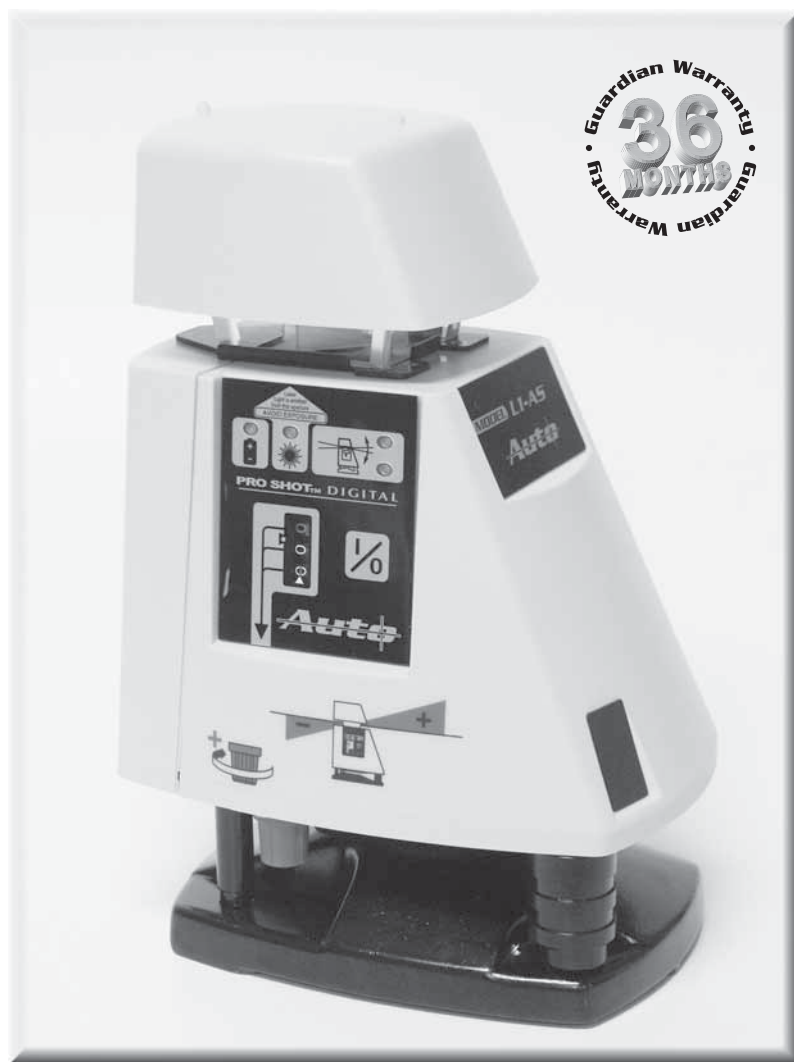


# PRO SHOT™ L1-AS

## *Operations Guide*



## Introduction

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Thank you for purchasing a Pro Shot™ L1-AS laser system. You now have superior laser accuracy and productivity available for all your projects.

Pro Shot™ laser model L1-AS is a rugged, reliable, high quality product, 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.

