

DR400 DigiRod User Guide



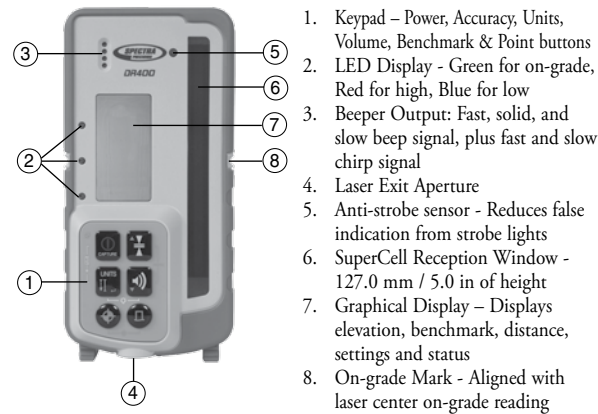
www.trimble.com/spectra

Introduction

Thank you for choosing the Spectra Precision® DR400 DigiRod™ from the Trimble® family of precision products. Before using the product, be sure to read this operator's manual carefully.

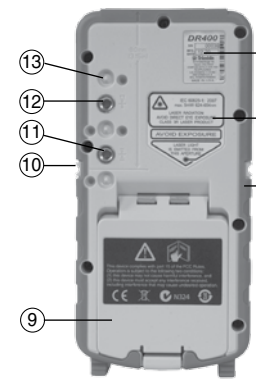
Your comments and suggestions are welcome; please contact us at the locations listed at the end of this manual.

Features



1. Keypad – Power, Accuracy, Units, Volume, Benchmark & Point buttons
2. LED Display - Green for on-grade, Red for high, Blue for low
3. Beeper Output: Fast, solid, and slow beep signal, plus fast and slow chirp signal
4. Laser Exit Aperture
5. Anti-strobe sensor - Reduces false indication from strobe lights
6. SuperCell Reception Window - 127.0 mm / 5.0 in of height
7. Graphical Display – Displays elevation, benchmark, distance, settings and status
8. On-grade Mark - Aligned with laser center on-grade reading

Features



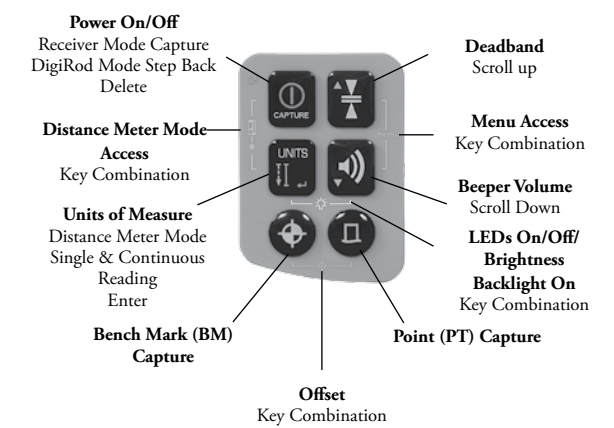
9. Battery Door & Latch for four "AA" batteries
10. Marking Notches, 80.0 mm (3.15 in) from top
11. Captive Screw Thread, Center on-grade clamp position
12. Captive Screw Thread, Offset on-grade clamp position
13. Clamp Guides - Dimples align rod clamp
14. Serial Number / ID Label
15. Laser Safety and Aperture Labels
16. Rubber over mold - Protects the unit from drops

Installing the Batteries

1. Open the battery door while pressing in the latch with your thumb
2. Insert four AA batteries noting the plus (+) and minus (-) diagrams inside the battery housing.
3. Close the battery door. Push down on latch until it "clicks" into the locked position.



Features



Turn Power ON/OFF

1. Press and hold for 2 seconds to turn power ON. Repeat to turn power OFF. The unit will initialize a function test, calibrate, then be ready for use.

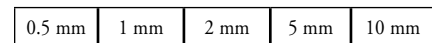
(Do not power up the unit in a laser beam or strobe. If detected, the unit will display "E200" and revert to the previous calibration.)



Laserometer Mode - Select Accuracy

Press once to change the current settings (A beep confirms the selected Accuracy)

The selected unit of measure determines the displayed deadband (accuracy). The current accuracy is stored in memory and will be retained when the unit is turned off or when batteries are replaced.



