

DIGITAL MEASURING KIT

DIGMK300

Technical Data and Reference Information



OPERATOR'S MANUAL

SIRCHIE®

Products • Vehicles • Training

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TABLE OF CONTENTS

DMLASER FORENSIC PROJECTION LASER.....	3
LASER SAFETY.....	3
USING THE DMLASER.....	3
Features and Benefits.....	3
Using the DMLASER.....	4
Battery Installation.....	4
Switch Between Laser Dot and Laser Line.....	4
Technical Specifications.....	5
DMANGLE ANGLE FINDER.....	6
OPERATION.....	6
DMRANGE / DRF100 RANGE FINDER.....	7
SAFETY INSTRUCTIONS.....	7
KEY FEATURES.....	7
Front-panel Controls.....	8
DISPLAY INDICATORS AND ICONS.....	9
SETUP: Install Batteries.....	10
OPERATION: Powering ON and OFF.....	10
QUICK START INSTRUCTIONS.....	10
To make a quick distance measurement:.....	10
CHOOSING A MEASUREMENT REFERENCE.....	11
CLEARING VALUES/UNDOING ACTIONS.....	11
CHANGING THE MEASUREMENT UNIT.....	11
TURNING THE BACKLIGHT ON AND OFF.....	11
MEASURING DISTANCES.....	12
Direct Measurements.....	12
Continuous Distance Measurement (Distance Tracking).....	12
Adding and Subtracting Distances.....	12
Indirect Measurements of Height or Length using Triangulation.....	13
MEASURING AREAS & PERIMETERS.....	14
MEASURING VOLUMES.....	14
RECALLING STORED MEASUREMENTS/CALCULATIONS.....	15
SPECIFICATIONS.....	16
OPERATING & MAINTENANCE TIPS.....	16
FCC STATEMENT.....	17

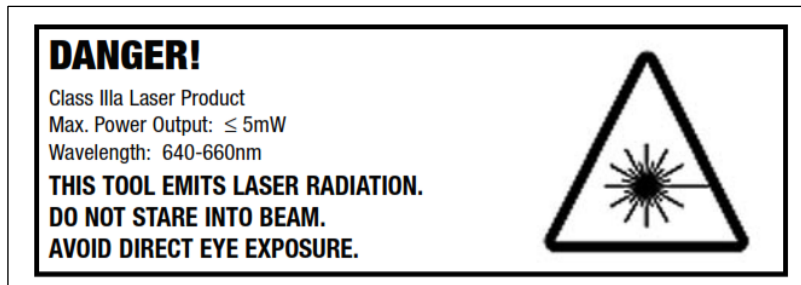
DMLASER FORENSIC PROJECTION LASER

The DMLASER is a durable, lightweight “torpedo” style level with a red laser beam that can be used in a variety of applications.

This state-of-the-art level projects a highly visible red dot on almost any surface with accuracy of $\pm 3/8$ in. @ 50 ft. (± 0.5 mm/m). By rotating the Conversion Head, the DMLASER projects a highly visible red line on almost any surface. You may use this function instead of a straightedge to superimpose a centerline on blood spatter patterns. The Conversion Head can project either a vertical or horizontal line, depending on the orientation it is set to.

LASER SAFETY

LASER RADIATION. AVOID DIRECT EYE EXPOSURE. DO NOT look into the laser light source. Never aim light at another person or object other than the work piece. Always turn the laser off when not in use or left unattended for a period of time. Read all instructions prior to operating this laser tool. Do not remove any labels from the tool.



