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Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of "Quality Parts,Customers Priority,Honest Operation,and Considerate Service",our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

FLUKE ®

421D
Distance Meter

Users Manual

LIMITED WARRANTY AND LIMITATION OF LIABILITY

Each Fluke product is warranted to be free from defects in material and workmanship under normal use and service. The warranty period is two years and begins on the date of shipment. Parts, product repairs, and services are warranted for 90 days. This warranty extends only to the original buyer or end-user customer of a Fluke authorized reseller, and does not apply to fuses, disposable batteries, or to any product which, in Fluke's opinion, has been misused, altered, neglected, contaminated, or damaged by accident or abnormal conditions of operation or handling. Fluke warrants that software will operate substantially in accordance with its functional specifications for 90 days and that it has been properly recorded on non-defective media. Fluke does not warrant that software will be error free or operate without interruption.

Fluke authorized resellers shall extend this warranty on new and unused products to end-user customers only but have no authority to extend a greater or different warranty on behalf of Fluke. Warranty support is available only if product is purchased through a Fluke authorized sales outlet or Buyer has paid the applicable international price. Fluke reserves the right to invoice Buyer for importation costs of repair/replacement parts when product purchased in one country is submitted for repair in another country.

Fluke's warranty obligation is limited, at Fluke's option, to refund of the purchase price, free of charge repair, or replacement of a defective product which is returned to a Fluke authorized service center within the warranty period.

To obtain warranty service, contact your nearest Fluke authorized service center to obtain return authorization information, then send the product to that service center, with a description of the difficulty, postage and insurance prepaid (FOB Destination). Fluke assumes no risk for damage in transit. Following warranty repair, the product will be returned to Buyer, transportation prepaid (FOB Destination). If Fluke determines that failure was caused by neglect, misuse, contamination, alteration, accident, or abnormal condition of operation or handling, including overvoltage failures caused by use outside the product's specified rating, or normal wear and tear of mechanical components, Fluke will provide an estimate of repair costs and obtain authorization before commencing the work. Following repair, the product will be returned to the Buyer transportation prepaid and the Buyer will be billed for the repair and return transportation charges (FOB Shipping Point).

THIS WARRANTY IS BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. FLUKE SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, ARISING FROM ANY CAUSE OR THEORY.

Since some countries or states do not allow limitation of the term of an implied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any provision of this Warranty is held invalid or unenforceable by a court or other decision-maker of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

Fluke Corporation	Fluke Europe B.V.
P.O. Box 9090	P.O. Box 1186
Everett, WA 98206-9090	5602 BD Eindhoven
U.S.A.	The Netherlands

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Distance Meter

Introduction

Carefully read the Safety Instructions and the User Manual before using this product.

How to Contact Fluke

To contact Fluke, call one of the following telephone numbers:

- Technical Support USA: 1-800-44-FLUKE (1-800-443-5853)
- Calibration/Repair USA: 1-888-99-FLUKE (1-888-993-5853)
- Canada: 1-800-36-FLUKE (1-800-363-5853)
- Europe: +31 402-675-200
- Japan: +81-3-3434-0181
- Singapore: +65-738-5655
- Anywhere in the world: +1-425-446-5500

Or, visit Fluke's website at www.fluke.com.

To register your product, visit http://register.fluke.com.

To view, print, or download the latest manual supplement, visit http://us.fluke.com/usen/support/manuals.

Use of the instrument

Permitted use

- Measuring distances
- Computing functions, e. g. areas and volumes
- Measuring tilts

Prohibited use

- Using the instrument without instruction
- Using outside the stated limits
- Deactivation of safety systems and removal of explanatory and hazard labels
- Opening of the equipment by using tools (screwdrivers, etc.), as far as not specifically permitted for certain cases
- Carrying out modification or conversion of the product

- Use of accessories from other manufacturers without the express approval of Fluke

- Deliberate or irresponsible behavior on scaffolding, when using ladders, when measuring near machines which are running, or near parts of machines or installations which are unprotected

- Aiming directly into the sun

- Pointing the laser directly at people or animals in light or dark conditions.

- Inadequate safeguards at the surveying site (for example, when measuring on roads, construction sites, etc.)

Limits of use

Note

See section "Technical Data".

The Fluke 421D is designed for use in areas permanently habitable by humans, do not use the product in explosion hazardous areas or in aggressive environments.

