LR60 Laser Receiver

User Guide

SPECTRA PRECISION LASER

Introduction

Thank you for choosing the Spectra Precision® Laser Receiver LR60. 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:
Trimble Construction Division
5475 Kellenburger Road
Dayton, Ohio 45424-1099 U.S.A.
Phone: (937) 245-5600
(800) 538-7800
Fax: (937) 233-9004
Internet: www.trimble.com

Please record your product information below. This will assist you if there are any questions regarding warranty or service.

PRODUCT: _____

SERIAL NUMBER: _____

DATE OF PURCHASE: _____

PURCHASED FROM: _____

PHONE: _____

Safety

Please follow all operating and safety instructions in this guide and that of your machinery. Perform periodic checks of the product's performance. Trimble 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 Trimble service personnel only.

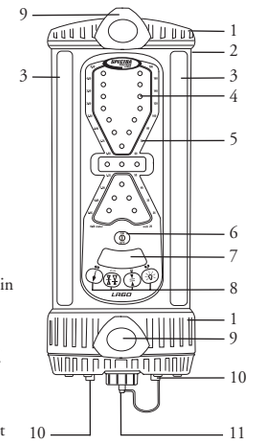
Maintenance and Care

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.

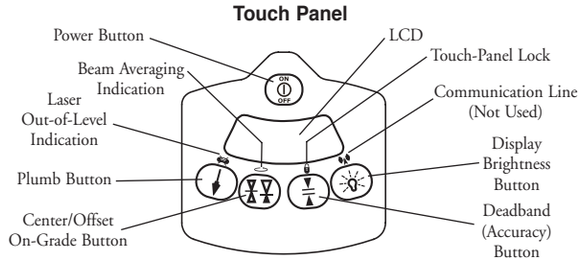
Features and Functions



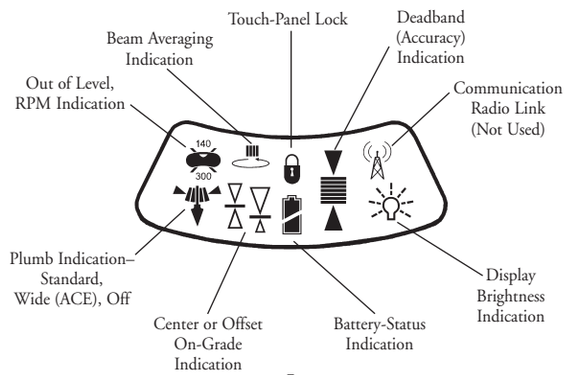
1. **Aluminum-Cast Upper and Lower Housings**—protect the receiver.
2. **Polycarbonate Housing**—protects the electronics.
3. **Receiving Windows**—include four sets of photocell that are equally spaced to allow for 360 degree reception.
4. **Ultra-Bright LEDs**—are highly visible and graphically display blade or bucket position. The green on-grade LEDs and red off-grade LEDs provide quick visual indication.
5. **Setup Length Scale**—is used for initial setup in wide Angle Compensation for Excavation (ACE) mode.
6. **Power Button**—turns the receiver on and off. It also acts as a "shift" key for secondary receiver functions.
7. **Liquid Crystal Display**—indicates the current receiver settings and battery status.
8. **Touch-Panel Buttons**—allow the settings to be adjusted
9. **Mounting Knobs**—are attached to stainless steel clamps that allow for quick and easy installation to the mast or magnetic mount.
10. **Access Screws**—allow easy access to battery compartment so the batteries can be replaced.
11. **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

Touch Panel



LCD



Installing and Recharging the Batteries

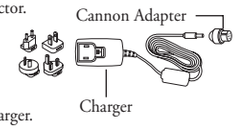
Alkaline Batteries

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.

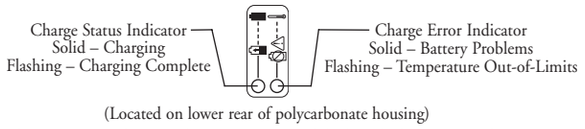
Battery Safety

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.



(Located on lower rear of polycarbonate 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 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

Press the power button. All the LEDs light and then each row lights from top to bottom. The LCD cycles through its symbols. If the receiver is out of the laser beam, the center green LED flashes and the LCD lights to confirm power is on. If the receiver is in a laser beam, a corresponding LED grade display lights.

Plumb Button

This plumb button has three positions: off, standard, and Angle Compensation for Excavation (ACE) mode. Plumb indication is generally used during excavation operations.