USING THE DMLASER

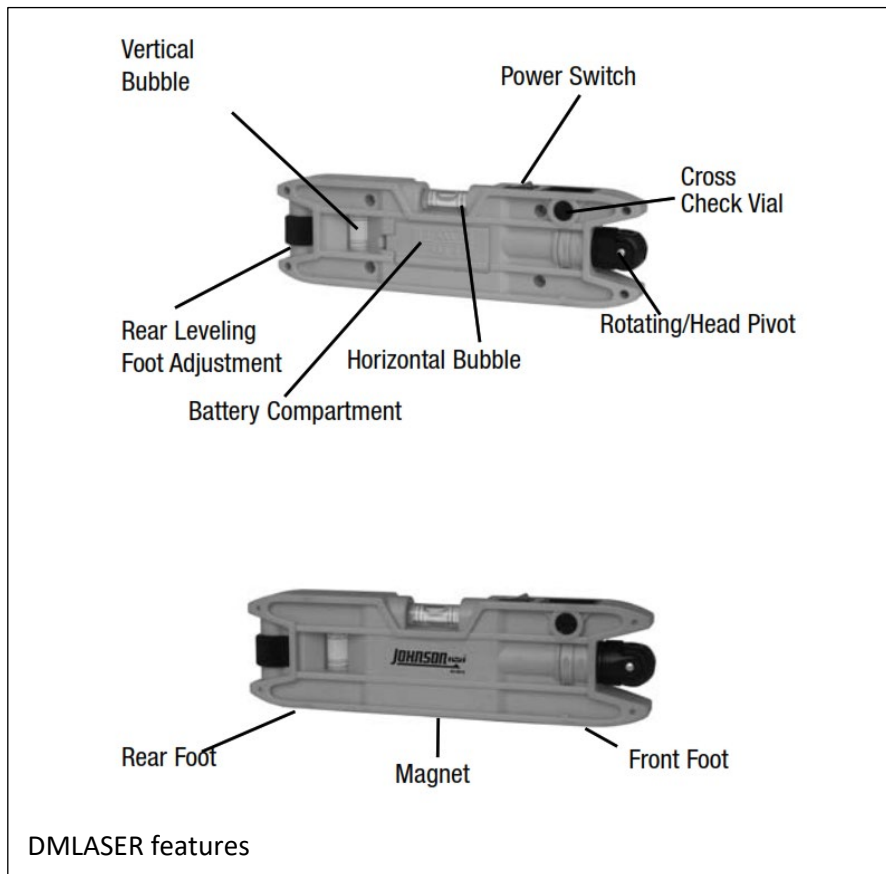
The Laser Level offers a highly visible level reference over both short and long distances with great accuracy. The level can be placed in a central location to transfer a level reference point anywhere you need it. With its on-board horizontal and vertical circular bubble vials, the level can be used in either a conventional horizontal position or a vertical position as a laser plumb bob.



DMLASER unit

Features and Benefits

- A professional grade laser level with a magnetic base for all types of leveling jobs
- Conversion Head converts laser “dot” to laser “line” (horizontal or vertical positioning)
- Reference ridge built into side of the level allows easy alignment without a height offset
- Two precision level vials—one (1) horizontal and one (1) vertical for plumb



Using the DMLASER

Battery Installation

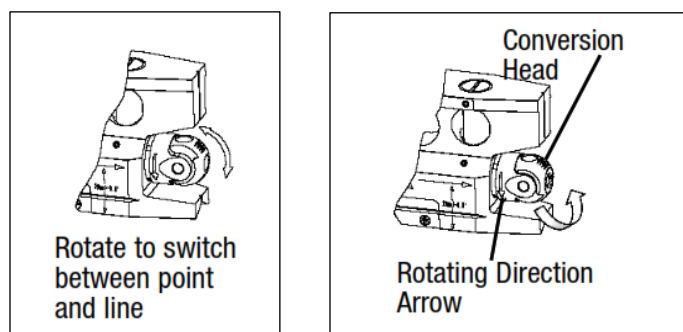
Remove battery door on side of unit and put in two alkaline “AAA” batteries according to the polarity markings on the battery cover door. Replace the battery door.

Note: Used (discharged) batteries are hazardous waste and should be disposed of properly.

Power On/Off: Press power switch to project laser line or point. Press power switch again to shut off laser output.

Switch Between Laser Dot and Laser Line

Rotate the head to switch between laser line and laser point. Rotating the Conversion Head up or down converts laser from a dot to a line, or line to a dot. Rotating the conversion head lens counter-clockwise, while in line mode, rotates line from horizontal to vertical. Note: The rotating head can only be turned in the direction indicated by arrow.