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### Battery installation

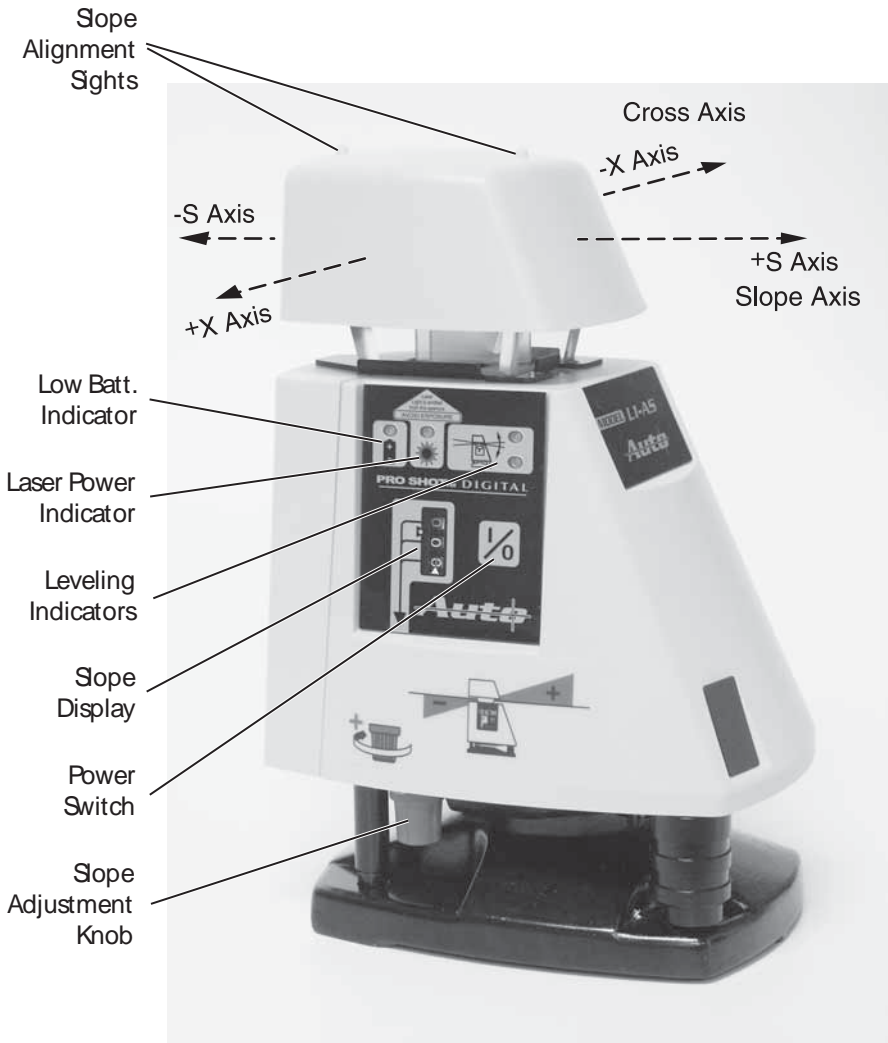
Install batteries as shown here. For reference, there is a diagram label on the bracket between the batteries.

Note: Batteries are shipped in the carrying case and must be installed for the laser to operate. Use the battery pocket in the case to store a spare set of batteries in order to prevent downtime.

**Battery door release screw**  
Releases with 1/4 turn counter-clockwise.

**Battery charging jack (optional)**  
For connecting battery charger when using rechargeable batteries. (see pg. 15 for accessory info.)





### **Slope alignment sights**

These sights are used to align the slope axis of the laser for excavating and grading when there is a slope required.

### **Low battery indicator**

The yellow L.E.D. indicates the batteries need to be replaced.

### **Laser Power indicator**

The green L.E.D. indicates the laser beam is on.

### **Leveling indicators/ H.I. alert**

A green L.E.D. in the upper leveling indicator control panel window turns on when the leveling system is active. A constant light indicates the laser is leveling. A flashing light indicates the laser is nearly level. When the laser is fully level, the rotating mirror begins to spin, the green power indicator L.E.D. comes on and the leveling L.E.D. turns off. If the laser cannot level, a red L.E.D. in the lower leveling indicator control panel window will flash. This indicates the tripod or surface the laser is on must be more level or closer to the slope that is dialed in.

When the laser finishes leveling and has been running for about five seconds, a feature called **H.I. alert** activates. When the laser enters this mode, the upper leveling indicator green L.E.D. will flash slowly five times. With H.I. alert active, if the laser is moved or bumped, or the grade knob is moved, the laser beam will shut-off, the rotor will stop spinning and the red and green leveling L.E.D.s will flash alternately. Any grade adjustments should be made before H.I. alert activates. To clear the H.I. alert, simply turn the laser off, then on again. You must re-confirm the laser beam elevation before continuing your work to avoid errors.

### **Slope display**

The slope counter displays the slope that is set into the laser.

### **Power switch**

The power switch activates the laser.

### **Slope adjustment knob** (see H.I. alert above)

The slope adjustment knob is used to set slope into the laser, or to set the laser to level (0.00 slope).