Press the button once to change between standard plumb mode and plumb off. The standard plumb mode is preset to a range of ±2.5°. The LCD does not show a plumb symbol when it is turned off; it shows the standard plumb indicator when the standard plumb mode is selected. The grade indication LEDs flash quickly when the mast and receiver are extended beyond the plumb range and flash slowly when retracted beyond the range. The display is solid when the mast and receiver are within the plumb range.

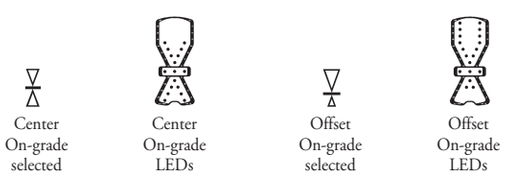
Angle Compensation for Excavation (ACE) Mode

The receiver displays grade information at wide swing angles of ±10° to 30°. To enter this mode, press and hold the plumb button for approximately 2 seconds. The on-grade location automatically switches to the center on-grade and the wider plumb angle symbol appears on the LCD. A single LED or pair of LEDs light. These LEDs correspond to the setup length that is input using the scale on the front label of the display area. A setup procedure is required to compensate for the dipper-arm swing arc. To determine this length and for more installation information, please refer to the "Installation-General" section of this guide.

Center/Offset On-Grade Button

Center on-grade or "grading mode" is selected when grade information is useful both above and below on-grade, as with typical grading operations. Offset on-grade or "excavator mode" is selected when using a backhoe or excavator. The excavator mode gives more information and a larger display above on-grade.

Press the button to cycle between the two options. The LCD indicates which mode is selected and the LEDs display the appropriate pattern. The center on-grade has 7 display channels plus 2 out-of-beam indications. The offset on-grade has 8 display channels plus 2 out-of-beam indications.



Deadband (Accuracy) Button

Four deadbands are available in the grading and excavating modes. The LCD indicates which mode is selected. Two deadbands (fine and standard) are available in the Angle Compensation for Excavation (ACE) mode. The smallest deadband is used for receiver setup. Selections are then made to fit job requirements. For specific deadbands, please refer to the "Specifications" section of this guide. To change the deadband, press the deadband button. The deadband and corresponding LCD symbol change and cycle with each press.

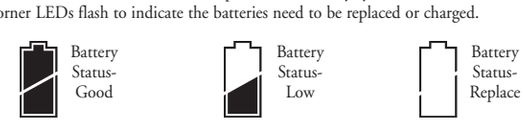
Display-Brightness Button

The display-brightness button controls the LED brightness. Options include Bright and Dim. Use Dim for normal and lower light conditions and Bright for sunny daytime operation. Dim conserves battery life by approximately 50%. Press the display-brightness button to cycle through both options. The selection is indicated on the LCD. Additionally, if the receiver is out of the laser beam, the LEDs display a circle with the current setting.

Additional Features

Battery-Status Indication

A battery-status symbol is depicted on the LCD when the receiver is powered by batteries. Three levels are displayed. The battery symbol is full when the batteries are good. The battery symbol is half full and blinking when the batteries are low. The receiver will still operate for a short period of time. When there is an outline only, the batteries are drained and must be replaced. The battery symbol outline and the four corner LEDs flash to indicate the batteries need to be replaced or charged.



Out-of-Beam Indication

The LED display indicates if the receiver has moved beyond the vertical laser-reception range. A sequence of LEDs indicates which direction the implement must be moved to pick up the beam. The out-of-beam indication continues for approximately two minutes.

Out-of-Beam Indication Disable

The out-of-beam indication can be turned off if desired. Press the two outer buttons (Plumb and Display Brightness) at the same time to disable. The receiver displays the out-of-beam LED sequence in reverse order from both top and bottom. When disabled, the receiver indicates out-of-beam by flashing the center LED. Press the two outer buttons again to enable the indication. The receiver remembers the out-of-beam display state at the next power up.

Installation

General

1. Set up the laser in a safe and convenient location. For more information about laser setup, please refer to the laser's user guide.
   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 both the top and bottom knobs counterclockwise until the mounting clamps in back open enough to fit around the mounting mast. Place the receiver on the mast. Turn the knobs clockwise to tighten.
   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.

For excavation, the receiver may be set up in the trench or above ground.

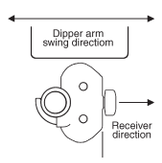
Angle Compensation for Excavation (ACE) Mode

The horizontal grade checking width is wider as the receiver setup length is decreased. For example, the closer the receiver is mounted to the bucket, the wider the grade checking range will be.