Technical Specifications

Laser Wavelength	650nm \pm 10
Laser Classification	Class IIIa
Maximum Power Output	\leq 5mW
Accuracy	\pm 3/8"/50 ft. (\pm 0.5mm/m)
Interior Range	Up to 100 ft. (30m) depending upon light conditions
Power Supply	2 "AAA" alkaline batteries (included)
Battery Life	Approx. battery life 70 hours continuous use
Dimensions	2" x 7" x 0.875" (51 x 177 x 22mm)
Weight	0.30 lbs. (0.14 kg)
Working Temperature	14°F to 113°F (-10°C to +45°C)

DMANGLE ANGLE FINDER


The DMANGLE is a precision instrument used for measuring absolute and relative angles. Its three (3) Magnetic edges allow it to be attached to magnetic or steel surfaces or the DMLASER.


OPERATION

Absolute Level: To power on, push the  LEVEL button. The absolute angle will be displayed along with "Level" in the upper-left corner.

Relative level: Place the DMANGLE on a surface and push the "ZERO" button. Then move the DMANGLE to the second surface. The DMANGLE will accurately measure and display the angle between the two surfaces. To switch back to Absolute Angle Mode press and hold the "LEVEL" button for 3 seconds.

Hold: To hold the reading, push "HOLD". "H" will display at the upper left corner of the display. To disable. Press "HOLD" again.

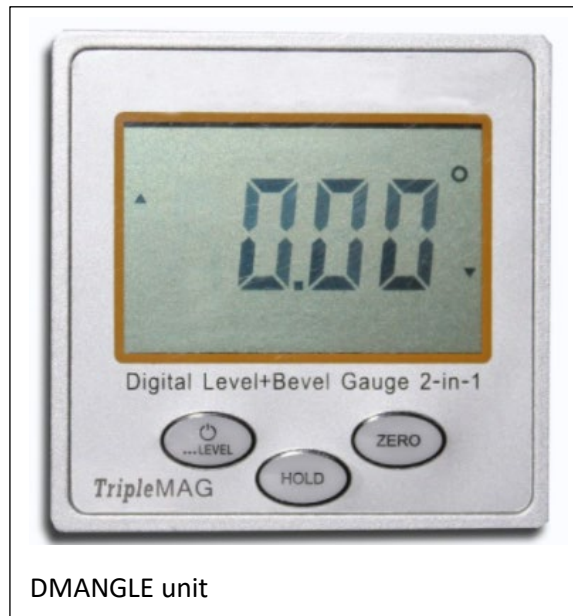
Low Battery: If the symbol  appears on the LCD display or the gauge will not power on, it is time to change the battery.

Power Off: To power off, push the  LEVEL button. Note the unit will power off automatically 3-5 minutes when not in use.

Replacing The Battery: Remove the back plate with the screwdriver provided and insert a new standard 9V battery. Please dispose of the old battery properly.

SPECIFICATIONS

- Resolution 0.05° (degrees)
- Repeatability 0.01° (degrees)
- Accuracy $\pm 0.2^\circ$ (degrees)
- Battery Standard 9 volt



DMANGLE unit

DMRANGE / DRF100 RANGE FINDER

Use the DRF100 as an alternative to conventional tape measures.

- Five measurement modes: Area, volume, two-point triangulation, three-point triangulation, automatic height.
- Continuous Distance Measurement (tracking) mode, with display of Max and Min values.
- Adds/subtracts next measurement to/from previous one. In Memory Recall mode, increments/decrements Record counter.
- Max. range: 100 ft (30 m)

SAFETY INSTRUCTIONS

CAUTION! The laser is a Class 2 type that emits less than 1 mW of radiation at a wavelength between 630 and 660 nanometers. Avoid direct eye contact with the laser, and do not point it at people or animals.



