LR50 & LR50W Laser Receiver

User Guide



SPECTRA PRECISION

LR50/LR50W

www.spectraprecision.com

Introduction

Thank you for choosing the Spectra Precision® Laser Receiver LR50. The laser receiver is a rugged, multi-purpose, electronic sensor that detects laser light generated by rotating laser transmitters. The receiver works with nearly all models of rotating lasers and detects both visible and invisible beams.

Before using the receiver, be sure to read this user guide carefully. Included in it is information about setting up, using, and maintaining the receiver. Also included in this manual are **WARNINGS!**, **CAUTIONS**, and **Notes**. Each of these words represents a level of danger or concern. A **WARNING!** indicates a hazard or unsafe practice that *could* result in serious injury or death. A **CAUTION** indicates a hazard or unsafe practice that could result in minor injury or property damage. A **Note** indicates important information unrelated to safety.

Your comments and suggestions are welcome; please contact us at:
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www.spectraprecision.com

NOTE: The LR50W ships configured to wireless (Radio) communication mode for use with a RD20 remote display. To change to wired (RS-485) mode for use with a control box, simultaneously press the power, deadband and display brightness buttons simultaneously (make sure the receiver is powered up first). Pressing this 3-button combination will toggle the receiver between wireless (Radio) and wired (RS-485) modes as indicated by the following:

Radio Mode Indication: The two outer on-grade LEDs double-blink every few seconds

Wired (RS-485) Mode Indication: The center on-grade LED double-blinks every few seconds

Once configured the receiver will remember it's setting after a power cycle. For additional wireless RD20 operating features please see the RD20 User Guide.

Safety

Please follow all operating and safety instructions in this guide and that of your machinery. Perform periodic checks of the product's performance. Spectra Precision LLC or its representatives assume no responsibility for results of the use of this product including any direct, indirect, consequential damage, and loss of profits. Check your work frequently.

⚠ **WARNING:** When working near construction or agricultural machinery, follow all safety precautions as described in the machinery's user guide.

⚠ **WARNING:** When excavating, follow all excavation and trench safety regulations and practices.

⚠ **WARNING:** Be aware of all overhead obstructions and electrical power lines. The receiver and mast may be higher than the machinery. Remove when transporting machinery.

CAUTION: Do not disassemble any part of the receiver other than to replace batteries. The receiver is to be serviced by authorized Spectra Precision LLC service personnel only.

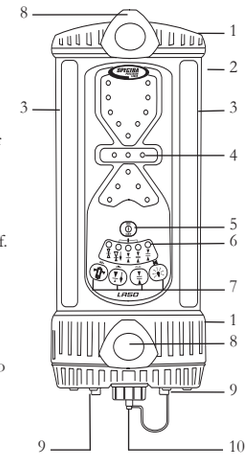
Maintenance and Care

Your receiver was shipped in a protective carrying case. If the receiver is transported from job to job inside its protective case and normal instrument precautions are followed, the receiver will provide many years of service. When storing the receiver, be sure to store it in its carrying case.

Do not wipe dust or dirt off the receiver with a dry cloth as scratching could occur, possibly damaging these surfaces. Use only a good quality glass cleaner with a soft cloth on all external components. If these surfaces have hardened concrete or other materials on them, take the system to your Authorized Service Center for cleaning.

If the receiver will not be used for more than 30 days, remove the alkaline batteries from it. Be sure to dispose of all batteries properly. Refer to your state or local requirements for the disposal information.