Areas of responsibility

Responsibilities of the manufacturer (Fluke)

Fluke is responsible for supplying the product, including the User Manual and original accessories, in a completely safe condition.

Responsibilities of the manufacturer of non-Fluke accessories

The manufacturers of non-Fluke accessories for the 421D are responsible for developing, implementing and communicating safety concepts for their products. They are also responsible for the effectiveness of these safety concepts in combination with Fluke equipment.

Responsibilities of the person in charge of the instrument

⚠ **Warning**

The person responsible for the instrument must ensure that the equipment is used in accordance with the instructions. This person is also accountable for the deployment of personnel and for their training and for the safety of the equipment when in use.

The person in charge of the instrument has the following duties:

- To understand the safety instructions on the product and the instructions in the User Manual.

- To be familiar with local safety regulations relating to accident prevention.

- To inform Fluke immediately if the equipment becomes unsafe.

Hazards in use

⚠ Caution

Watch out for erroneous distance measurements if the instrument is defective or if it has been dropped or has been misused or modified.

Precautions

Carry out periodic test measurements. Particularly after the instrument has been subject to abnormal use, and before, during and after important measurements.

Make sure the 421D optics is kept clean and that there is no mechanical damage to the bumpers.

⚠ Caution

In using the instrument for distance measurements or for positioning moving objects (for example, cranes, building equipment, platforms, etc.) unforeseen events may cause erroneous measurements.

Only use this product as a measuring sensor, not as a control device. Your system must be configured and operated in such a way, that in case of an erroneous measurement, malfunction of the device or power failure due to installed safety measures (for example, safety limit switch), it is assured that no damage will occur.

⌧ ⚠ Warning

Flat batteries must not be disposed of with household waste. Care for the environment and take them to the collection points provided in accordance with national or local regulations.

The product must not be disposed of with household waste.

Dispose of the product appropriately in accordance with the national regulations in force in your country.

Always prevent access to the product by unauthorized personnel.

Product specific treatment and waste management information can be downloaded from the Fluke home page at http://www.fluke.com or received from your Fluke dealer.

Safety Instructions

Symbols

The symbols used in the Safety Instructions have the following meanings:

⚠ Warning

Indicates a potentially hazardous situation or an unintended use which, if not avoided, will result in death or serious injury.

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⚠ **Caution**

Indicates a potentially hazardous situation or an unintended use which, if not avoided, may result in minor injury and/or in appreciable material, financial and environmental damage.

Symbol	Description
🔋	Do not dispose of this product as unsorted municipal waste. Go to Fluke's website for recycling information.
☀	Warning. Laser
⚠	Risk of Danger. Important information. See Manual.
CE	Conforms to European Union directives.

Note

Important paragraphs which must be adhered to in practice as they enabled the product to be used in a technically correct and efficient manner.

Electromagnetic Compatibility (EMC)

The term "electromagnetic compatibility" is taken to mean the capability of the product to function smoothly in an environment where electromagnetic radiation and electrostatic discharges are present, and without causing electromagnetic interference to other equipment.

⚠ **Warning**

The 421D conforms to the most stringent requirements of the relevant standards and regulations. Yet, the possibility of it causing interference in other devices cannot be totally excluded.

⚠ **Caution**

Never attempt to repair the product yourself. In case of damage, contact Fluke (www.fluke.com).

FCC statement (U.S.A only)

This equipment has 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.

This equipment 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 communications.

However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

⚠ **Warning**

Changes or modifications not expressly approved by Fluke for compliance could void the user's authority to operate the equipment.

Laser classification

Integrated distance meter

The 421D produces a visible laser beam which emerges from the front of the instrument.

It is a Class 2 laser product in accordance with:

- IEC60825-1 : 2007 "Radiation safety of laser products"

Laser Class 2 products:

Do not stare into the laser beam or direct it towards other people unnecessarily. Eye protection is normally afforded by aversion responses including the blink reflex.

⚠ **Warning**

Do not look directly into the beam with optical aids. Looking directly into the beam with optical aids (for example, binoculars, telescopes) can be hazardous.

⚠ **Caution**

Looking into the laser beam may be hazardous to the eyes.

Do not look into the laser beam. Make sure the laser is aimed above or below eye level. (particularly with fixed installations, in machines, etc.)