**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.

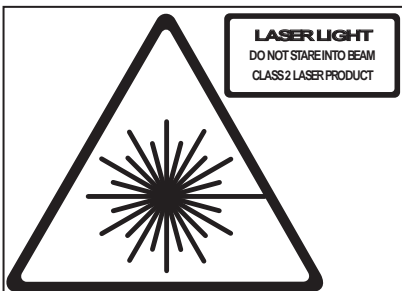
**U.S. OSHA requirements for operating visible lasers.**

- 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.



← L1-AS  
(North America)

*A warning placard is included with each laser which can be attached to the outside of the carrying case. The case can then be placed in a visible location near where the laser is being used in order to meet jobsite posting requirements.*



← L1-AS  
(IEC)

Caution and certification label locations - L1-AS



Optional re-chargeable battery warning label

Note: The L1-AS 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 L1-AS laser conforms to applicable EC directives regarding RFI and EMI.

The L1-AS complies with FDA performance standards 21 CFR subchapter J.

Serial / CDRH / EC compliance

Made in U.S.A. by: Laser Reference, Inc.  
450 Salmar Ave. - Campbell, CA 95008

**CE** This product complies with FDA standards 21 CFR subchapter J

Serial No. X 000000

### **Calibration should be checked from time to time.**

Although the L1-AS is calibrated at the factory and is an exceptionally rugged laser, it is well worth the effort to check calibration before you first use it (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.

### **Check your setup.**

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. Particularly 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. Realize that 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.

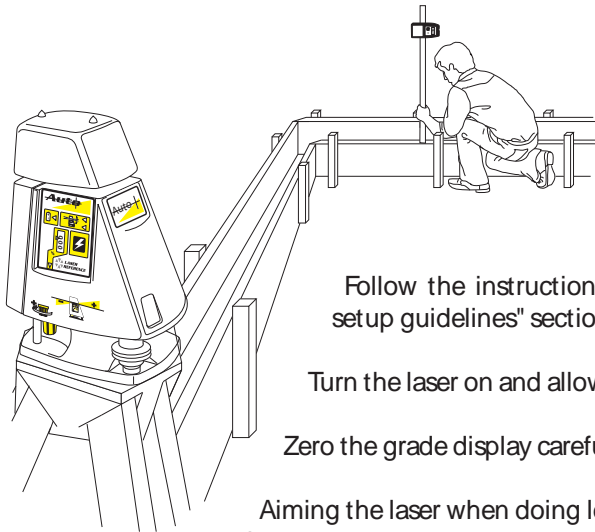
### **Work as close to the laser as possible.**

You can work up to 1000 feet from the L1-AS with the R7. As with all instruments, the farther you go, the more any error can add up. Set the laser in a safe place, as close as you can to your work.

### **Maintain your equipment.**

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





Follow the instructions in the "initial setup guidelines" section.

Turn the laser on and allow it to level.

Zero the grade display carefully.

Aiming the laser when doing level work is not important.

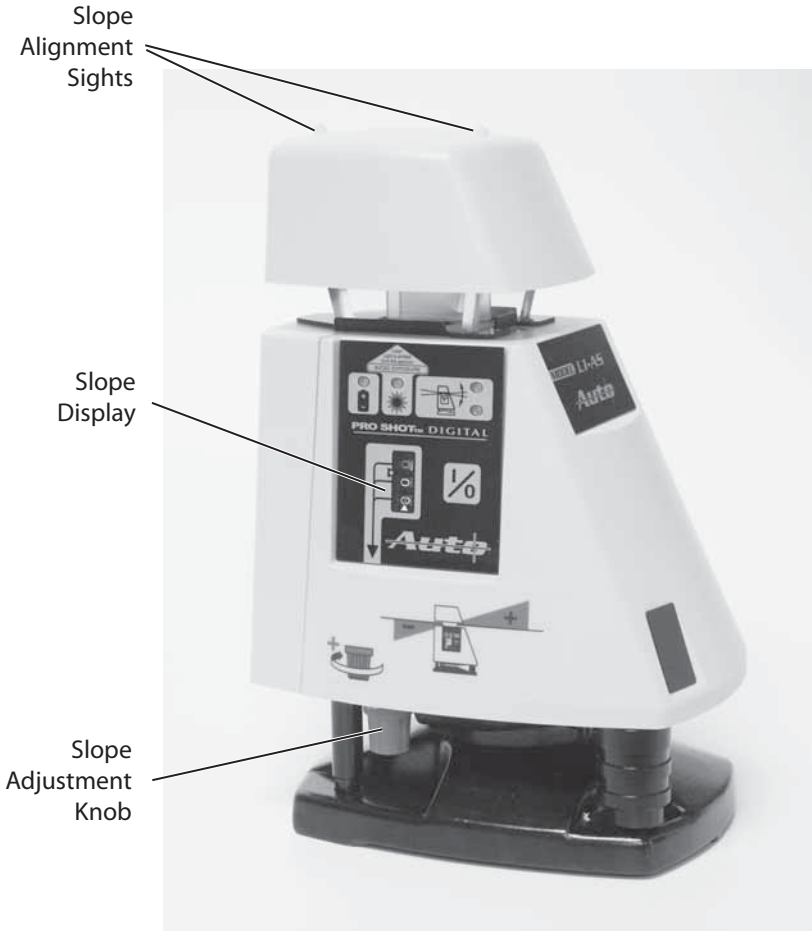
In the event that a very long distance is required, the laser can be set-up in the middle of the site, covering a total of 2000 feet (610 meters) diameter with the R7 hand held receiver or MC-1 machine control receiver.