Select Beeper Volume

Press once to change the current settings.

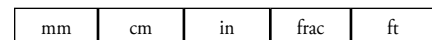


Off - Low - Medium - Loud

The current beeper volume is stored in memory and will be retained when the unit is turned off or when batteries are replaced.

Select Units of Measure

Press once to change the current settings.



The current unit of measure is stored in memory and will be retained when the unit is turned off or when batteries are replaced.

Select LED Brightness / Backlight On

Press the Units and Volume buttons together to turn the backlight on for 30 seconds and to display the LEDs at their current setting. Subsequent presses cycle through the LED brightness settings (bright, dim and OFF).

The current brightness of LEDs is stored in memory and will be retained when the unit is turned off or when the batteries are replaced.

Capture Function

A) DR400 is in the laser beam and the power is on:

Press the Power / Capture button once. The current elevation reading will be held. A flashing display will confirm the reading has been captured.

Press On/Off button to return to normal operation.

B) DR400 is out of the laser beam and power is on:

Press the Power / Capture button once. A short intermittent beep (The beeper will turn on to Low if turned off.)

Place the DR400 in the beam. (Example: Fasten it to a measuring rod, bring the DR400 into the laser beam. You now have 5 seconds to capture the reading.)

The beeper will chirp rapidly after approximately 5 seconds to confirm beam capture. A flashing display will also indicate the reading has been captured.

Press On/Off button to return to normal operation.

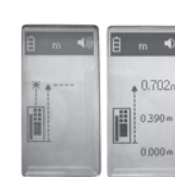


Laser Distance Meter Mode

Press and HOLD the Power and Units button for 1 second to select the Laser Distance Meter mode.

Screen changes/reverses to laser distance meter view.

Units of measure must be set in DigiRod mode prior entry into laser distance meter mode. The Units button becomes the Measure button in laser distance meter mode.



Taking a single measurement: Press and release the Measure (Units) button. The laser beam symbol flashes and laser spotting beam appears. Place the spotting beam on the target and press and release the measurement button again to take the measurement. Measurements are always referenced to the back (top) of the unit. The previous 2 measurements are indicated in smaller font at the bottom of the display.

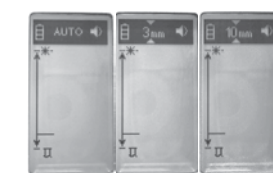
Taking continuous measurements: Press and release the Measure (Units) button. The laser beam symbol flashes, laser spotting beam appears. Press and HOLD the measurement button for 2 seconds to take continuous measurements. The shortest measurement (Min) and longest measurement (Max) are indicated at the bottom of the display. Press the measurement button again to stop taking continuous measurements.

Exiting laser distance meter mode: Cycle On/Off to exit laser distance meter mode, or press the Benchmark or Point buttons to exit laser distance meter mode and go directly to DigiRod mode.

DigiRod Mode

Press and release either the Benchmark or Point buttons. The screen changes to DigiRod view.

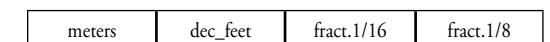
Select accuracy: AUTO, 3 mm or 10 mm. Press once to change current setting. The recommended setting is AUTO, which allows the widest tilt angles (30 degrees) for measurements and the fastest readings. The accuracy of a particular shot is displayed as fine (3 mm or 1/8"), medium (10 mm or 1/2") or coarse (>10 mm or 1/2") with a flashing symbol after each measurement.



The current accuracy is stored in memory and will be retained when the unit is turned off or when batteries are replaced.

NOTE: The above accuracies are typical using a 1.5 m (5 ft) Height of Instrument (HI).

Select units of measure: Press once to display the current setting. Press again to scroll through settings:



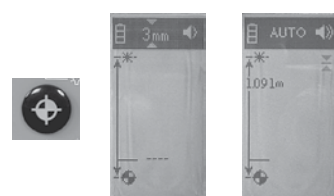
DigiRod Measurement Considerations

1. For precision Benchmark or Point readings the accuracy can be set to 3 mm, which "forces" the user to hold the unit relatively plumb and steady. Once a precision reading (such as a Benchmark) is taken, the unit can be set to AUTO for remaining readings.
2. The closer to plumb the DigiRod is held, the more accurate the readings.
3. The shorter the H.I. is for a given Accuracy band, the more accurate the readings.
4. The more stable the DigiRod is held, the more accurate the readings.
5. Targets that have poor reflectivity (black or dark surfaces such as new blacktop) and bright sunlight will increase the time required to collect or make impossible LDM readings. (See Error Code Chart)
6. Do not use DigiRod upside down or inaccurate readings will result.