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Start-up

Inserting/replacing batteries

See figure {**A**}

1. Remove battery compartment lid and attach handstrap.

2. Insert two AAA (LR3) batteries, observing correct polarity.

3. Close the battery compartment again. Replace the batteries when the symbol ▯ flashes permanently in the display.

Note

Use alkaline batteries only.

Note

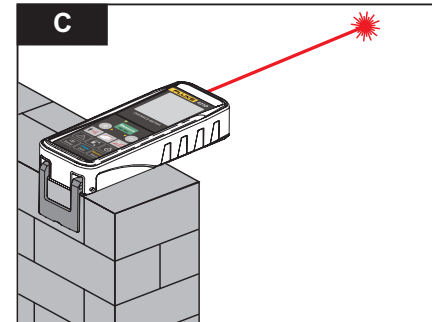*Remove the batteries before any long period of non-use to avoid the danger of corrosion.*

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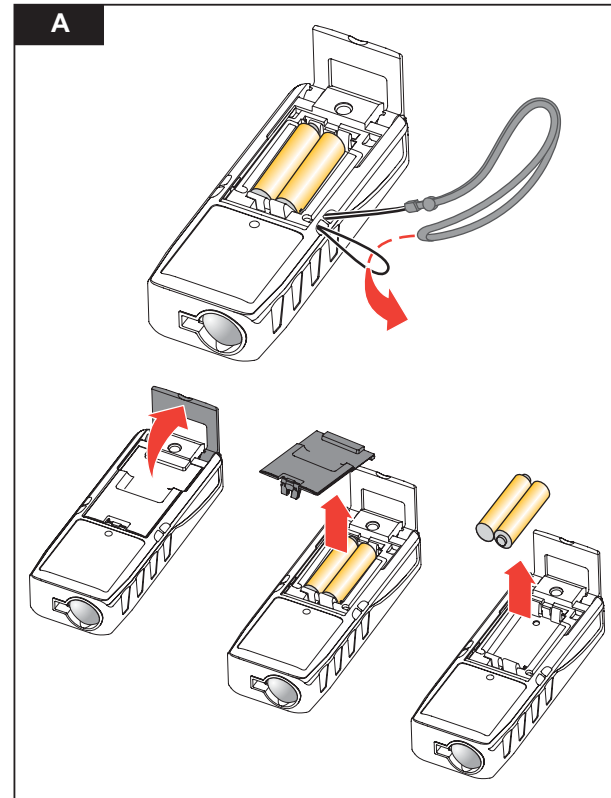
Changing the reference point (multifunctional endpiece)

See figure {**B**}.
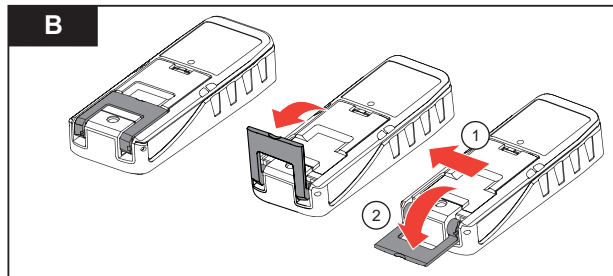
The instrument can be adapted for the following measuring situations:

- For measurements from an edge, fold out the positioning bracket until it first locks in place. See figure {**C**}.

- For measurements from a corner, open the positioning bracket until it locks in place, then push the positioning bracket lightly to the right to fold it out fully. See figure {**D**}.

7
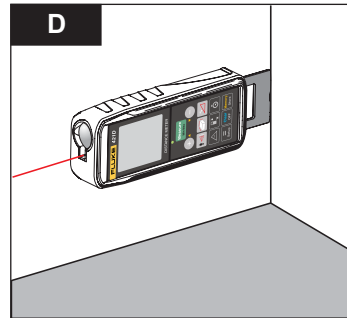
A built-in sensor automatically detects the orientation of the positioning bracket and adjusts the zero point of the instrument accordingly.