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

Follow the suggestions in the "initial setup guidelines" section.

Carefully aim the laser using the sights on the top cap. These sights indicate the direction of slope.

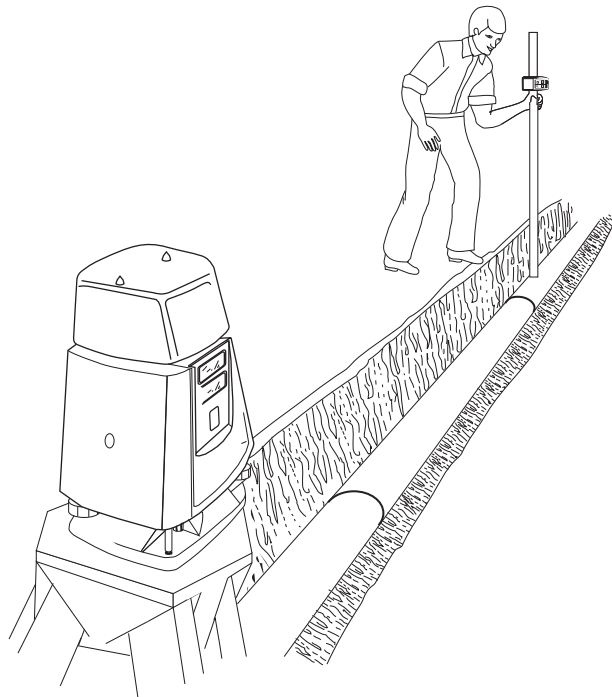
Using the red slope adjustment knob, adjust the slope display to your required slope. Note that if the laser has finished leveling and H.I. Alert has become active (see initial controls and displays pg. 2/3) you will need to turn the laser off, then on again to clear H.I. Alert.



The display reads in percent of grade (the number displayed is the units of rise or fall per 100 units of run). A 2-1/2% up slope (projecting upward from the front of the laser) shows as 2.50 on the display. If a down slope is needed, the display is set to the needed slope and the rear of the laser is aimed in the direction of slope. The graphic label just above the slope knob shows the direction that upward or downward slopes are projected.

Regularly check your setup against benchmarks. If none are present, set at least two of your own to monitor the accuracy of your setup.

The laser can be set at an offset to the ditch. Just be sure to point the sights on the top cap parallel to the direction of the slope.

