

TABLE OF CONTENTS



FOR YOUR SAFETY	5
COMPONENTS	6
How to Use the Laser System	6
Powering the Laser	6
Laser Setup	7
Turning On/Off the Laser	7
Turning On/Off the Radio Remote Control	8
Matching the Remote Control with the Transmitter	8
Activating/Deactivating Standby Mode	8
Using the Manual Mode	8
Mask Mode	9
Y(\angle)- or X(\sphericalangle)-Axis Slope Mode	9
APPLICATIONS	10
General Construction	10
Determining the Height of Instrument (HI)	10
Using the Slope Mode	10
Establishing Vertical Alignment	11
CALIBRATION	11
Checking Calibration of the Y- and X-Axes	11
Checking Calibration of the Z-(vertical) Axis	11
PROTECTING THE UNIT	11
CLEANING AND MAINTENANCE	12
PROTECTING THE ENVIRONMENT	12
WARRANTY	12
TECHNICAL DATA	12

Introduction

Thank you for choosing one of the Spectra Precision Lasers from the Trimble family of precision grade lasers.

The grade laser is an easy-to-use tool that offers accurate horizontal, vertical and sloped laser reference up to 1300 ft (400 m) away using a receiver.

FOR YOUR SAFETY



For hazardless and safe operation, read all the user guide instructions.



LASER RADIATION
AVOID DIRECT EYE EXPOSURE
CLASS 3A/3R LASER PRODUCT

- 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 GL422 is Class 3A/3R (< 5mW, 600 ... 680 nm). The GL412 laser is subject to Class 2 (< 3.4 mW, 600 ... 680 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.
- If initial service is required, which results in the removal of the outer protective cover, removal must only be performed by factory-trained personnel.

Caution: Use of other than the described user and calibration tools or other procedures may result in exposure to hazardous laser light.



Caution: Unsafe operation may result if the product is used differently than described in this operator's manual.

COMPONENTS

- 1 Power Button
- 2 Battery LED
- 3 Manual/Standby Button
- 4 Leveling LED
- 5 Manual/Hi-Warning LED
- 6 Up and Down Arrow Buttons
- 7 Left and Right arrow Buttons
- 8 Liquid Crystal Display (LCD)
- 9 Rotor
- 10 Sunshade
- 11 Sighting Guides
- 12 Axes-Alignment-Marks
- 13 Recharge Jack
- 14 Handle
- 15 Battery door
- 16 5/8x 11 Tripod Mounts
- 17 Rubber feet

How to Use the Laser System

Powering the Laser

Batteries

WARNING

Ni-MH batteries may contain small amounts of harmful substances.

Be sure to charge the battery before using it for the first time, and after not using it for an extended length of time.

Charge only with specified chargers according to device manufacturer's instructions.

Do not open the battery, dispose of in fire or short circuit; it may ignite, explode, leak or get hot causing personal injury.

Dispose in accordance with all applicable federal, state, and local regulations.

Keep the battery away from children. If swallowed, do not induce vomiting. Seek medical attention immediately.

Installing Batteries

Remove the battery door by turning the center knob 90° counterclockwise.

Insert batteries (or a rechargeable battery pack) into the housing so that the negative poles are on the bigger battery spiral springs.

Install the battery door and tighten it by turning the center screw 90° clockwise.

A mechanical switch prevents alkaline batteries from being charged. Only the original rechargeable battery pack allows charging within the unit. Any other rechargeable batteries have to be charged externally.

Recharging the Batteries

The laser is shipped with rechargeable NI-MH batteries.

Note: The battery LED shows the approximate charge of the batteries.

The LED will flash when battery voltage is between 3.8 and 4.0 volts.

The LED will be on continuously when battery voltage is less than 3.8 volts.

The charger requires approx. 10 hours to charge empty rechargeable batteries.

For charging, connect the plug of the charger to the recharge jack of the unit.

New or long-time out-of-use rechargeable batteries reach their best performance after being charged and recharged five times.



The batteries should only be charged when the laser is between 50° F and 104° F (10° C to 40° C). Charging at a higher temperature may damage the batteries. Charging at a lower temperature may increase the charge time and decrease the charge capacity, resulting in loss of performance and shortened life expectancy.

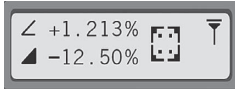
Laser Setup

Position the laser horizontally (tripod mount and rubber feet downward!) on a stable platform, wall mount or tripod at the desired elevation.