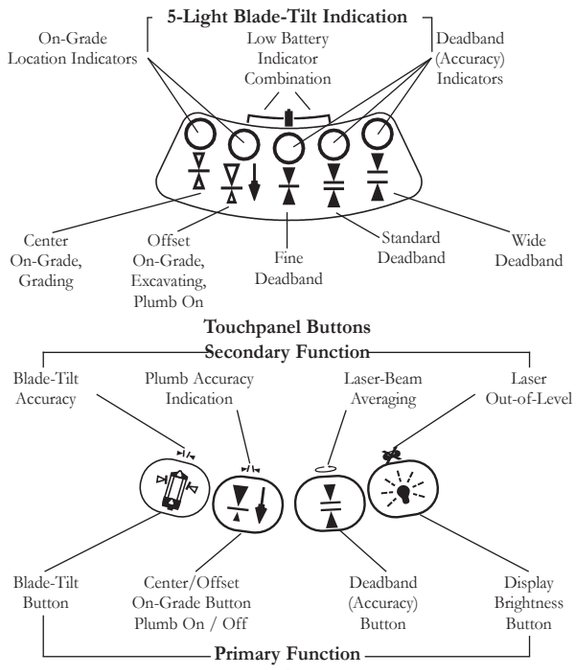
Features and Functions



1. **Aluminum-Cast Upper and Lower Housings**—protect the receiver.
2. **Polycarbonate Housing**—protects the electronics.
3. **Receiving Windows**—include four sets of photocells that are equally spaced to allow for 360 degree reception.
4. **Super-Bright LEDs**—are highly visible and graphically display blade or bucket position.
5. **Power Button**—turns the receiver on and off.
6. **LED Status Indicators**—show on-grade location, deadband selection, and low-battery warning. They also function as the blade-tilt indicator.
7. **Touch-Panel Buttons**—function primarily to select blade-tilt indication, on-grade location, deadband (accuracy), plumb indication, and display brightness. Their secondary functions are to select blade-tilt accuracy, plumb-accuracy indication, laser-beam averaging, and laser out-of-level warning.
8. **Mounting Knobs**—are attached to stainless steel clamps. The large front-facing knobs allow for quick and easy installation to the mast or magnetic mount.
9. **Access Screws**—allow easy access to battery compartment so the batteries can be replaced.
10. **Accessory Connector**—accepts the cable to the optional remote display, machine power cable, or automatic control box. The connector also accepts Ni-MH battery charger. A dust cap covers the connector to help keep it clean.

Controls and Displays

Installing and Recharging the Batterines



Alkaline Batteries

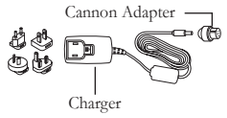
1. Hold the receiver so the accessory connector is pointing up.
2. Remove the dust cap from the accessory connector.
3. Loosen the two thumb screws and remove the battery-access cover.
4. Install four "C" cell alkaline batteries as shown on the label diagram inside the battery compartment noting the (+) and (–) terminals.
5. Replace the battery-access cover. Firmly tighten the two thumbscrews.
6. Replace the accessory-connector dust cap.

Nickel Metal Hydride Batteries (Ni-MH)

Rechargeable batteries require an initial and subsequent charging time of approximately 3 hours. Two or three charging cycles may be required to obtain maximum battery life. To charge:

1. Remove the dust cap from the accessory connector.
2. Insert the cannon adapter into the receiver accessory connector aligning the slot and connector key. Insert the charger female barrel into the cannon adapter.
3. Make sure the proper AC prongs are on the charger.

   Note: To change the prong adapter, press the tab release in the direction indicated by the arrow and remove the existing prong. Insert the proper adapter and release the tab.



4. Plug the charger into an appropriate outlet. The receiver will not operate when it is charging.

   Note: The charge-status indicator located on the back of the housing remains solid when the batteries are charging. The left LED flashes when the batteries are fully charged.
5. When the batteries are charged, unplug the charger from the outlet, and remove the cannon adapter from the accessory connector. Replace the dust cap.

Battery Safety

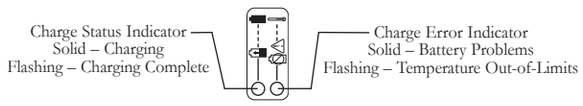
Built-in overcharging protection prevents damage to the receiver if it is left on charge after being fully charged. Charge protection also prevents damage if you accidentally try to recharge alkaline batteries.

CAUTION: Do not attempt to charge alkaline or other disposable batteries.

Note: The batteries should only be charged when the receiver is between 0 °C to 45 °C (32 °F to 113 °F).

The rechargeable battery electronics include charge status and charge-error indicators located on the back of the housing.