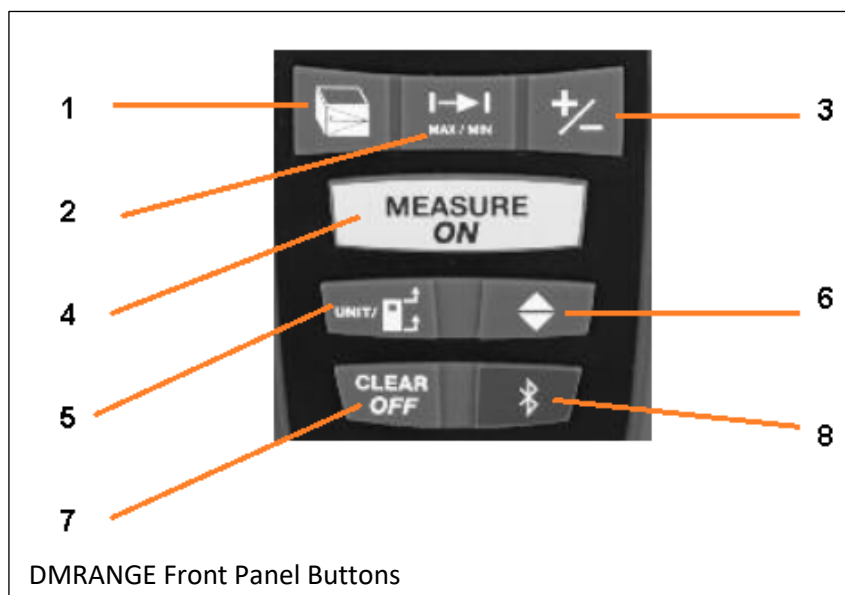
KEY FEATURES

- Accuracy: $\pm 1/16$ in. (± 1.5 mm)
- Range: 100 ft. (30m) range
- Displays distances in feet with decimal fraction (default), feet + fractional inches, inches or meters
- Calculates areas, perimeters and volumes
- Uses triangulation to calculate height or length from a distance
- Backlit 4-line LCD

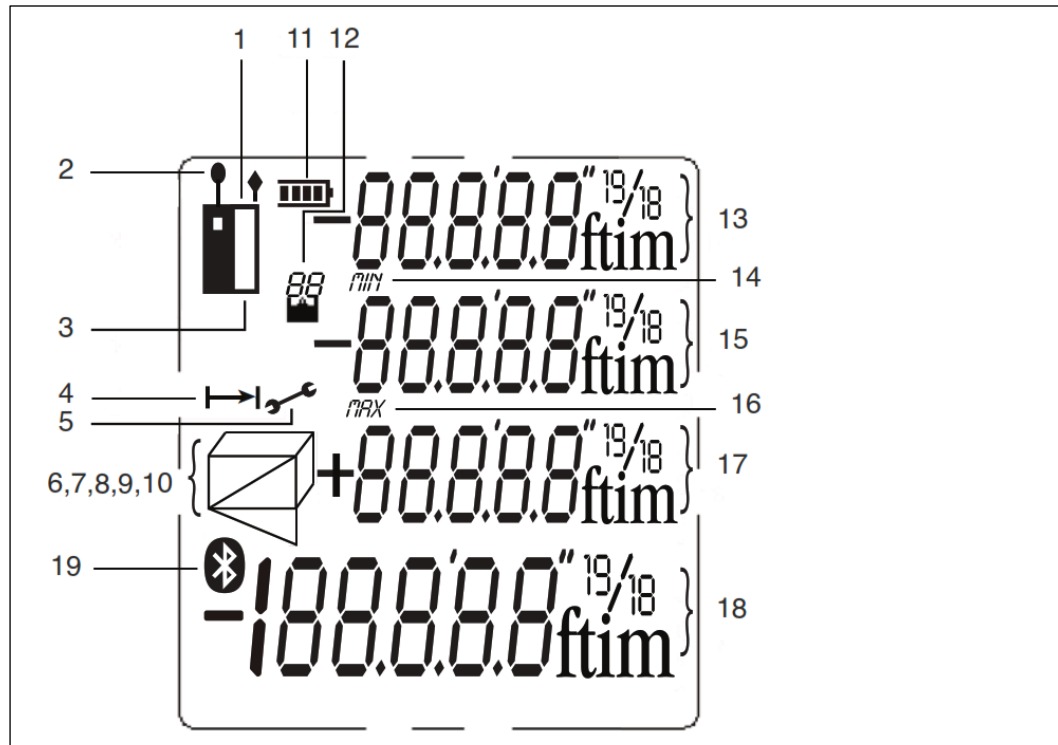
- Continuous on-screen digital readout of DMRANGE's angle with respect to the horizontal in most measurement modes
- Addition, subtraction, and continuous measurement (tracking) modes ideal for layout work
- Fast response time
- Automatically stores 20 most recent measurements/calculations
- References measurements from top or bottom of housing or end of extension ruler
- Auto power off, auto laser off and auto backlight off
- Splashproof and dustproof to IP54 standard
- Pocket-sized and lightweight
- Powered by two "AAA" Alkaline batteries (included)