Keypad

See figure {**E**}:

1. Measure/Min Max/Power On
2. Plus (+)/Scroll up
3. Minus (-)/Scroll down
4. Area/volume
5. Tilt function/Stake out
6. Reference
7. Timer
8. Memory
9. Clear/off
10. Setup/mem/equal

11. Room corner/triangle angles
12. Indirect measurement (Pythagoras)
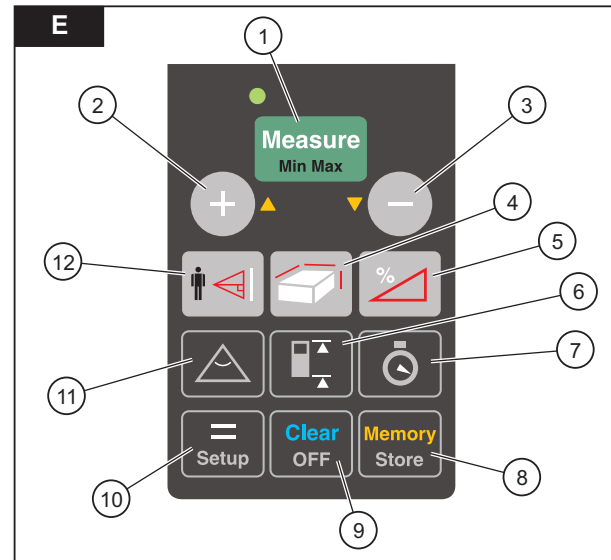
Display

See figure {**F**}

1. Laser active
2. Reference (front)
3. Reference (rear)
4. Reference (corner stop)
5. Measuring with the tripod
6. Stake out function
7. Single Pythagorean measurement
8. Double Pythagorean measurement
9. Double (partial height) measurement
10. Illumination
11. Save constant value, call up constant value
12. Historical memory, call up values
13. Battery status
14. Timer
15. Area/volume
16. Tilt
17. Horizontal distance measurement using tilt
18. Room corner angle function
19. Menu
20. Continuous laser
21. Reset
22. Reference (tripod)
23. Beep

24. Circumference
25. Wall area
26. Ceiling area
27. Intermediate line 1
28. Intermediate line 2
29. Intermediate line 3
30. Summary line
31. Message code indicator

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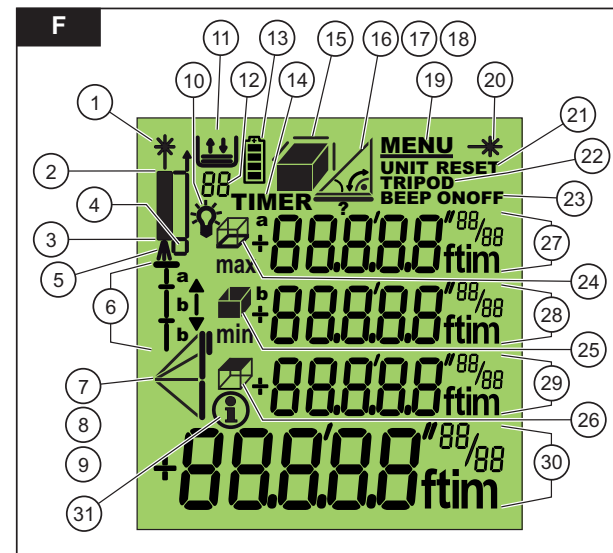
Menu functions

Settings

The menu allows settings to be altered and permanently stored. After switching off the device or replacing the batteries the settings are stored.

Navigation in the menu

The menu allows settings to be made at the user level. The instrument can be specifically configured to your personal requirements.

General description

[Measure Min Max] button (**long** press) brings up the <u>**MENU**</u>, the set units and the symbol **UNIT** are displayed.

[Measure Min Max] button (**short** press) pages through each menu item. See figure {**G**}.

⊕· or ·⊖ button to make changes in menu items.

[Measure Min Max] button (**short** press) brings up the next menu item.

A long press on the [Measure Min Max] button in the menu confirms the new settings made in the submenu items.

Pressing the [Clear OFF] button (**short** press) in the menu allows you to quit the settings function without saving.