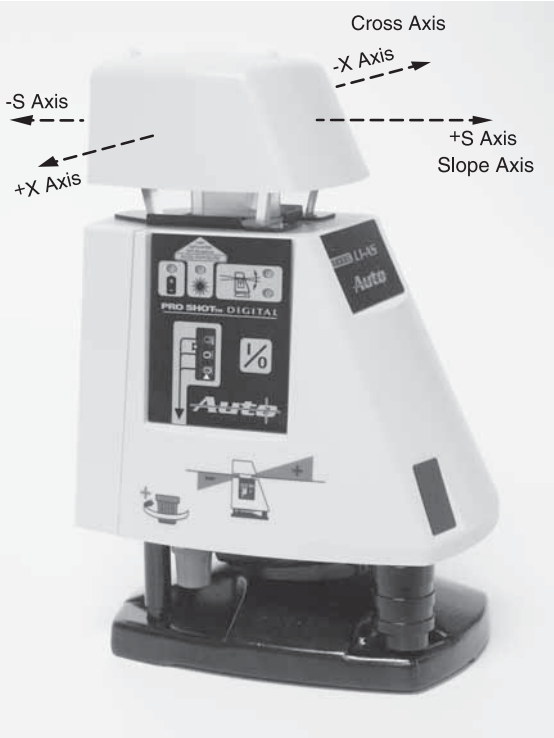


Sites designed with compound slope actually have just a single resultant slope. When a site has slope in two directions, 90 degrees apart, the model S1 Compound Slope Adapter Kit can be used to calculate and set the L1-AS to the proper angle and resultant slope.

In order to begin a compound slope setup, the S1 Compound Slope Adapter Kit must be installed on the laser, following the instructions included with the kit. Next, follow the steps below:

1. Determine the two slopes for the site and the direction of each slope. Set the compound slope adapter angle to zero (0) degrees and aim the laser parallel to the main slope on the site (the main slope is the steeper of the two slopes). Be certain that the up-slope direction of the laser is aimed uphill on the main slope. If there is any question which is the up-slope direction for the laser, you can refer to the label on the side of the laser just above the slope knob.

2. Using the compound slope chart supplied with the S1 kit, find the two slopes for the site on the chart and follow their row and column until they intersect. Remember that the main slope is the steeper of the two slopes. The upper number in the box where the two slopes intersect is the angle to set into the S1 adapter. The lower number is the resultant slope to dial into the laser's slope counter. Note: The slope number is displayed with greater precision than the slope counter increments.



3. Rotate the S1 adapter until it matches the angle determined with the slope chart. Note: if, when standing behind the laser, the highest corner on the site is to the right of the grade sight, you must rotate the adapter counter clock-wise until you reach the proper reading. If the high corner is to the left, you must rotate the adapter clock wise.

4. Turn the entire laser toward the uphill direction of the cross slope (toward the highest corner on the site) until the slope alignment sight is once again aligned parallel to the main slope. The laser is now at the proper angle.

5. To finish the setup, dial in the resultant slope determined from the chart and go to work. Note: you can re-check the setup at any time by doing the following: A. Verify the slope counter setting. B. Verify that the proper angle is set into the compound slope adapter. C. Verify that the slope sighting slot is parallel with the main slope direction. D. Verify that the uphill direction of the laser is aimed toward the high corner of the site.

*Always set at least two grade checking stakes that are 90 degrees apart so that you can verify the laser setup from day to day on the site.*

1. Zero the compound slopeadapter ring and aim the laser parallel to the main slope, with the up-slope direction of the laser aimed up-hill on the site.

2. Look-up the intersection of the main slope (.25) and the cross slope (.15) using the slope chart. The box at the intersection. looks like this: 

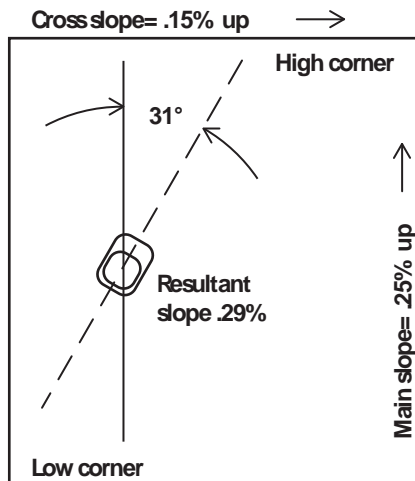
31
0.292

3. Turn the adapter sighting slot 31° counter clock-wise.

4. Turn the entire laser to re-align the sighting slot parallel with the main slope. (the laser is now aimed 31° toward the high corner).