Charge Status Indicator: The LED remains solid when the batteries are charging. The LED flashes when the batteries are fully charged. When the batteries are



(Located on lower rear of polycarbonate housing)

charged, unplug the charger from the outlet, and remove the cannon adapter from the accessory connector.

Charge Error Indicator: The LED is solid when the internal battery connection has an error, the batteries are installed incorrectly, the battery type is incorrect, or a battery cell is dead. A flashing LED indicates that the temperature is too hot/cold to charge. Charging automatically starts when the temperature is within the above noted range.

Battery Replacement

1. Remove the dust cap, loosen the two thumb screws, and remove the battery-access cover
2. Remove the old batteries. Install new batteries as previously described. See "Alkaline Batteries" for more information.
3. Replace the access cover, firmly tighten the two screws, and replace the dust cap.

   Note: Refer to your local requirements for proper battery disposal.

Using the Receiver

Operation

Power Button

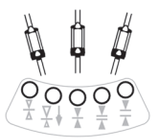
1. Press the power button to turn on the receiver.

   Notes: All the LEDs light briefly. Quickly following, each LED grade-display row turns on and off from top to bottom and each status indicator turns on and off. Additionally, the current deadband status and on-grade location momentarily display. If the receiver is out of a laser beam, the center green LED flashes to confirm power is on. If the receiver is in a laser beam, a corresponding LED grade display lights.
2. To activate the secondary functions, press and hold the power button while the receiver is on and then press the touch-panel buttons. These functions are indicated by the symbols above the buttons.
3. To turn off the receiver, press and hold the power button until the LEDs light; then release the button. Settings will be retained the next time the unit is turned on.

Blade-Tilt Button

Press the blade-tilt button to turn on/off the display. The LED status indicators display in a rolling sequence. When the function is turned on, the LEDs sequence from the center outward. When the function is turned off, the LEDs sequence from the outer LEDs inward.

When blade-tilt is activated, the LEDs provide 5 channels of tilt indication. The center LED is on when the blade or dipper stick is within the tilt-accuracy setting. The right side lights when the operator's right side of the blade or dipper stick is low. The left side lights when the left side is low.



Initially the blade-tilt function is set to level. It can be set to match the current blade slope. See "Installation" for more information.

Blade-Tilt Accuracy

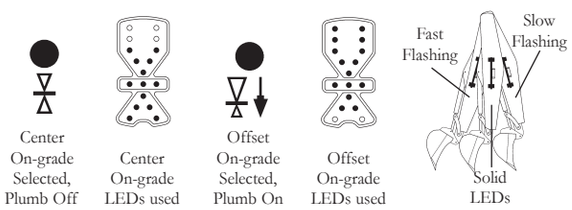
Blade-tilt accuracy has three options: fine, standard and wide. To cycle through and select one of these options, press and hold the power button; then press the blade-tilt button. The current selection flashes rapidly. To change the current selection, continue pressing this button combination while the status LED is flashing.



Center/Offset On-Grade Button

Center on-grade is selected for typical grading or cut/fill operations. This mode indicates an equal amount of grade information above and below on-grade.

Offset on-grade is selected for typical excavation operations. This mode gives more information and a larger display area above on-grade. This mode also enables the plumb indication, which shows when the mast and receiver are perpendicular to the ground (plumb), for more accurate grade readings. Each selection uses a different array of LEDs. If you press the button once, the current on-grade location LED flashes. Pressing the button again while the LED is flashing allows you to change the selection.



Plumb Indication

The plumb indication shows when the mast and receiver are perpendicular to the ground or beyond the selected deadband range. The grade-display LEDs flash quickly when the boom is extended, flash slowly when the boom is retracted beyond this range, and remain lit when the boom is within the plumb range setting.

Plumb-Accuracy Indication

Plumb accuracy has three options: fine, standard, and wide. To cycle through and select one of these options, press and hold the power button; then press the on-grade location button. The current selection flashes rapidly. To change the current selection, continue pressing this button combination while the status LED is flashing.



Deadband (Accuracy) Button

Each on-grade location has three deadband or accuracy selections: fine, standard, and wide. The center or grading deadbands are smaller than the offset or excavating deadbands.