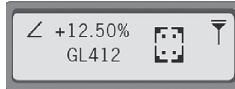
The laser recognizes automatically whether it is used horizontally or vertically when switched on.

Turning On/Off the Laser

Press the power button to turn on the laser.



GL422 – Display



GL412 – Display

The LEDs (2, 4 and 5) are turned on for 2 seconds. At the LCD, the last used grade values, the mask mode status and the antenna symbol will be displayed.

Note: The laser always powers up in the automatic self-leveling mode with 600 rpm and the last-entered grade.

The laser is level when the leveling indicator 4 is no longer flashing (once every second) and the grade values at the laser's and remote control's LCD are not flashing.

For the first five minutes after the laser self levels, the LED 4 lights solid then flashes every four seconds to let you know the laser is still level.

Repeatedly pressing and releasing the up and right arrow buttons simultaneously toggles the rotation speed between 300 and 600 rpm.

Note: If the temperature changes after the laser has been turned on by more than 5 degrees C (10 degrees F) the laser will compensate for the temperature change by resetting the leveling system. During a temperature compensation reset, the grade display flashes, rotation stops and the laser beam turns off. When the temperature compensation reset has been finished, a new grade value can be dialed into the unit.

Note: When the laser is set up vertically and turned on, the rotor centers in its line range automatically. The LCD indicates line can be adjusted by using the up/down (\angle) buttons.



If the laser is positioned beyond its self-leveling range of $\pm 9\%$, the manual and leveling indicators flash simultaneously and a warning sound is emitted. Turn the unit off, reposition the laser within the self-leveling range and turn it on again.

Note: If the laser is out of its self-leveling range and remains out of it for more than 10 minutes, it shuts down completely.

HI alert:



After the laser has been level for more than 5 minutes, the HI (height of instrument) alert activates. If the laser is disturbed (tripod bumped, etc.) so that when it re-levels the laser beam elevation changes by more than 3 mm (1/8 in.), the HI alert shuts down the laser and rotor, a warning sound occurs and the red LED flashes two times per second (twice the manual-mode rate). In a HI condition, a HI and flashing dashed lines appear at the laser's and remote control's LCD. To restore level, turn the laser off and on.

After the laser has re-leveled, check your initial reference elevation.

Note: The HI-alert condition can also be deleted by activating/deactivating the Standby mode with the remote control.

In order to switch the laser off, press the power button again.

Turning On/Off the Radio Remote Control

The radio remote control is a hand-held device that allows you to send operational commands to the laser from a remote location. A "T" appears in the right corner of the laser's and remote's first display line indicating a connection between the laser and the remote control has been made. A flashing "T" indicates that the connection has been interrupted, e.g. the operating range has been exceeded. When the radio remote control and laser are communicating, a bar above the "T" (antenna icon) appears.

Press the power button to turn on the radio remote control.

Note: When the radio remote control is initially turned on, the standard display (model number and software version) appear for the first 3 seconds, then the axes symbols and last-entered grade for each axis briefly appear in the LCD. If the connection between the laser and remote is interrupted for more than 3 seconds, the standard display appears again until the connection is re-established.



When the remote control is initially turned on and after every button press, the LCD backlight is activated and turns off automatically if no button is pressed for 8 seconds.

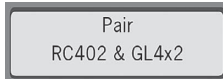
The LED (2) indicates the remote control's battery status (similar function as the battery LED at the laser).

To turn off the radio remote control, press and release the power button.

Note: 20 minutes after the last button press, the remote control turns off automatically.

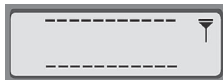
Matching the remote control with the transmitter

In order to make sure the remote control can communicate with the transmitter, both units have to be matched. First, make sure the transmitter and the remote control are turned off. Then press and hold the right arrow button and turn on the transmitter. Next, repeat the same steps on the remote control. Both displays show the following information:



After one second, the last used grade values, the mask mode and the antenna symbol are displayed at both displays to indicate the transmitter has been matched with the remote control.

Activating/Deactivating Standby Mode



Standby mode is a power-saving feature that conserves laser battery life.

Press and hold the laser's or remote control's manual button for 3 seconds to activate standby mode.

Note: When standby mode is activated, the laser beam, rotor, self-leveling system, and LEDs shut down, but the HI alert remains activated.

To let you know that the laser is in standby mode, the battery LED flashes every 4 seconds and dashed lines appear in the laser's and remote control's LCD.

To deactivate standby mode and restore full operation of the laser, press and hold the laser's or remote control's manual button for 3 seconds.