G

1

Setup

> 2 s

UNIT

0.000 m
0.000^{0}m
0.00 m
0.00 ft
0'00'' $1/32$
0.0 in
0 $1/32$ in

RESET

ON
OFF

Setup

7

6

Setup

ON
OFF

Setup

2

Setup

UNIT ⚠

+/- 45°
%

3

Setup

BEEP

ON
OFF

EXIT

< 3 s

Setup

Clear
OFF

Setup

4

TRIPOD

ON
OFF

5

Setup

✳ Laser

ON
OFF
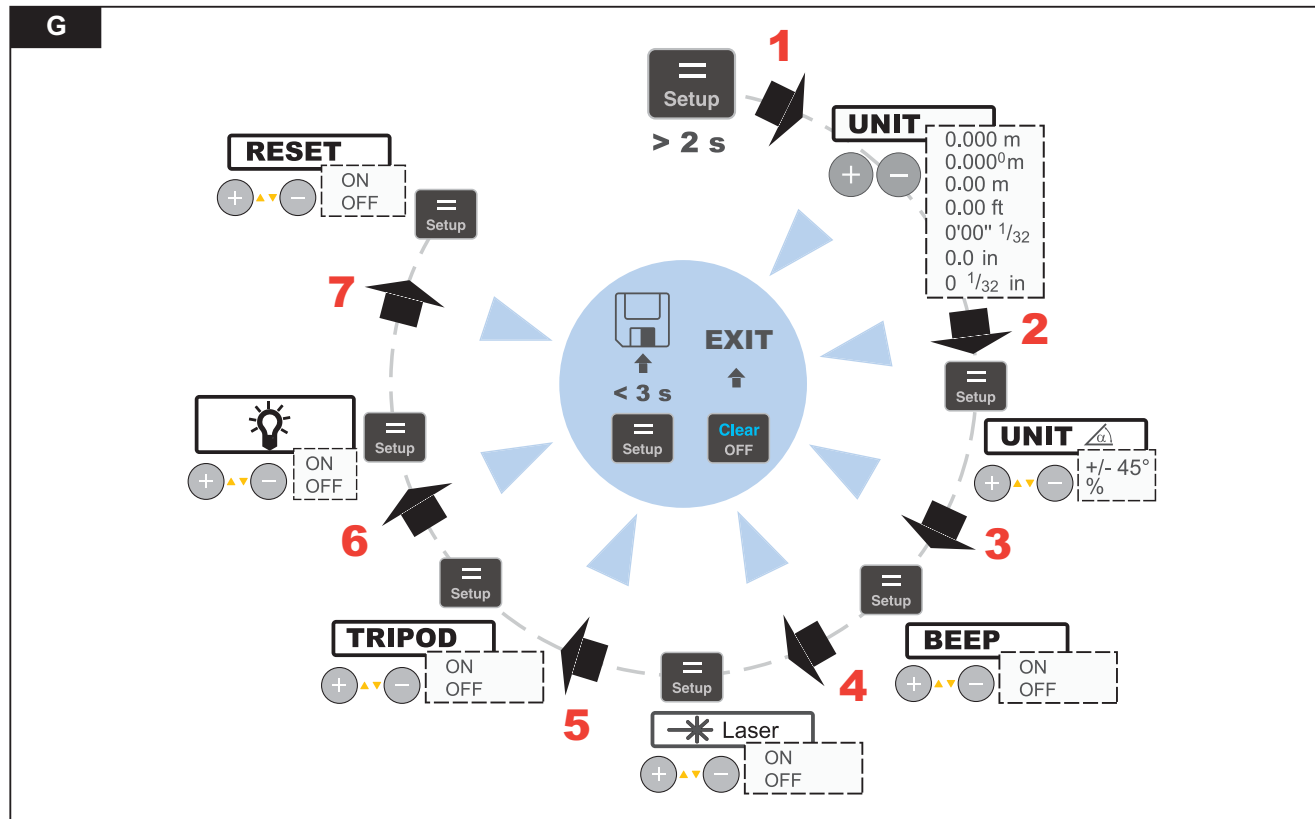
Setting the unit for distance measurements

The following units can be set:

Menu #	Distance	Area	Volume
1.1	0.000 m	0.000 m^2	0.000 m^3
1.2	0.000^0 m	0.000 m^2	0.000 m^3
1.3	0.00 m	0.000 m^2	0.000 m^3
1.4	0.00 ft	0.00 ft^2	0.00 ft^3
1.5	0'00" 1/32	0.00 ft^2	0.00 ft^3
1.6	0.0 in	0.00 ft^2	0.00 ft^3
1.7	0 1/32 in	0.00 ft^2	0.00 ft^3

Setting the unit for tilt measurements

The following units can be set for tilt measurements:

Menu #	Units for tilt
2.1	+/- 0.0°
2.2	0.00%

Beep (BEEP)

You can switch the beep on or off.

Menu #	Beep function
3.1	On
3.2	Off

Continuous laser (→✳)

You can switch the continuous laser function on or off.

Menu #	Continuous laser function
4.1	On
4.2	Off

With the continuous laser function set on, each press of the button [Measure Min Max] triggers a measurement. The laser automatically switches off after 15 minutes.