Front-panel Controls

1. **Five-function button.** Press briefly to cycle through the five available measurement modes: Area, volume, two-point triangulation, three-point triangulation, automatic height
2. **Max/Min** button: Enters Continuous Distance Measurement (tracking) mode, with display of Max and Min values
3. **+/- button:** Adds/subtracts next measurement to/from previous one. In Memory Recall mode, increments/decrements Record counter
4. **Measurement** button: Activates laser and makes measurement
5. **Units** button: Press briefly to cycle through three measurement reference options: top and bottom of DMRANGE unit's housing, and bottom of extension ruler. Press and hold to cycle through four available distance units.
6. **Up/Down** button: Enters Memory Recall mode
7. **Clear/Off** button: Press and hold to power DMRANGE UNIT off. Press briefly to undo last action or clear (reset to zero) the last measurement or calculation
8. **Bluetooth** button: Activates/deactivates transmission of measurements and calculations to a Bluetooth capable device



DISPLAY INDICATORS AND ICONS



1. Measurements referenced from top of DMRANGE unit's housing
2. Flashes when laser is on
3. Measurements referenced from bottom of DMRANGE housing or bottom of extension ruler
4. Operating in Direct or Continuous Measurement Mode
5. Operating error indication
- 6–10. Measurement type indicator
 - Distance (direct)
 - △ Distance (indirect—triangulation with two inputs)
 - ◁ Distance (indirect—triangulation with three inputs)
 - ▱ Area and perimeter
 - ▭ Volume
11. Battery charge indicator
12. No. of stored record displayed
13. Top display line
14. Value displayed on second line is a minimum
15. Second display line
16. Value displayed on third line is a maximum
17. Third display line
18. Bottom (summary) display line (shows last measurement or calculation result)
19. Bluetooth transmission enabled icon

SETUP: Install Batteries

The DMRANGE unit must have the two supplied “AAA” batteries installed in a compartment in the back of the unit. To open the compartment, use the included flat-head screwdriver to loosen the single screw holding the battery compartment cover in place (see photo at right). After opening the extension ruler, remove the cover and set it aside. Position the batteries so their polarity marks match the diagram inside the compartment. Replace the cover and tighten the screw to secure it.



OPERATION: Powering ON and OFF

To turn the DMRANGE unit on, press and hold the MEASURE/ON button. This activates the display, backlight and laser. It also sounds a chirp, causes the laser icon to flash, and places the DMRANGE unit in direct distance measurement mode.

While the DMRANGE unit is powered on, any push of any button produces a chirp to confirm that some action has taken place (a measurement was made, an operating mode or measurement unit was changed, etc.). The only actions that are not accompanied by a chirp are the laser timing out (after 30 seconds of inactivity) for safety reasons and the backlight timing out (after 10 seconds of inactivity) to conserve battery charge. The DMRANGE UNIT also chirps when it automatically powers off after 3 minutes of inactivity. The chirp cannot be disabled.