The laser and all other functions turn on again.

Using the Manual Mode



Manual horizontal



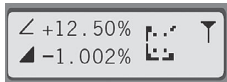
Manual vertical

Pressing the manual button on the laser or the remote control changes the laser from automatic self-leveling mode to Manual mode. Manual mode is indicated by the flashing (once every second) red LED 5 plus scrolling horizontal segments appear in the LCD.

In Manual mode (horizontal), the Y(\angle)-axis can be sloped by pressing the Up- and Down-Arrow-buttons on

the laser's keypad or the remote control. Additionally, the X(▲)-axis can be sloped by pressing the Left- and Right-Arrow-buttons on the laser or remote control. In vertical mode, the up and down arrow buttons align the laser beam to the right/left side, and the left and right arrow buttons adjust the slope of the laser beam. To resume automatic self-leveling mode, press the manual button again.

Mask Mode



Mask Mode – permits turning off the laser beam (electronic shutters) in up to 3 lighthouse windows. Mask Mode is used when multiple lasers are on the jobsite and they are interfering with each other's receiver. Regardless of a horizontal or vertical setup, the mask mode for +/-Y- or +/-X-axis is selected by pressing the manual button in sequence with one of the arrow buttons. Pressing the up or down arrow button in sequence with the manual button will activate/deactivate the mask mode for the + or – Y axis. To activate the mask mode on the +Y-axis, press the up arrow button at the laser or remote control, then within <1 second press and release the Manual button. To activate the mask mode on the -Y-axis, follow the same sequence only start with the down arrow button. The right or left arrow button in sequence with the manual button will activate/deactivate the mask mode for the + or – X axis accordingly. To indicate which side of the laser the beam has been turned off, the bars on the same side of the mask mode symbol are turned off.

Note: The unit always powers up with the mask mode deactivated (default).

Y(∟)- or X(▲)-Axis Slope Mode

Changing the Grade Value of the Y (∟)- and X (▲)-Axes

Note: The laser automatically self-levels up to +/-9% grade from a leveled tripod.

Tilt the laser towards the up-grade direction for larger grades to make sure the laser is inside its self-leveling range. The grade value for both axes can be changed using two methods – standard and quick-change. The standard method is used for entering small changes in the grade value. The quick-change method is used for setting grade to zero and entering large changes in the grade value. To activate the grade change mode, press and hold one of the arrow buttons; a single beep confirms the grade change mode has been entered. The single slope laser GL412 grade value can only be changed on the Y (∟)-axis using the up and down arrow buttons.

Standard Method

Press and hold the up or down button for the Y (∟)-axis and the left or right button for the X (▲)-axis until the correct grade value appears in the laser's and remote control's LCD.

Note: The speed of the grade value change increases with the amount of time the button is held down.

Note: Grade values from 0 to +/-9.999% are displayed to 3 decimal places. Grade values greater than 10% are displayed to 2 decimal places.

To reverse the sign of the Y (∟)- or X (▲)- grade, press and release the manual button quickly while in grade change mode.

The laser will self-level to the required grade position 2 seconds after releasing the grade change arrow button or after pressing an arrow button of the unused axis; a single beep confirms the grade change mode has been left.

Note: The grade values at the laser's and remote control's LCD will flash until the laser has been self-leveled to the requested grade position.

Quick-Change Method

Note: The grade value can be quickly set to 0.000% by simultaneously pressing and holding the arrow buttons for the axis you want to change

1. Simultaneously press and hold the up and down buttons for the Y-axis or the left and right buttons for the X-axis to set the grade value to 0.000%.
2. Continuing to press and hold the up and down / left and right buttons will change grade in 1% increments.

Note: The grade value for both axes increases in 1.00% increments. When the grade value for either axis reaches its highest amount, the grade value switches to the lowest value for that axis. For example, the value switches from +15% to -10%.

The laser will self-level to the required grade position, 2 seconds after releasing the grade change arrow button or after pressing an arrow button of the unused axis; a single beep confirms the unit left the grade entry mode.

Note: The grade values at the laser's and remote control's LCD will flash until the laser has been self-leveled to the requested grade position.

APPLICATIONS

General Construction

Determining the Height of Instrument (HI)

The height of instrument (HI) is the elevation of the laser's beam.

The HI is determined by adding the grade-rod reading to a benchmark or known elevation.

1. Set up the laser and place the grade rod on a job-site benchmark (BM) or known elevation.
2. Slide the receiver up/down the grade rod until it shows an on-grade reading.
3. Add the grade-rod reading to the benchmark to determine the height of instrument.