Taking a Benchmark: Press and release the Benchmark button. Place the spotting beam on the (ground) target and the receiver in the rotating laser plane and hold the unit steady to allow the DigiRod to take the measurement (2-3 seconds). The unit beeps, laser spotting beam appears and benchmark elevation number flashes "----".

The DigiRod generates audible tones to indicate proper placement in the laser beam and tilt:

DigiRod Audible Tones	Condition
Slow intermittent beep	In capture mode, but no laser strike
Slow beep	Laser strike is too low
Fast beep	Laser strike is too high
Slow chirp	Laser strike is in range, but unit is tilted out of range or too unsteady
Fast chirp	Laser strike and tilt are in range, collecting the measurement
Continuous beep	Measurement finished



Taking a Benchmark:

Once the measurement is taken press the Enter button (↵) to accept or the up/down buttons (▲▼) to change the benchmark elevation number in the display (see the next section to change/accept elevation numbers).

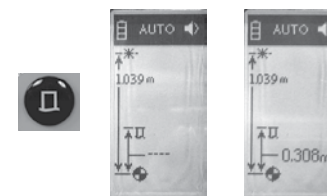
Once entered the Benchmark Elevation (BM ELV) is stored in memory.



Taking a Point: The Point is the relative measurement compared to the previously taken Benchmark Elevation.

Press and release the Point button. Place the spotting beam on the (ground) target and the receiver in the rotating laser plane and hold the unit steady to allow the DigiRod to take the measurement (2-3 seconds).

Unit beeps, laser spotting beam appears, point elevation number flashes "----".



Changing and Accepting Elevation Numbers:

The Benchmark Elevation number flashes as a prompt to accept or change the elevation number. To accept or change the elevation number, scroll the number up or down by pressing the up or down (accuracy+volume) buttons. Press the Enter button (↵) to accept the displayed elevation.

To ZERO the elevation number, press the up/down buttons (▲▼) simultaneously for 1 second. To change the elevation number in integer increments press and HOLD the up and down buttons simultaneously for longer than 2 seconds. To fast increment the elevation number press and hold the up button, wait a few seconds, then simultaneously press and hold the down button. To fast decrement the elevation number hold the down button, wait a few seconds, then simultaneously press and hold the up button.

Benchmark Elevation (BM ELV) number flashes

Emulating Different Rod Types

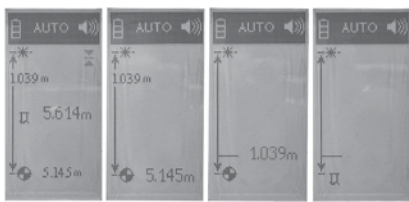
1. To emulate a cut / fill rod; Set the Benchmark Elevation (BM ELV) to zero, subsequent Point measurements will be displayed relative to the BM.
2. To emulate a direct reading rod; Set the BM ELV to the desired (non zero) elevation, the subsequent Point measurements will be displayed as elevations with respect to the BM ELV.
3. To emulate an indirect reading rod; do not establish a BM, or delete an existing BM. Subsequent point readings will be displayed as H.I.'s with respect to the laser plane.

Step Back Delete:

Press and release ON/OFF to allow display, change or deletion of Benchmark Elevation and change (if enabled) or deletion of Benchmark Height of Instrument (BMHI) and offset numbers.

1st press allows change/deletion of Benchmark or Offset elevations.
2nd press allows change (if enabled) or deletion of Benchmark H.I.