To turn the DMRANGE unit off manually, press and hold the CLEAR/OFF button. The instrument will respond with a chirp as it powers off.

QUICK START INSTRUCTIONS

To make a quick distance measurement:

1. Power the DMRANGE unit on.
2. Within 30 seconds, point the top of the instrument at a target and press the button. The distance to the target—in the default measurement unit of feet with decimal fraction—will be displayed on the bottom line of the display. The MEASURE/ON top line will indicate the DMRANGE unit's angle with respect to the horizontal. When making direct distance measurements, always orient the DMRANGE unit so the top line reads close to 0.0°.

If the laser has timed out (i.e., it has been on for more than 30 seconds), or if you have just made a measurement, you will not see a red dot on the target and there will be no flashing icon on the display. To make a distance measurement with the laser off, you must press the MEASURE/ON button twice—once to activate the laser and once to make the measurement.

CHOOSING A MEASUREMENT REFERENCE

The DMRANGE unit can reference its measurements from the top or bottom of the housing, or the bottom of the extension ruler (bottom of housing). For most distance measurements, choosing the bottom of the housing as the reference produces the most accurate readings. Doing so allows you to hold the bottom of the DMRANGE unit horizontally against one wall of a room, or vertically against the floor, and send the laser beam out the top of the unit toward the opposite wall or the ceiling.

However, for continuous distance (tracking) measurements using the top of the DMRANGE unit as the reference produces the most accurate readings. In tracking mode, you typically walk the instrument back from a wall to a distance specified on a blueprint. In this case, what you want to measure is the distance to the wall from the top of the unit.

The UNIT button on the front panel lets you select the bottom or top of the housing, or the bottom of the extension ruler, as the measurement reference. When the DMRANGE unit is powered off and on again, the measurement reference automatically resets to the default: the bottom of the unit.

CLEARING VALUES/UNDOING ACTIONS

When pressed briefly, the two-function CLEAR/OFF button:

1. Works like the “Clear Entry” button on a calculator to clear the last value entered in a calculation sequence
2. Works like the “Undo” command on a computer menu to cancel the last action selected

CHANGING THE MEASUREMENT UNIT

The DMRANGE unit’s default distance measurement unit is feet with decimal fraction. The default area measurement unit is square feet, expressed as **ft²**. The default volume measurement unit is cubic feet, expressed as **ft³**.

To temporarily change the distance measurement unit, press the UNIT button as many times as necessary until the desired unit appears on the bottom display line. The alternatives to feet with decimal fraction, in order, are inches (in), feet + fractional inches (expressed as X'Y", where X is a whole number and Y is a whole number plus a common fraction), and meters (m).

When the DMRANGE unit is powered off and on again, the distance measurement unit automatically resets to the default: feet with decimal fraction.

TURNING THE BACKLIGHT ON AND OFF

To turn the display backlight on, briefly press the UNIT button. The backlight will remain on for ten seconds and then automatically turn off (silently) to conserve battery charge.

MEASURING DISTANCES

Direct Measurements

To measure the distance to a target:

1. Power on the DMRANGE unit and select a measurement unit, an appropriate measurement reference (in most cases, the bottom of the DMRANGE unit) and an appropriate backlight state (**on** for indoor work, **off** for outdoor work).
2. If the laser icon is not flashing and the laser pointer is not visible, press the MEASURE/ON button to activate the laser. Doing so will sound a chirp, cause the laser icon to flash, and place the DMRANGE unit in direct distance measurement mode.
3. After confirming that the laser is on, level the DMRANGE unit horizontally by referring to the top line of the display, aim the unit at a target, and press the MEASURE/ON button. The DMRANGE unit will chirp, and the distance to the target—in the default distance unit of feet with decimal fraction—will appear on the bottom line of the display.

Continuous Distance Measurement (Distance Tracking)

This operating mode is ideal for transferring measurements from construction plans or blueprints. In practice, you walk the DMRANGE unit back from a wall a specified distance while the unit tracks its own position by measuring the distance to the wall twice per second. As you make these dynamic measurements and you close in on the specified distance, the DMRANGE unit takes note of the closest and farthest you have been from the wall and displays these minimum and maximum distances along with the final distance.