The most accurate and repeatable method for checking grade is with the bucket cylinder fully retracted. The mast must be mounted so that it points to the bucket teeth in this setup.

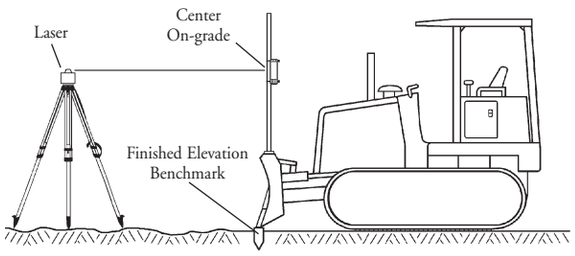
Checking grade with the bucket leveled or in other positions provides for faster rough excavation. The receiver indicates level at the bucket pivot pin in these positions. It is important to take grade readings only when the bucket is in the original setup position.

The LED display must be in the direction of the operator and be perpendicular to the direction of the dipper arm swing.



For all excavation operations, always take a sample reading with the bucket "on-grade" and check to make sure the elevation is correct.

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. Mount the receiver to 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 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.

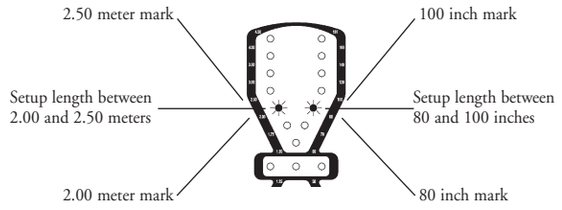
Excavating

Angle Compensation for Excavation (ACE)

1. Use the length determined by the setup procedure.
2. Press and hold the plumb button to enter the ACE mode and the setup length entry mode.

   Note: The on-grade location automatically switches to the center on-grade, and the wide plumb (ACE) symbol appears on the LCD. A single LED or pair of LEDs lights and cycles up the scale as the button is held.
3. Release the button when the LEDs are closest to the setup length. An LED flashes in approximately 2 seconds to confirm the settings.

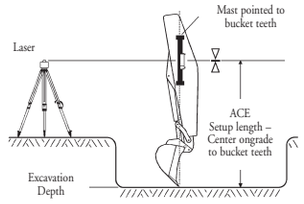
   Example: If the setup measurement is 2.13 meters, release the button between the 2.00-m and 2.50-m marks on the left-side scale. (If the setup length measurement is 84 inches, release the button when the pair of LEDs is lit between the 80-inch and 100-inch marks on the right-side scale.)



4. If the setup number is passed, simply continue pressing the button until it cycles to the correct number again. The number may also be selected by pressing and releasing the button while in the setup length entry mode. The LEDs change one increment each time the button is pressed.
5. Release the button to accept the displayed setup length. An LED flashes in approximately 2 seconds to confirm the settings.

If the setup measurement is an exact number on the scale, use the next higher number on the scale.

In-Trench Setup - Bucket Extended



1. Position the machine, and dig to the desired finished elevation.
2. Fully retract the bucket cylinder and place the bucket teeth at the finished elevation.
3. Set up the laser and turn it on.

Standard Plumb

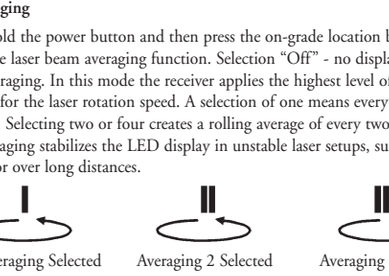
1. Mount the mast on the side of the dipper arm.
2. Turn on the receiver, and select standard plumb mode, offset on-grade, (center on-grade may be used), and the smallest deadband.
3. Place the receiver on the mast and adjust the dipper arm so that the receiver is within the standard plumb range.

4. Slide the receiver up or down until you get an on-grade display.
5. Select the desired deadband and begin excavating.
6. Take grade readings with the bucket retracted and the LEDs solid.

ACE mode

1. Mount the mast on the side of the dipper arm so that it points to the bucket teeth.
2. Turn on the receiver and select standard plumb mode, center on-grade, and the smallest deadband.
3. Mount the receiver to the mast, adjust the dipper arm to plumb, and slide the receiver up or down until you get a solid on-grade display.
4. Safely measure the distance from the bucket teeth to the center on-grade mark on the back of the receiver. This is the setup length.
5. Enter the ACE mode.
6. Press and hold the plumb button to scroll up the setup-length scale and release the button when the lit LED is closest to the measured setup length. The LED flashes to confirm the setting.
7. Select the desired deadband and begin excavating.
8. Take grade readings with the bucket fully retracted and LEDs solid.