5. Dial the resultant slope of .29% into the slope counter. • Done.

### Compound slope example



**Calibration is your responsibility, check it often.**

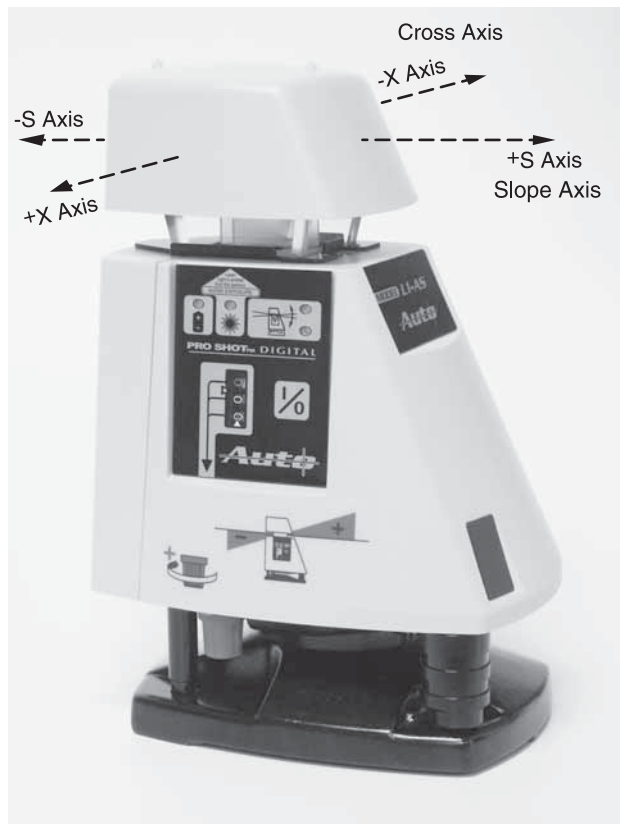
Although the L1-AS is calibrated at the factory and is an exceptionally rugged laser, it is well worth the effort to check calibration before you first use it (after shipping) and then from time to time to ensure that you are doing the highest quality work possible. Always check calibration if the laser has been handled roughly.

**Follow the steps below to check the calibration of the laser and make necessary adjustments.**

1. Attach the laser to a stable platform or tripod approximately 100 feet from a wall or other stable vertical surface (a telephone pole or concrete building will work well). We will call the vertical surface the target. The tripod head or platform must be level enough to allow you to turn the laser 360 degrees with minimal re-leveling needed.

2. Rotate the entire laser so that either direction of the cross (X) axis (see picture) is aimed at the target.

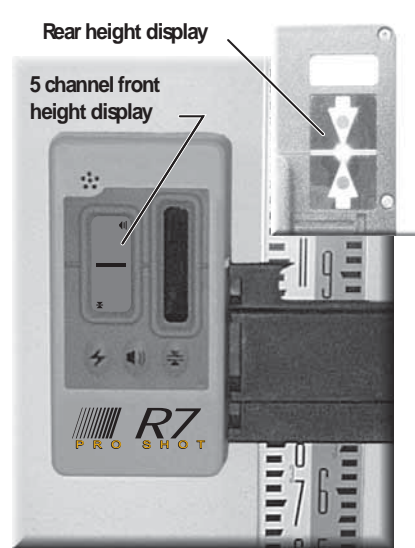
3. Carefully set the slope display counter to 0.00 (The red stripe on the last counter digit should be aligned with the pointer). Turn the laser on and allow it to level.



4. Take the receiver to the target and find the height of the laser beam by moving the receiver up or down until you get a display and/or tone. Now, find the center of the display and mark the target, using the receiver's beam center notch as a guide.
5. Return to the laser and rotate it 180 degrees. Allow the laser to re-level. The opposite cross axis (X) direction is now aimed at the target. Find and mark the laser beam height (see step 4).
6. The difference between the two marks (if any) is double the difference between how the laser is calibrated and true level for the cross 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 10. If not, continue with the next step.
7. With the 1/4" wrench provided, turn the hex head calibration screw that is under the main housing (near the serial number label) to adjust the cross axis calibration. Turning the screw clockwise (looking down on the laser) will lower the beam in the +x axis. A 1/8 turn of the screw will make approximately a 1-1/4" (30mm) change at 100' (30M) **turn the screw a small amount each time** until the beam matches the true level mark. Do not move the laser or platform during this adjustment.
8. Check the cross axis adjustment by rotating the laser back to the first direction and letting the laser re-level. Check that the reading is within the needed tolerance of the true level mark.
9. Rotate the laser 90 degrees to aim the front of the slope axis at the target (+s axis). Allow the laser to re-level and 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. Verify that the slope display counter is still exactly at 0.00. If not, zero the slope display and re-check the reading. Carefully remove the battery cover and locate the calibration adjustment potentiometer under the black rubber plug next to the batteries on the lower left side of the housing. Turning the potentiometer clockwise will lower the beam in the +s axis. Turning the potentiometer 1/4 turn will make approximately a 5/16" (8mm) change at 100' (30M). **Turn the screw a small amount each time** until the beam matches the true level mark.