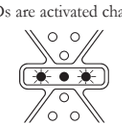
To show the current selection, press the button once; the status LED flashes. To change the current selection, press the button again.

	Fine	Standard	Wide
Center On-Grade (Grading)	5 mm (0.20 in.)	10 mm (0.40 in.)	20 mm (0.80 in.)
Offset On-Grade (Excavating)	12 mm (0.50 in.)	25 mm (1.0 in.)	50 mm (2.0 in.)

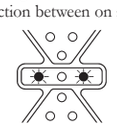
Beam Averaging

The secondary function for the deadband button is beam averaging. The beam-averaging function senses the laser strikes and applies the highest level of averaging appropriate for the laser rotation speed. Averaging stabilizes the LED display in unstable laser setups, such as windy conditions or long-range applications. The factory default setting is for beam averaging to be on. The beam-averaging function can also be turned off. When the function is off, the receiver processes and displays each laser strike.

To change between having this function turned on or off, press and hold the power button then press and release the deadband button. The outer green on-grade LEDs flash to indicate that averaging is selected. When the center LED is on, averaging is on. When the center LED is off, averaging is off. Pressing this button combination while the LEDs are activated changes the current selection between on and off.



Averaging ON



Averaging OFF

Display-Brightness Button

The display-brightness button controls the brightness for the LED grade display and blade-tilt display. Options include Bright and Dim. Use dim for normal and lower light conditions and bright for sunny daytime operation. Dim conserves battery life.

When the receiver is out of the laser beam and the display-brightness button is pressed, the LEDs display a circle showing the current setting. To change the setting, press the button again while the LEDs are activated. The LEDs then display the new setting.

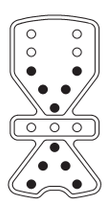
When the receiver is in the laser beam, simply press the button and the setting changes.

Out-Of-Level Warning

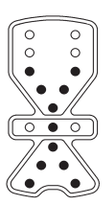
The secondary function for the display-brightness button is the laser out-of-level (OOL) warning. The function is used with lasers that can indicate that they are out of level by changing their rotation speed. The factory default setting is for the warning to be off.

To activate the out-of-level warning, turn on the receiver. Press and hold the power button then press and release the display-brightness button. The center green LED lights to confirm that the warning is on. Pressing the button combination again while the "X" pattern is lit allows you to toggle between having this function turned on and off. When the center green LED is not lit, the warning is off.

When the warning is turned on and the laser drops to 140 RPM, a flashing "X" appears on the display to indicate that the laser is out of level.



Laser Out of Level OFF



Laser Out of Level ON

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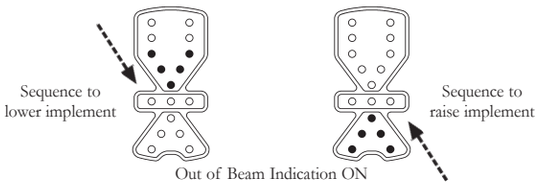
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Out-of-Beam Indication

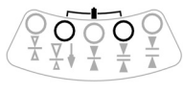
The receiver has an out-of-beam (OOB) function. When it is turned on, the LED grade display indicates that the receiver has moved beyond the vertical laser-reception range. A sequence of LEDs indicates which direction to move the blade or cutting edge to pick up the laser beam. If the receiver is above the beam, move the edge down. If the receiver is below the beam, move the edge up. The sequence stops as soon as a laser signal is received. Otherwise, the function shuts off after two minutes.

The factory default setting is for the out-of-beam function to be on. The LED display sequences inward toward on-grade to indicate that the function is on. To turn the function off, press the two outside buttons (Blade Tilt and Display Brightness) at the same time. The LED display sequences outward from on-grade to indicate that the function is off.



Out of Beam Indication ON

Low-Battery Warning



The receiver has low-battery warning LEDs. During normal operation with good batteries, the LEDs are off. When the batteries are low, the LEDs begin flashing. When the warning occurs, the receiver continues to operate as normal, but about 90 minutes of battery life remain. When the batteries are too low for normal operation, the LEDs remain on, the four corner grade-display LEDs flash, and the receiver no longer receives laser signals. Replace the batteries (or recharge them if you're using rechargeable batteries). The warning does not operate when the receiver is connected to machine power via a power cable.