Measuring with the tripod (TRIPOD)

The reference must be appropriately adjusted in order to be able to take correct measurements with a tripod. To do this select the **TRIPOD** symbol in this menu item. You can switch the reference on the tripod on or off. The setting can be seen on the display ⍗.

Menu #	Measuring with tripod function
5.1	On
5.2	Off

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Display - keypad illumination (☼)

Automatic illumination of the display and the keypad can be switched on or off.

Menu #	Illumination function
6.1	On
6.2	Off

Reset - returning the instrument to the factory settings (RESET)

The instrument has a **RESET** function. When you select the menu function **RESET** and confirm, the instrument defaults to the factory settings.

Menu #	Reset function
7.1	On
7.2	Off

A reset returns the following values to their factory settings:

- Reference (rear)
- Display illumination (ON)
- Beep (ON)
- Unit (m(mm))
- Stack and memory are erased

Note

All customized settings and stored values are also lost.

Operation

Switching on and off

`Measure Min Max` Switches on the instrument and laser. The display shows the battery symbol until the next button is pressed.

`Clear OFF` Pressing this button for longer switches the instrument off.

The instrument switches off automatically after six minutes of inactivity.

CLEAR button

`Clear OFF` The last action is cancelled. While making area or volume measurements, each single measurement can be deleted and remeasured in series.

Display / keypad illumination

The instrument has a sensor that automatically switches the display and keypad illumination on or off in response to lighting conditions.

Reference setting

The default reference setting is from the rear of the instrument. A special beep sounds whenever the reference setting is changed.

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⬚ Press this button (**short** press) to take the next measurement from the front edge ▐'.

After a measurement the reference returns automatically to the default setting (rear reference). See figure {**H**}.
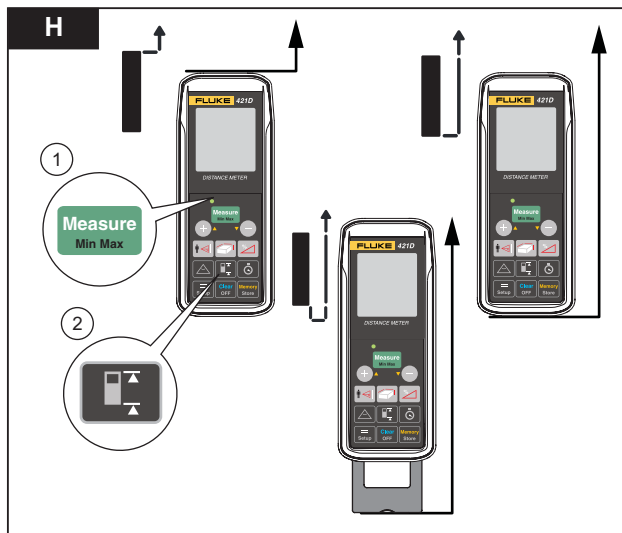
⬚ Press this button (**long** press) to set the reference to the front. Does not return to default (rear) reference.

⬚ Press this button, the rear reference is set again.

Measuring

Single distance measurement

Measure Min Max Press to activate the laser. Press again to trigger the distance measurement.

The result is displayed immediately.

Minimum/maximum measurement

This function allows the user to measure the minimum or maximum distance from a fixed measuring point. It can also be used as to determine spacings. See figure {**I**}.
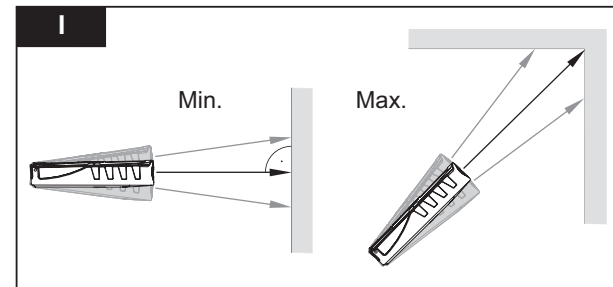
It is commonly used to measure room diagonals (maximum values) or horizontal distances (minimum values).

Measure Min Max Press and hold down this button until you hear a beep. Then slowly sweep the laser back and forth and up and down over the desired target point - (for example, into the corner of a room).

⬚ Measure Min Max Press to stop continuous measurement. The values for maximum and minimum distances are shown in the display as well as the last measured value in the summary line.