**Calibration is now complete.**

The R7 can be attached to a grade rod, or used without the rod clamp to make reference marks on walls, floors, or other surfaces. The R7 senses the laser beam and uses a five channel front LCD to show height information. LEDs are used to display the same information on the back. When the R7 is exactly at the beam height, the on grade indication is displayed. If the R7 is high or low, either the above grade or the below grade indication will be displayed showing the direction to move the R7 in order to get on grade. The R7 has three controls, a power on/off button, a tone high/low/off button and a button to select on-grade accuracy. The R7 automatically turns off if no laser beam strikes are received for twelve minutes.



The tone comes on high (loudest) when the R7 is powered on. Pressing the tone button 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 R7 senses a laser signal. The R7 is powered by a 9 volt battery that lasts approximately 60 hours. When the battery is used up, the low battery indicator will be displayed. To access the battery, locate the battery door on the back of the housing and slide the door toward the bottom of the receiver. The door can stay attached to the housing when it is fully open. Remove the battery from the compartment (you may need to tap the R7 on your palm to free the battery). Replace the battery following the diagram molded on the battery door.



## Optional Factory Accessories

### Extra R7 Receivers

Although one R7 comes with each system, additional receivers can dramatically increase productivity on many jobs.  
*(see picture on opposite page)*

### Re-Chargeable Battery Kit

The Re-Chargeable battery kit includes 4 Ni-Cad batteries, a charger and a replacement battery door.



### Compound Slope Kit

With the compound slope kit installed, the transmitter can be easily set-up to project a plane with slopes in two directions. The included slope chart eliminates the need for calculations. Look-up the two slopes on the chart and follow the simple instructions on the back of the chart.

Calibration • There is no set interval for calibrating the L1-AS, 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. If you use rechargeable batteries, **be careful to never charge alkaline or carbon batteries**. Also, do not charge Ni-Cd batteries too often. Ni-Cd batteries should be charged after about 20 to 24 hours of operation. 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.

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### 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.

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 L1-AS laser transmitter, along with R5 or R7 receivers, manufactured on or after February 1, 1997, are warranted for thirty-six (36) months from the date of new equipment purchase from an authorized dealer. 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

Range (with R7 receiver) .....	1000' rad., 2000' dia. (305m/610m)
Rotational Coverage .....	360 degrees
Accuracy .....	±15 arc seconds (3/32" per 100') (2.4mm per 30m)
Self-Leveling Range .....	±4 Degrees
Slope Capability .....	± 9%, single axis
Slope Display .....	Digital Counter, .01% increments
Power Supply .....	Four C-Cell batteries
Run Time on New Batteries .....	60 hours (alkaline)
Automatic Shut-off .....	If off-level for more than 3 min.
Rechargeable Batteries .....	Available option
Environmental .....	Dust and water resistant
Rotation Speed .....	600rpm
Operating Temp. (ambient) .....	-0°f to +122°f (-18°c to +50°c)
Storage Temperature .....	-40°f to +140°f (-40°c to +60°c)
Safety class .....	CDRH Class II • IEC 825-1 Class 2
Height .....	9.5in (24cm)
Weight .....	5.5lbs (2.5kg)



**LASER REFERENCE, Inc.  
151 Martinvale Lane  
San Jose, CA 95119 · USA**

Toll Free (USA) +1.800.238.0685

Telephone +1.408.361.0220

Fax +1.408.361.3180

Web [www.proshotlaser.com](http://www.proshotlaser.com)

Email [sales@proshotlaser.com](mailto:sales@proshotlaser.com)

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