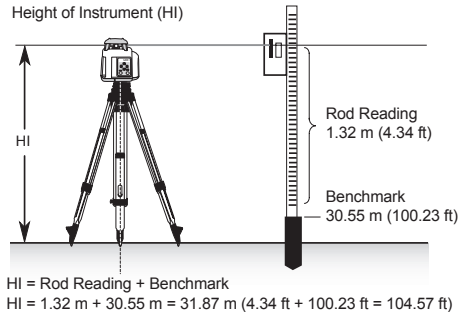
Example:

Benchmark = 30.55 m (100.23 ft)

Rod reading = +1.32 m (+4.34 ft)

Height of instrument = 31.87 m (104.57 ft)

Use this HI as a reference for all other elevations.

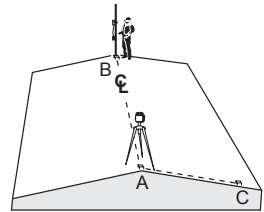


Using the Slope Mode

1. Set up the laser over the reference point (A).
2. Use the sighting guides on the top of the laser to align the laser to the desired direction hub. Turn the laser on the tripod until it is properly aligned.
3. Attach a receiver to a grade rod. Set the grade rod on the direction hub (B) with the grade value 0% on both axes to check the laser's elevation.

Note: Use this HI as a reference for checking the alignment of the laser after setting the slope.

4. Dial a slope for the cross (▲) axis by pressing the laser's or remote control's left or right arrow button.
5. Recheck the laser's elevation using the HI in step 3 on the 0% axis at point (B).



Note: If the HI has been changed, rotate the laser on the tripod until you get an on-grade reading again. Make sure you DON'T change the height of the receiver on the grade rod.

6. Dial in the final required grade value on one or both axes.

Note: Axis alignment over a short distance can be done by using only the sighting guides on the sunshade which allows the user to skip points 3 to 5.

Note: After you've finished grading on one side of the road, you can reverse the sign of the ▲ axis using the radio remote control.

To reverse the sign of the Y (∟-) or X (▲)- grade, press and release the manual button quickly while in grade change mode.

Establishing Vertical Alignment

1. Set up the laser on its side over the first reference point.
2. Position the receiver at the second reference point.
3. To adjust the laser beam for line direction, use the up and down buttons on the laser or radio remote control until the laser beam matches the line point.

Note: To adjust the vertical laser beam different to the plumb position, press and release the manual button and then use the left and right buttons on the laser or the radio remote control.

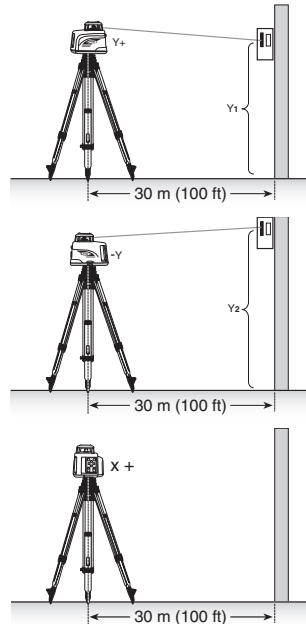
CALIBRATION

Checking Calibration of the Y- and X-Axes

1. Set up the laser 30 m (100 ft) from a wall and allow it to level.
2. Set the grade to 0.000% in both axes.
3. Raise/lower the receiver until you get an on-grade reading for the +Y axis. Using the on-grade marking notch as a reference, make a mark on the wall.

Note: For increased precision, use the fine-sensitivity setting (1.5 mm/ 1/16 in.) on the receiver.

4. Rotate the laser 180° (-Y axis toward the wall) and allow the laser to re-level.
5. Raise/lower the receiver until you get an on-grade reading for the -Y axis. Using the on-grade marking notch as a reference, make a mark on the wall.
6. Measure the difference between the two marks. If they differ more than 3 mm at 30 m (1/8 inch at 100 feet), the laser needs calibrating.
7. After checking the Y-axis, rotate the laser 90°. Repeat the above starting with the + X axis facing the wall.



Checking Calibration of the Z-(vertical) Axis

To check vertical calibration, you need a plumb bob with at least 10m (30ft) of string.

1. Suspend the plumb bob in front of a house i.e., attached to a window frame whose window height is at least 10m (30ft).
2. Set up the laser in vertical so that the laser beam strikes the receiver's on-grade position at the top of the string.
3. Look for any deviation using the receiver from the top of the string to the bottom of it. If the deviation is more than 1mm (<1/16 in.), the vertical axis needs calibrating.