Functions

Addition / subtraction

Distance measuring

⊕· The next measurement is added to the previous one.

·⊖ The next measurement is subtracted from the previous one.

This process can be repeated as required. **⬚ Setup** Press this key to display result. The result is always shown in the summary line with the previous value in the second line.

⬚ Clear OFF The last step is cancelled.

Area

⬚ Press **once**. The ◢ symbol appears in the display.

⬚ Measure Min Max Press this button to take the first length measurement (for example, length).

⬚ Measure Min Max Press it again to take the second length measurement (for example, width).

The result is displayed in the summary line.

Press the ⬚ button (**long** press) to calculate the circumference.

Volume

⬚ Press this button **twice**. The ⬚ symbol appears in the display.

⬚ Measure Min Max Press this button to take the first length measurement (for example, length).

⬚ Measure Min Max Press this button to take the second length measurement (for example, width).

⬚ Measure Min Max Press this button to take the third length measurement (for example, height). The value is shown in the second line.

The volume then appears in the summary line.

Press the ⬚ button (**long** press) to display additional room information such as ceiling/floor area, surface area of the walls, circumference.

⬚ Ceiling/floor area

⬚ Wall area

⬚ Circumference

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Tilt measurement

Note

The inclination sensor measures tilts between ±45°.

Note

During tilt measurement the instrument should be held without a transverse tilt (±10°).

⊠ Press this button **once** to activate the tilt sensor. The ∠ symbol appears in the display. The tilt is continuously shown as ° or % depending on the setting.

[Measure Min Max] Press to measure the inclination and the distance. See figure {**J**}.
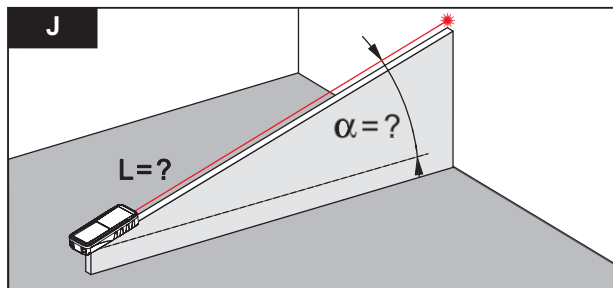
Tilt sensor calibration

The user can calibrate the device's tilt sensor. The angle sensor is switched on by pressing the ⊠ once. Then two measurements are taken on a flat surface. The first measurement is taken and a note is made of the measured angle **a**. The device is then turned through exactly 180 °, the second measurement is taken and a note is made of the measured angle **b**. The value **x** to which the device must be corrected is calculated as follows:

x = -(a+b)/2

The calibration mode is then entered by pressing keys [Clear OFF] and the ⊠ both at the same time for 2 seconds. The correction value x can be entered here using the ⊕· and ·⊖ keys. The entered value is stored and implemented by pressing the [Setup] key.

Indirect horizontal distance

This function allows the user to determine a horizontal distance even when the line-of-sight is blocked by an object or obstacle. See figure {**K**}.
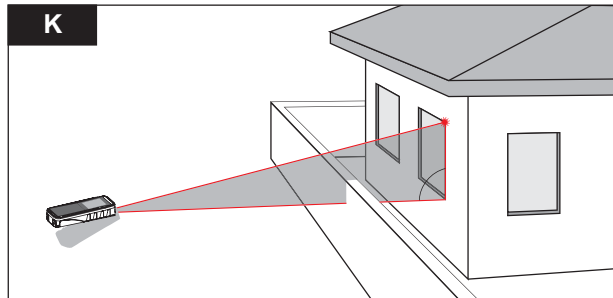
⊠ Press this button **twice** and the following symbol appears in the display ◿.

Measure Min Max Press this button to measure tilt and diagonal distance. The summary line displays the result as the direct horizontal distance.

Stake out function

Two different distances (a and b) can be entered into the instrument and can then be used to mark off defined measured lengths, for example, in the construction of wooden frames.

See figure {**L**}.
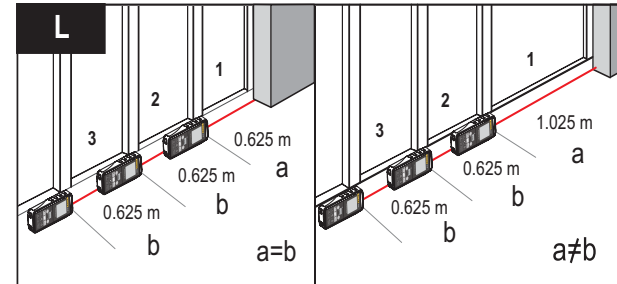
Entering stake out distances:

⊠ Press this button **three times** and the stake out function symbol appears in the display.