1. Before Benchmark deleted
2. 1st press prompts BM ELV adjust.
3. 2nd press deletes BM ELV and prompts BM HI adjust.
4. 3rd press deletes BM HI



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BM ELV Adjust - Benchmark elevation adjustment ON*- OFF

Tilt Comp. - Tilt compensation ON*- OFF

BM HI Adjust - Benchmark height of instrument adjustment ON- OFF*
Only appears in the DigiRod Menu if BM ELV Adjust is ON

BM ELV Adjust: When turned ON, allows the benchmark elevation to be adjusted by the user, permitting direct elevation rod functions and preset digging depths to be entered

ON*: Prompts user for benchmark elevation after a benchmark is shot
OFF: No prompt is available to the user, limiting the DigiRod functions to cut/fills and indirect rod (HI) readings only

Tilt Compensation: When turned ON (recommended), allows the DigiRod to compensate for tilt for better accuracy. When turned OFF allows the DigiRod functions to be used in inverted or sideways mounted applications (although with NO compensation)

ON*: Tilt compensation is ON
OFF: Tilt compensation of OFF

BM HI Adjust: When turned ON, allows the benchmark HI (the vertical distance from the laser plane to the benchmark) to be adjusted by the user
ON: Prompts user for a benchmark HI after a benchmark is shot
OFF*: No prompt is available to the user, so the benchmark HI determined by the internal laser distance meter is always used

Battery Status: Full batteries - OK
Half - Initial warning
1/4 - Approx. 30 minutes remain
Empty - Change batteries.



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Error Codes

Code	Cause	Corrective Action
-402	Laser distance meter timeout while in DigiRod mode or while in Tracking mode in Laser Distance Meter mode	Target area is too dark, or not within range, move to a lighter target area that is within range
-404	Laser distance meter timeout while in Laser Distance Meter mode	Target area is too dark, or not within range, move to a lighter target area that is within range
-600	No laser strike timeout while in DigiRod mode	No rotating laser beam was detected, check the rotating laser is operating correctly and the DR400 photocell is in the laser plane
-601	Laser distance meter error while in DigiRod mode	Laser distance meter target area is too dark, not within range, or the laser distance meter temperature range is exceeded. Move to a lighter target area that is within range and temperature limits.
-603	Laser distance meter reads > 6m distance while in DigiRod mode	Target area is too far, move to a target area that is within range
-604	Cold temperature range exceeded while in DigiRod mode	Move to a work area that is within temperature limits
-252	High temperature exceeded while in Laser Distance Meter mode	Move to a work area that is within temperature limits
-253	Low temperature exceeded while in Laser Distance Meter mode	Move to a work area that is within temperature limits
-255	No return signal while in Laser Distance Meter mode	Target area is too dark, or not within range, move to a lighter target area that is within range
-256	Ambient light too high or distance to target too close while in Laser Distance Meter mode	Avoid shining bright lights directly into the laser aperture, or the target area is too close, move to a target that is farther away
-257	Return signal is too high while in Laser Distance Meter mode	Target area is too reflective, such as a mirror, move to a target that is not too shiny
-258	Weak return signal while in Laser Distance Meter mode	Target area is too dark, or not within range, move to a lighter target area that is within range

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Offset (stored additional benchmark):

A benchmark must be entered and its elevation must be set to Zero before offset can be used. The offset value is stored in memory and remains after a power cycle. The previous benchmark can be restored by deleting the offset.



Simultaneously press and release the Benchmark and Point buttons to create an offset from an existing benchmark elevation. Accept or change the offset value as desired using the up/down/enter buttons.

Once the offset value is accepted, the offset HI (the distance from the laser plane to the offset) are displayed. (the previous BM is not displayed).

Exiting DigiRod mode:



Cycle ON/OFF to exit DigiRod mode and go to Laserometer mode,

or press the ON/OFF and Units buttons to exit DigiRod mode and go directly to laser distance meter mode.

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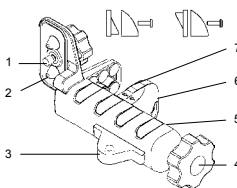
Move Clamp Positions:



Offset on-grade clamp position - clamp position is sensed automatically and displayed. Offset clamp position moves the on-grade location to allow more grade information to be displayed above grade. This is useful in applications where going below grade is not required, i.e. driving stakes down to grade.

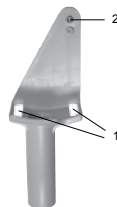
Rod Clamp

1. Captive Rod Clamp Screw - attaches to the back of detector.
2. Alignment Points (2) - help secure and align rod clamp.
3. Level Vial - can be viewed from above or below to verify that the rod is plumb.
4. Clamping Screw Knob - secures clamp to rods by moving the traveling jaw. Clockwise tightens; Counterclockwise loosens.
5. Reference Bar - top of bar is aligned with on-grade.
6. Traveling Jaw - moving jaw grips tightly to rods.
7. Reversible Face - slanted face for round and oval rods; flat face for rectangular and square rods.