Installation

General

⚠ **WARNING:** Follow all safety precautions as discussed in the machine's user guide. Also follow all excavation and safety requirements and practices.

1. Set up the laser in an appropriate location for receiver visibility and efficient machine operation. For more information about laser setup, please refer to the laser's user guide. Turn on the laser.

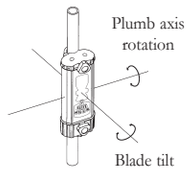
   Note: Operating distances depend on the rotating laser power. The receiver can pick up the beam from all directions (360°), but it requires a clear line of sight to the laser.

2. If your laser has selectable rotation speeds, select a high rotation speed. The receiver can process speeds up to 1200 RPM.
3. To mount the receiver on the mast, turn the top and bottom mounting knobs counterclockwise until the clamps in back open enough to fit around the mounting mast. Place the receiver on the mast. Turn the knobs clockwise to tighten the clamps.

   Note: The receiver will mount to round tubing that has a 42 mm to 50 mm (1.66 in. to 2.00 in.) outside diameter or to 38 mm ($1^1/_2$ in.) square tubing.

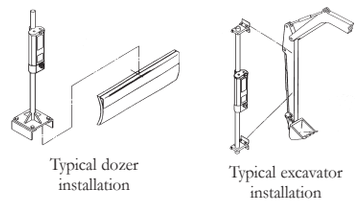
4. To remove the receiver from the mast, loosen the two clamps.

The blade-tilt and plumb indications are measured inside the receiver. The blade tilt indicates side-to-side position. Plumb indicates front-to-back position. Masts and receivers must be properly aligned to the machinery for accurate indications.



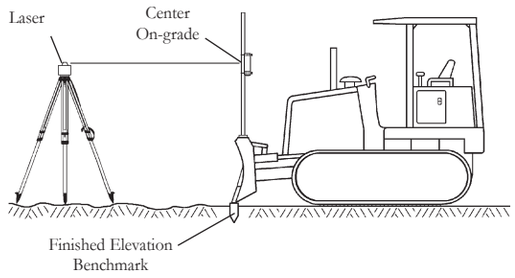
Make sure dozer mast is vertically aligned with the blade (both front-to-back and side-to-side) when the blade is in its normal operating position.

For excavation, the mast typically points towards the bucket teeth. For additional installation details, see "Slope Matching."


Typical dozer installation

Typical excavator installation

Grading



1. Position the machine so the blade can be set to the desired finished elevation (typically on a benchmark or hub stake).

2. Set up the laser in an appropriate location for receiver visibility and efficient machine operation. Turn on the laser.
3. Turn on the receiver, select center on-grade (grading mode), and select the smallest deadband.
4. To mount the receiver on the mast, turn the top and bottom mounting knobs counterclockwise until the clamps in back open enough to fit around the mounting mast. Place the receiver on the mast.
5. Slide the receiver up or down until on-grade is indicated. Adjusting the height of the laser may be necessary.

   Note: Alternatively, if the height of instrument (laser beam) to finished elevation length is known, the receiver can be set by measuring this distance from the cutting edge of the blade to the center on-grade mark on the back of the receiver label.

6. Face the LED grade display toward the machine and turn the mounting knobs clockwise to tighten the clamps
7. Select the desired deadband and brightness.

   Note: The LED grade display indicates which way to move the blade using the machine's controls to maintain an on-grade reading.

8. Make a sample pass with the blade "on-grade" and check to make sure the elevation is correct.

Slope Matching

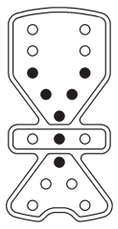
The blade-tilt indicator can be nulled or set to zero for a blade slope other than level. This function is used for matching an existing slope or setting the blade to a predetermined slope.

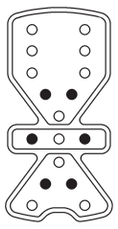
The factory default setting for the blade-tilt indicator is level.