In-Trench Setup – Bucket Leveled



1. Position the machine, and dig to the desired finished elevation.
2. Level the bucket and place the bottom of the bucket at the finished elevation.
3. Set up the laser and turn it on.

Standard Plumb

The standard plumb process is the same irrelevant of whether the bucket is extended or leveled. For instruction on how to perform this process, please refer to "In-Trench Setup – Bucket Extended."

ACE mode

1. Mount the mast on the side of the dipper arm so that it points to the bucket pivot pin.
2. Turn on the receiver, and select standard plumb mode, center on-grade, and the smallest deadband.
3. Mount the receiver to the mast, adjust the dipper arm to plumb, and slide the receiver up or down until you get a solid on-grade display.
4. Safely measure the distance from the bucket pivot pin to the center on-grade mark on the back of the receiver. This is the setup length.

5. Enter the ACE mode.
6. Press and hold the plumb button to scroll up the setup-length scale and release the button when the lit LED is closest to the measured setup length. The LED flashes to confirm the setting.
7. Select the desired deadband and begin excavating.
8. Take grade readings with the bucket leveled and LEDs solid.

Out-of-Trench Setup - Bucket Extended

1. Fully retract the bucket cylinder and position the machine so that a measurement can safely be obtained on the dipper arm.
2. Set up the laser and turn it on.
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).

Standard Plumb

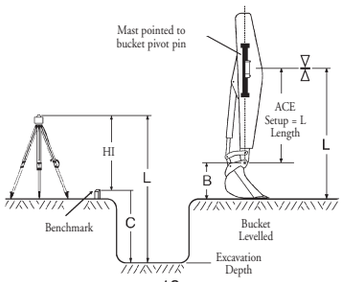
1. Mount the mast on the side of the dipper arm so that it points to the bucket teeth.

2. Position the receiver so that the setup length (L) is the distance from the bucket teeth to the offset on-grade symbol on the back of the receiver. (Set up to the center on-grade symbol if center on-grade will be used).
3. Turn on the receiver, and select standard plumb mode, offset on-grade, and the desired deadband. (Select center on-grade if set to center symbol).
4. Begin excavating. Take grade readings with the bucket retracted and the LEDs solid.

ACE mode

1. Follow the Standard Plumb procedures except the setup length is the distance from the bucket teeth to the center on-grade symbol on the back of the receiver.
2. Enter the ACE mode.
3. Press and hold the plumb button to scroll up the setup-length scale and release it when the lit LED is closest to the measured setup length. The LED flashes to confirm the setting.
4. Select the desired deadband and begin excavating.
5. Take grade readings with the bucket retracted and LEDs solid.

Out-of-Trench Setup – Bucket Leveled



1. Level the bucket and position the machine so a measurement can safely be obtained on the dipper arm.
2. Set up the laser and turn it on.
3. Determine the distance from the laser to the bottom of the trench (L). The length is the height of the instrument (HI) plus the depth of cut from the benchmark to the bottom of the trench (C).

Standard Plumb

The standard plumb process is the same irrelevant of whether the bucket is extended or leveled. For instruction on how to perform this process, please refer to "Out-of-Trench Setup – Bucket Extended."

ACE mode

1. Follow the Standard Plumb procedures except the setup length is the finished elevation to the center on-grade symbol (L) minus the bucket-height length (B). (Setup length = L - B)
2. Enter the ACE mode.
3. Press and hold the plumb button to scroll up the setup-length scale and release the button when the lit LED is closest to the measured setup length. The LED flashes to confirm the setting.
4. Select the desired deadband and begin excavating.
5. Take grade readings with the bucket leveled and LEDs solid.

Important Information about Excavating

Note: For all excavation operations, always take a sample reading with the bucket "on-grade" and check to make sure the elevation is correct.

For all grading operations, make a sample pass with the blade "on-grade" and check to make sure the elevation is correct.

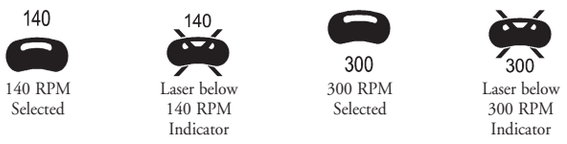
For extendable dipper arms – if the mast is mounted to the dipper arm section that moves with the bucket, grade can be checked with the dipper arm extended to any position. If the mast is mounted to the dipper arm section that does not move with the bucket, grade can only be checked when the dipper arm is in the exact setup position.