Before entering continuous distance measurement mode, be sure to temporarily change the measurement reference from the bottom of the housing to the top by briefly pressing the UNIT button. Next, hold the DMRANGE unit horizontally with its top against the wall. Then, after making sure that the laser is on, press the button and back away from the wall while continuing to point the laser at the wall.

Initially (until the DMRANGE unit reaches its minimum measurement distance of several inches from the wall), the display will show an Error 261 message. Once the minimum measurement threshold is passed, the DMRANGE unit will begin to measure the distance from to the wall twice per second. The measurements, accompanied by chirps twice per second, will be shown and continuously updated on the bottom line of the display. At the same time, the second and third display lines continuously update the DMRANGE unit's minimum and maximum distance from the wall during this measurement session.

When you and the DMRANGE unit reach the specified distance, press the MEASURE/ON button to silence the chirping. The subsequent inactivity triggers the 30-second countdown to laser power off and the 3-minute countdown to DMRANGE unit power off. The unit's MIN, MAX and current distance values remain on the display until it powers off automatically.

Adding and Subtracting Distances

The DMRANGE unit has a front-panel button that makes it easy to add or subtract a distance from an existing measurement, in effect turning the earlier measurement into a Baseline. This Addition/subtraction function comes in handy when accumulating multiple distance measurements.

For example, consider how the DMRANGE unit could speed up the measurements needed to lay out a long brick wall of multiple sections that are not in a straight line. Once stakes, strings and frame are in place, the DMRANGE unit could accurately measure the length of each section by shooting from one stake to the next. It would also keep a running total of these measurements and display the final result—the wall's perimeter—on its bottom line.

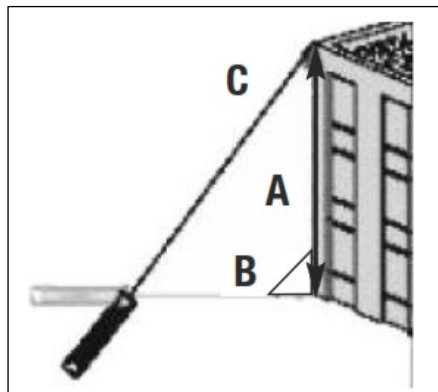
To add a measurement to an existing measurement displayed on the bottom line, briefly press the +/- button. The earlier measurement will be moved from the bottom line to the second line and a flashing icon will appear at the left of five dashes (representing the distance value to be added) on the third line. Then press the MEASURE/ON button while aiming the laser at the point from which the first measurement was made. The DMRANGE unit will measure the distance to that point, replace the dashes on the third line with that value, and display the sum of the two measurements on the bottom line.

To subtract a measurement from an existing measurement displayed on the bottom line, press and hold the MEASURE/ON button. The earlier measurement will be moved from the bottom line to the second line and a flashing "-" (minus) icon will appear at the left of five dashes (representing the distance value to be subtracted) on the third line. Then press the MEASURE/ON button while aiming the laser at the point from which the first measurement was made. The DMRANGE unit will measure the distance to that point, replace the dashes on the third line with that value, and display the difference of the two measurements on the bottom line.

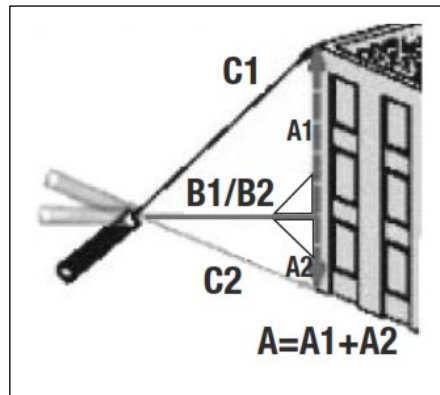
Indirect Measurements of Height or Length using Triangulation