To change the blade-tilt indicator at a slope other than level:

1. Position the blade at the desired slope. Make sure the receiver is properly aligned with the blade from side to side and front to back.
2. With the receiver on, press and hold the power button and immediately press and hold both the blade-tilt button and the display-brightness button. Continue holding all three buttons until a "0" symbol followed by a "Y" symbol briefly displays. The blade slope is now nulled at the existing slope.
3. To reset the blade-tilt indication back to level, position the blade to level using a four-foot level or other method. Repeat the above procedure with the blade level.

This procedure may also be used to correct the display when a mast is not aligned properly to the blade.

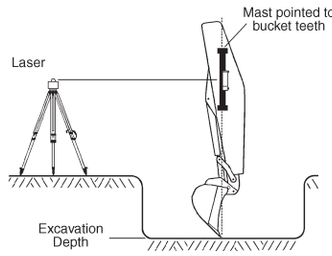

"Y" symbol


"O" symbol

Excavating

When an excavator or backhoe is being used, the dipper arm should be vertical or near vertical and the bucket positioned so that it can easily be put in the same position each time a grade reading is taken. The bucket can be fully extended or curled as long as the position is consistent when grade readings are taken. The receiver can be set up in the trench or out of the trench if the cut elevation can be determined.

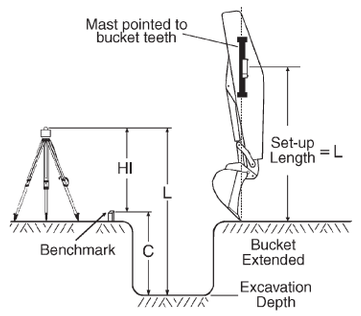
In-Trench Setup



1. Position the machine and dig to the desired finished elevation.
2. Position the bucket in the grade-checking position at the finished elevation.
3. Set up the laser in an appropriate location for receiver visibility and efficient machine operation. Turn on the laser.
4. Mount the mast on the side of the dipper arm.
5. Point the mast at the bucket teeth as illustrated if checking grade with the bucket fully extended. (If checking grade with the bucket curled or other position, point the mast to the point of the bucket that makes contact with the ground.)
6. Turn on the receiver, and select the offset on-grade and the smallest deadband.

7. Mount the receiver on the mast, and adjust the dipper arm so that the receiver is within the plumb range—LEDs solid. Adjust the plumb-accuracy indication if desired.
8. Slide the receiver up or down until you get a solid on-grade display.
9. Select the desired deadband and begin excavating.
10. Take grade readings with the bucket in the grade-checking position and the grade-display LEDs solid.
11. Take a sample reading with the bucket "on-grade" and check to make sure the elevation is correct.

Out of Trench Set-Up



1. Set the laser up in an appropriate location for receiver visibility and efficient machine operation and turn it on.
2. Place the bucket in the grade-checking position and situate the machine so a measurement can safely be obtained on the dipper arm. The dipper arm may be set more horizontal to the ground for convenient measurements if necessary.

3. Determine the distance from the laser to the bottom of the trench (L). This is the setup length. The length is the height of the instrument (HI) plus the depth of cut from the benchmark to the bottom of the trench (C).
4. Mount the mast on the side of the dipper arm.
5. Point the mast at the bucket teeth as illustrated if checking grade with the bucket fully extended. (If checking grade with the bucket curled or other position, point the mast to the point of the bucket that makes contact with the ground.)
6. Position the receiver so the setup length (L) is the distance from the point of the bucket that makes contact with the ground to the offset on-grade symbol on the back label. (Set up to center on-grade symbol if center on-grade is being used).
7. Turn on the receiver and select offset on-grade and the desired deadband.
8. Adjust the plumb-accuracy indication if desired. (Select center on-grade if set to center symbol).
9. Begin excavating.
10. Take grade readings with the bucket in the grade-checking position and the grade-display LEDs solid.
11. Take a sample reading with the bucket "on-grade" and check to make sure the elevation is correct.