Secondary Functions

While the receiver is on, press and hold the power button and then press the touch-panel buttons to activate secondary or "shift" functions that are indicated by the symbols above the button.

Laser Out of Level

This function is for use with lasers that have the ability to indicate that they are out of level by changing the RPM of the laser. Two speeds of 140 RPM and 300 RPM are available as well as out-of-level turned off. Press and hold the power button and then press the plumb button to cycle through the options of 140 RPM, 300 RPM, and off. The LCD indicates which speed is selected. "No display" on the LCD indicates out-of-level is disabled. When the laser RPM drops to the selected laser out-of-level speed, an "X" symbol appears on the LED grade display and on the LCD symbol.



Beam Averaging

Press and hold the power button and then press the on-grade location button to select and cycle the laser beam averaging function. Selection "Off" - no display - chooses adaptive averaging. In this mode the receiver applies the highest level of averaging appropriate for the laser rotation speed. A selection of one means every beam strike is processed. Selecting two or four creates a rolling average of every two or four beam strikes. Averaging stabilizes the LED display in unstable laser setups, such as windy conditions or over long distances.

Touch-Panel Lock

Press and hold the power button and then press the accuracy button to turn the touch-panel lock function on and off. When the function is on, the lock symbol appears on the LCD. Buttons cannot be changed and accidental changes from dirt or debris knocking the buttons are prevented. To make changes to the receiver, turn off the lock function.

Communication Options

This function is not currently used on the receiver.

Notice to Our European Union Customers

For product recycling instructions and more information, please go to: www.trimble.com/environment/summary.html

Recycling in Europe

To recycle Trimble WEEE,
call: +31 497 53 2430, and
ask for the "WEEE associate," or

mail a request for recycling instructions to:
Trimble Europe BV
c/o Menlo Worldwide Logistics
Meerheide 45
5521 DZ Eersel, NL

Specifications

Beam Reception Range	360 degrees	
Operating Range	Over 460 m (1500 ft) radius, depending on laser	
Laser RPM	Minimum: 105; Maximum: 1200	
Vertical Reception	222 mm (8.75 in.)	
Accuracy: On-Grade Deadbands	Grading	Excavating
Setup	5 mm (0.20 in.)	6 mm (0.25 in.)
Fine	10 mm (0.40 in.)	12 mm (0.50 in.)
Standard	20 mm (0.80 in.)	25 mm (1.0 in.)
Wide	40 mm (1.60 in.)	50 mm (2.0 in.)
	ACE—Angle Compensation Mode	
Fine		12 mm (0.50 in.)
Standard		25 mm (1.0 in.)
Plumb Swing Range		
Standard	± 2.5°	
Angle Compensation Mode	± 10° to ± 30°	
Display Output	Bright, Dim	
Automatic Control Capability	Yes, with CB25 Control Box	
Power Options	Alkaline – 4 x "C" Cell – Standard Nickel Metal Hydride – 4 x "C" Cell Power Cable – 10 –30 V dc	
Battery Life – Alkaline *(Continuous in beam)*	75 hours, Display Dim 45 Hours, Display Bright	
Battery Life – Ni-MH *(Continuous in beam)*	50 hours, Display Dim 40 hours, Display Bright	
Battery Recharge Time	3 – 4 hours	
Automatic Shut Off	75 minutes with no laser beam	
Out of Beam Indication	High and Low	
Remote Display Option	Yes	
Automatic Control Option	Yes	
Dimensions (LxWxD)	394 x 142 x 149 mm (15.50 in. x 5.58 in. x 5.88 in.)	
Mounting Pipe		
Round Tube(Outside Diameter)	42 mm to 50 mm (1.66 in. to 2.00 in.)	
Square Tube	38 mm (1.50 in.)	
Operating Temperature	–20 °C to +60 °C (–4 °F to 140 °F)	

**Specifications subject to change without notice*

Warranty

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

Trimble 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 Trimble 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 Trimble certified or recommended parts, automatically voids the warranty.

The foregoing states the entire liability of Trimble regarding the purchase and use of its equipment. Trimble 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 LASER

Trimble Construction Division
5475 Kellenburger Road
Dayton, Ohio 45424-1099
U.S.A.
+1-937-245-5600 Phone
www.trimble.com

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