The value (a) and the corresponding intermediate line flash.

By using ⊕• and •⊖, you can adjust the values (first a and then b) to suit the desired stake out distances. Holding the buttons down increases the rate of change of the values.

Once the desired value (a) has been reached it can be confirmed with the Setup button.

The value (b) and the intermediate line flashes (the defined value (a) is automatically adopted). Value (b) can be entered using ⊕• and •⊖.

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The defined value (b) is confirmed with the [Setup] button and starts the stake out laser measurement.

The display shows required stake out distance in the summary line between the stake out point (first a and then b) and the instrument (rear reference).

If the 421D is then moved slowly along the stake out line the displayed distance decreases. The instrument starts to beep at a distance of 0.1 m from the next stake out point.

The arrows in the display indicate in which direction the 421D needs to be moved in order to achieve the defined distance (either a or b). As soon as the stake out point is reached the beep changes and the arrows in the display disappear.

The function can be stopped at any time by pressing the [Clear OFF] button.

Room corner angle function

The angles in a triangle can be calculated by measuring the three sides. This function can be used e. g. to check a right-angled room corner. See figure {**M**}.
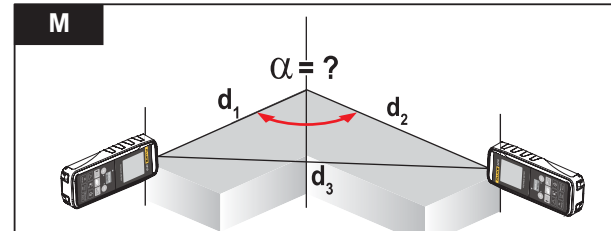
Press this button and the room corner symbol appears in the display.

Mark the reference points to the right and left (d1/d2) of the angle to be measured.

[Measure Min Max] Press this button to measure the first (short) side of the triangle (d1 or d2).

[Measure Min Max] Press this button to measure the second (short) side of the triangle (d1 or d2).

[Measure Min Max] Press this button to measure the third (long) side of the triangle (d3).

The result is displayed in the summary line as the room corner angle.

Indirect measurement

The instrument can calculate distances using Pythagoras' theorem.

Note

Make sure you adhere to the prescribed sequence of measurement:

- *All target points must be in a horizontal or vertical plane.*

- *The best results are achieved when the instrument is rotated about a fixed point (for example, with the positioning bracket fully folded out and the instrument placed on a wall).*

- *The minimum/maximum function can be used -see explanation in "Measuring -> Minimum/maximum measurement". The minimum value must be used for measurements at right angles to the target; the maximum distance for all other measurements.*

Note

Make sure that the first measurement and the distance to be measured are at right angles. Use the Minimum/maximum function, as explained in "Measuring -> Minimum/maximum measurement".

Indirect measurement - determining a distance using 2 auxilliary measurements

See figure {**N**}.
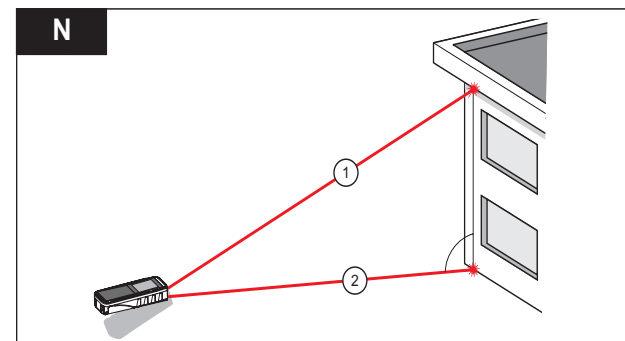
For example, for measuring building heights or widths. It is helpful to use a tripod when measuring heights that require the measurement of two or three measurements.

⊩◁ Press this button **once**, the display shows ⊿.

The laser is switched on.

`Measure Min Max` Aim at the upper point (1) and trigger the measurement. After the first measurement the value is adopted. Keep the instrument as horizontal as possible.

`Measure Min Max` Press and hold down this button to trigger continuous measurement, sweep the laser back and forth and up and down over the ideal horizontal target point.

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