Specifications

Beam Reception Range	360 degrees		
Operating Range	Over 460 m (1500 ft) radius, laser dependent		
Laser RPM	Minimum: 105; Maximum: 1200		
Vertical Reception	171 mm (6.75 in.)		
Accuracy:	Fine	Standard	Wide
Center On-Grade (Grading)	5 mm (0.20 in.)	10 mm (0.40 in.)	20 mm (0.80 in.)
Offset On-Grade (Excavation)	12 mm (0.50 in.)	25 mm (1.0 in.)	50 mm (2.0 in.)
Blade-Tilt & Plumb-Swing Accuracy	± 0.5°, ± 1.5°, ± 2.5°		
Display Output	Bright or Dim		
Automatic Control Capability	Yes, with CB20, CB25 and CB30 Control Box		
Power Options	Alkaline – 4 x "C" Cell – Standard Nickel Metal Hydride – 4 x "C" Cell Power Cable – 10 –30 V dc		
LR50 Battery Life – Alkaline LR50W Battery Life – Alkaline *(Continuous in beam)*	60 hours, Display Dim / 45 Hours, Display Bright 30 hours, Display Dim / 20 Hours, Display Bright		
LR50 Battery Life – Ni-MH LR50W Battery Life – Ni-MH *(Continuous in beam)*	45 hours, Display Dim / 30 hours, Display Bright 20 hours, Display Dim / 15 hours, Display Bright		
Battery Recharge Time	3 – 4 hours		
Automatic Shutoff	75 minutes with no laser beam		
Out-of-Beam Indication	High and Low, Selectable On or Off		
Remote Display Option	Yes		
Dimensions (LxWxD)	343 mm x 142 mm x 149 mm (13.50 in. x 5.58 in. x 5.88 in.)		
Mounting Pipe Round Tube (Outside Diameter) Square Tube	42 mm to 50 mm (1.66 in. to 2.00 in.) 38 mm (1 ½ in.)		
Operating Temperature	–20 °C to +60 °C (–4 °F to 140 °F)		

**Specifications subject to change without notice*

Declaration of Conformity

This receiver to which this declaration relates is in conformity with the essential requirements and other relevant requirements of the Directive 2004/108/EC (EMC), Directive 2006/95/EC (LVD) and Council Directive 1999/5/EC R&TTE.

Safety: (article 3.1a)	BS EN60950-1: 2006/A12:2011 EN 62311:2008
EMC: (article 3.1b)	ETSI EN 301 489-1 V1.9.2 (2011-09) in accordance with the specific requirements of CISPR22 Class A ETSI EN 301 489-17 V2.1.1 (2009-05)
Spectrum: (article 3.2)	ETSI EN 300 328 V1.7.1 (2006-10), EN61000-9-2, EN61000-9-3, EN61000-9-6, EN61000-9-8

We hereby declare that the equipment specified above conforms to the above Directive(s).

Spectra Precision (USA) LLC.
3265 Logistics Lane, Suite 200
Dayton, OH 45377 U.S.A.

August 24, 2012

Warranty

Spectra Precision LLC warrants the receiver to be free of defects in material and workmanship for a period of two years.

Spectra Precision LLC or its authorized service center will repair or replace, at its option, any defective part for which notice has been given during the warranty period. If required, travel and per diem expenses to and from the place where repairs are made will be charged to the customer at the prevailing rates.

Customers should send the product to the nearest authorized service center for warranty repairs, freight prepaid. In countries with Spectra Precision LLC subsidiary service centers, the repaired product will be returned to the customer, freight prepaid.

Any evidence of negligent, abnormal use, accident, or any attempt to repair the product by other than factory-authorized personnel using Spectra Precision LLC certified or recommended parts, automatically voids the warranty.

The foregoing states the entire liability of Spectra Precision LLC regarding the purchase and use of its equipment. Spectra Precision LLC will not be held responsible for any consequential loss or damage of any kind.

This warranty is in lieu of all other warranties, except as set forth above, including any implied warranty merchantability of fitness for a particular purpose, are hereby disclaimed. This warranty is in lieu of all other warranties, expressed or implied.

SPECTRA PRECISION

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