Note: If calibration is required, please, refer to the calibration instructions on our Trimble website www.trimble.com/support.shtml.

PROTECTING THE UNIT

Do not expose the unit to extreme temperatures or temperature changes (do not leave inside the car).

The unit is very robust and can resist damage if dropped even from tripod height. Before continuing your work, always check the leveling accuracy. See **Checking Calibration** section.

The laser is water proof and can be used indoors and outdoors.

CLEANING AND MAINTENANCE

Dirt and water on the glass parts of laser or prism will influence beam quality and operating range considerably.

Clean with cotton swabs.

Remove dirt on the housing with a lint-free, warm, wet and smooth cloth. Do not use harsh cleansers or solvents.

Allow the unit to air dry after cleaning it.

PROTECTING THE ENVIRONMENT

The unit, accessories and packaging ought to be recycled.

This manual is made of non-chlorine recycling paper.

All plastic parts are marked for recycling according to material type.



Do not throw used batteries into the garbage, water or fire. Remove them in compliance with environmental requirements.

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



WARRANTY

According to legal regulations, the warranty-period for this unit is 12 months for material and manufacturing defaults.

We do not take any liability for damages caused by a non-accurate unit.

Before starting to work, always carry out the **Accuracy Check** according to the corresponding chapter.

This warranty is no longer valid if the unit is opened or the labels are removed.

TECHNICAL DATA

Laser

Leveling accuracy^{1,3}:

Grade accuracy^{1,3}:

Rotation:

Operational area GL422^{1,2}:

Operational area GL412^{1,2}:

Laser type:

Laser class GL422 /GL412:

Self-leveling range:

Grade range GL422:

Grade range GL412:

Leveling time:

Leveling indicators:

± 0.5 mm/10 m, 1/16" @ 100 ft, 10 arc seconds

± 1.0 mm/10 m, 1/8" @ 100 ft, 20 arc seconds

at grades from -2.5 to +2.5%,

± 3.0 mm/10m (3/8" @ 100 ft), 60 arc seconds

at grades over +/- 2.5%.

600 (300) rpm

appr. 400 m (1300 feet) radius with detector

appr. 300 m (1000 feet) radius with detector

red diode laser 635 nm – GL422; 650 nm – GL412

Class 3A/3R, <5mW / Class 2, <3.4mW; t <0.25 sec

appr. ± 5°

-10% to +15% both axes (not simultaneously)

-10% to +15% Y(Δ)-axis

appr. 30 sec

LED flashes

Laser beam diameter ¹ :	appr. 8 mm
Operating range using remote control:	up to 100 m (330 ft)
Power source:	4 x 1.5V D - cell (LR20)
Battery life ¹ :	55 hrs NiMH; 90 alkaline
Operating temp.:	-20°C to 50°C (-4°F to 122°F)
Storage temp.:	-20°C to 70°C (-4°F to 158°F)
Tripod attachments:	5/8 x 11 horizontally and vertically
Dust and Water proof	IP66
Weight:	3.1 kg (6.8 lbs)
Low voltage indication:	flashing/shining of the battery indicator
Low voltage disconnection:	unit shuts off

- 1) at 21° Celsius
- 2) under optimal atmospheric circumstances
- 3) along the axis

Remote control

Operating range:	up to 100 m (330 ft)
Power source:	2 x 1.5V AA alkaline batteries
Battery life ¹ :	130 hours
Dust and Water proof	IP54
Weight:	0.18 kg (0.4 lbs)

DECLARATION OF CONFORMITY

We

Trimble Kaiserslautern GmbH

declare under our sole responsibility that the products

GL422/412

to which this declaration relates is in conformity with the following standards

EN 61000-4-2, 2001; EN 55011, 2003; EN 61000-4-3, 2003

following the provisions of directive Electromagnetic compatibility 89/336/EEC.

The managing director

Electro-Magnetic Compatibility

Declaration of Conformity

This digital apparatus does not exceed the Class B Limits for radio noise for digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

This device complies with part 15 off the FCC rules. Operation is subject to the condition that this device does not cause harmful interference.

Note: The product been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. The product generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio or television reception, which can be determined by turning the product off and on. The user is encouraged to try to eliminate the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the product and the receiver.
- For more information, consult your dealer or an experienced radio/television technician.

Caution: Changes or modifications to the product that are not expressly approved by Trimble could void authority to use the equipment.