Handle

1. Mounting Locations - Insert the base feet of the DR400 into slots
2. Captive Rod Clamp Screw - attaches to the back of the DR400.



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Warranty

Trimble warrants the DR400 to be free of defects in material and workmanship for a period of 5 years. For the first 3 years, Trimble or its authorized Dealer or Service Center will repair or replace, at its option, any defective part, or the entire product, for which notice has been given during the warranty period. For the 4th and 5th year an exchange fee may apply. This warranty period is in effect from the date the system is delivered by Trimble or its authorized Dealer to the purchaser, or is put into service by a Dealer as a demonstrator or rental component.

Any evidence of negligent or abnormal use, or any attempt to repair equipment by other than factory-authorized personnel or Trimble certified or recommended parts, automatically voids the warranty.

Special precautions have been taken to ensure the calibration of the angle sensor and laser in the DR400; however, calibration is not covered by this warranty. Maintenance of the calibration is the responsibility of the user (see the Calibration section in this manual).

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 an implied warranty. Merchantability of fitness for a particular purpose is hereby disclaimed.

Customers should send products to the nearest authorized Factory, Dealer or Service Center for warranty repairs, freight prepaid. In countries with Trimble Service Subsidiary Centers, the repaired products will be returned to the customer, freight prepaid.

Calibration

Before each use, be sure to check the DR400 for signs of damage. If the DR400 has been dropped or subjected to other rough treatment, it should be checked for accuracy. For instructions on checking calibration, please visit our website support list at www.trimble.com/support.shtml.

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Special Menu Functions:



Laserometer Menu Mode:

Press Accuracy and Volume buttons together for 2 seconds immediately after DR400 power up

How to change Menu functions:



1. Scrolling up or down ▲▼
2. Enter change mode ↵
3. Change selected items ▲▼
4. Confirm change ↵



5. Press Power button to exit or press Units button at exit prompt

Laserometer - Main Menu

Sensitivity - Sensitivity Medium*-High-Low

DRO Averaging - Averaging algorithm Medium*-High-Low

Arrow Mode - Arrow display Deadband*-Proportional

Out-of-Beam Indication - Out-of-beam display ON-OFF*

Grade Alert - Grade Alarm ON-OFF*

Automatic Shut Off - Automatic shutoff 0.5h*-24h-OFF

Info - Information about the DR400

Exit

*Default setting

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Specifications - General

Backlight	Yes, ON for 30 seconds after key-press/reading
Elevation LEDs	HI: Red, On-Grade: Green, Low: Blue
Anti-strobe sensor	Yes
Beeper Volumes	Loud = 105 dBA / Medium = 95 dBA Low = 75 dBA and OFF
Reception Height	12.7 mm (5 inches)
Reception Angle	90 degrees
Auto Shut-Off	30 minutes, 24 hours, OFF
Dust and Waterproof	Yes
Laser Beam	639 nm Class 3R
Weight (no handle/clamp)	540 g (19 oz)
Warranty	5 years (3-No Excuses, 2-Manufacturer Defects)
Operating Temperature	-15°C to +50°C (5°F to 122°F)
Storage Temperature	-25°C to +70°C (-13°F to 158°F)
In DigiRod Mode	
Three Accuracy Settings (Typical at a 1.5m (5 ft) HI)	AUTO with shot confidence reporting 3 mm (1/8 inch) fixed 10 mm (1/2 inch) fixed
Tilt Angle Compensation	AUTO: 30 degrees tilt allowed, spotting beam blinks and slow chirp tone when exceeded, shot confidence reported 3 mm: 5 degrees tilt allowed, spotting beam blinks and slow chirp tone when exceeded 10 mm: 10 degrees tilt allowed, spotting beam blinks and slow chirp tone when exceeded
Laserometer "On-Grade" range	80 mm
Laser Distance Meter range	0.3-6 m (1-20 ft)
Emulated rod types	Direct Elevation, Indirect Elevation and Cut/Fill 6 m (20 ft) long

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Request for Service

To locate your local dealer or authorized Trimble Service Center outside the U.S.A for service, accessories, or spare parts, contact one of our offices listed below.

<p>North & Latin America Trimble Spectra Precision Division 8261 State Route 235 Dayton, Ohio 45424 U.S.A. (888) 527-3771 (Toll Free) +1-937-203-4419 Phone +1-937-482-0030 Fax</p>	<p>Asia-Pacific Trimble Navigation Singapore PTE Ltd. 80 Marine Parade Road, #22-06 Parkway Parade Singapore, 449269 +65 6348 2212 Phone +65 6348 2232 Fax</p>
<p>Europe Trimble Kaiserslautern GmbH Am Sportplatz 5 67661 Kaiserslautern GERMANY Tel +49-(0)6301-71 14 14 Fax +49-06301-32213</p>	<p>China Trimble Beijing Room 2805-07, Tengda Plaza, No. 168 Xiwai Street Haidian District Beijing, China 100044 +86 10 8857 7575 Phone +86 10 8857 7161 Fax www.trimble.com.cn</p>
<p>Africa & Middle East Trimble Export Middle-East P.O. Box 17760 Jebel Ali Free Zone, Dubai UAE +971-4-881-3005 Phone +971-4-881-3007 Fax</p>	

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Sensitivity of Reception:

Medium*: for most applications

High: When the laser beam is weak, or at very long distances

Low: If outside sources are disturbing elevation readings

Out-of-Beam Indication: Sequence to show the direction to get back into the laser beam (for 25 seconds)

ON: Out-of-Beam Display ON

OFF*: Out-of-Beam Display OFF

Grade Alert: When turned ON, disables the audible signal when on-grade. When moved out of the on-grade dead-band, the beeper activates as normal:

OFF*: Alarm off (solid beeper ON)

ON: Alarm on (solid beeper OFF)

Automatic Shutoff

0.5 h*: shutoff after 30 minutes

OFF: Unit is permanently ON

24 h: shutoff after 24 hours

DigiRod Menu Mode:

Press switches together for 2 seconds while in DigiRod mode (after pressing either the Benchmark or Point buttons)



or



then



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In DigiRod Mode

Emulated rod units	Meters, Feet-Tenths (decimal feet), Feet-Inches (1/8 or 1/16)
Battery Life (AA-4)	1,500 shots typical
In Laser Distance Meter Mode:	
Measurement Range	.3 - 50 m (1 - 160 ft)
Measurement Accuracy	+/- 2.0 mm (+/- 1/16 in)
Measurement Reference	Rear (top) face of the unit
Units	Meters, Feet-Tenths (decimal feet), Feet-Inches (1/8 or 1/16)
Continuous/Min-Max Mode	Yes
Display Memory	Previous 2 shots constantly displayed
Battery Life (AA-4)	1,500 shots typical
In Laserometer Mode	
Working Radius	1-330m (3-1000 ft) (laser dependant)
Detectable Spectrum	610 -780 nm
On-Grade Accuracy	Ultra Fine 0.5 mm (0.02 / 1/32 in) Super Fine 1.0 mm (0.05 / 1/16 in) Fine 2.0 mm (0.10 / 1/18 in) Medium 5.0 mm (0.20 / 1/4 in) Coarse 10 mm (0.50 / 1/2 in) Calibration 0.1 mm (0.01 / 1/64 in)
Audible Sound Tones	HI: Fast Beep, On: Continuous Beep, Low: Slow Beep
Capture Mode	Yes
Special Functions (via MENU)	Sensitivity, Averaging, Out-of-Beam, Arrow Modes, Grade Alert, Information
Battery Life (AA-4)	>70 hours typical use

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Laser Safety

Use of this product by people other than those trained on this product may result in exposure to hazardous laser light.

- Do not remove warning labels from the unit.
- The DR400 is Class 3A/3R (<5mW @ 639 nm).
- Never look into the laser beam or direct it to the eyes of other people
- Always operate the unit in a way that prevents the beam from getting into people's eyes.
- NOTE: It is required to post a Laser Safety Sign and to read, sign and carry a Laser Operator's Card when this laser is operated in public places. To download and print the required materials please visit our website support link at www.trimble.com/support.shtml.



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Reorder PN 0400-110T Rev A (04/12)