The DMRANGE unit can use triangulation (one type of indirect measurement based on Pythagorean geometry) to calculate the height or length of an object from a distance. The instrument can perform three kinds of Pythagorean calculations:

- **Triangulation with two inputs.** This kind of distance measurement can be made only for distances that present you with a right angle. A good example is measuring the height of a building from across the street at ground level. Because the DMRANGE unit and the bottom of the building are both at ground level, the side of the building (whose height "A" is unknown) forms one leg of a right triangle whose other leg is the distance across the street. In other words, you can use triangulation to determine the height "A" using only two inputs because "A" is perpendicular to "B"—one of the distances you can measure. The DMRANGE unit can measure "B" as well as the distance to the top of the building which is the hypotenuse of the right triangle. Once the DMRANGE unit has determined the values of "B" and "C", it calculates the value of "A" according to Pythagoras' famous equation: $A^2 + B^2 = C^2$.



• **Triangulation with three inputs.** This kind of distance measurement can be made for distances that do not present you with a right angle. A good example is measuring the height of a building from another building across the street through an open fourth-floor window. Because the DMRANGE unit and the bottom of the target building are not both at ground level, you must measure one common leg “B1/B2” (which is perpendicular to the wall of the building) and the hypotenuses of two right triangles “C1” and “C2”. Once these two values are known, the DMRANGE unit can solve two Pythagorean equations for the missing values of the other two legs (“A1” and “A2”). The final calculation, which solves for A— the height of the building — is $A = A1 + A2$.



MEASURING AREAS & PERIMETERS

The DMRANGE unit can calculate the area of a square or rectangular room or space by measuring its length and width and multiplying the two values. It can also calculate the perimeter of the room or space by adding the length and width and multiplying by two.

To measure an area or perimeter:

1. Make sure the DMRANGE unit is using its bottom as the measurement reference and that the laser is on.
2. Press the five-function button once. A “parallelogram” icon will appear on the left side of the display with its bottom leg flashing.
3. Holding the bottom of the DMRANGE unit against one wall of the room or space, aim the laser pointer at the opposite wall and press and hold the MEASURE/ON button. The distance measured will appear on the top line of the display, the bottom leg of the parallelogram will stop flashing, and the right leg of the parallelogram will begin flashing.
4. Move the DMRANGE unit to an adjacent wall of the room or space and hold its bottom against that wall. Aim the laser at the opposite wall and press the button. The distance measured will appear on the second line of the display and the area of the room or space—in “square” units—will appear on the bottom line. The calculated perimeter of the room or space will appear on the third line of the display.

MEASURING VOLUMES

The DMRANGE unit can calculate the volume of a square or rectangular room or space by measuring its height, depth and width and multiplying the three values.

To measure a volume:

1. Make sure the DMRANGE unit is using its bottom as the measurement reference and that the laser is on.
2. Press the five-function button twice. A “cube” icon will appear on the left side of the display with its top front “width” leg flashing.

3. Holding the bottom of the DMRANGE unit against the floor of the room or space, aim the laser pointer at the ceiling and press the MEASURE/ON button. The distance measured will appear on the top line of the display, the top front “width” leg of the cube will stop flashing, and the top right “depth” leg of the cube will begin flashing.
4. Move the DMRANGE unit to one wall of the room or space and hold its rear against that wall. Aim the laser pointer at the opposite wall and press the MEASURE/ON button. The distance measured will appear on the second line of the display, the top right “depth” leg of the cube will stop flashing, and the right front “height” leg of the cube will begin flashing. The third line of the display will display the calculated area of the plane bounded by the width and depth of the volume.
5. Move the DMRANGE unit to an adjacent wall of the room or space and hold its bottom against that wall. Aim the laser at the opposite wall and press the MEASURE/ON button. The distance measured will replace the planar area on the third line of the display and the volume of the room or space—in “cubic” units—will appear on the bottom line.

RECALLING STORED MEASUREMENTS/CALCULATIONS

The DMRANGE unit automatically stores its last 20 measurements or calculations and retains them in memory after being powered off. The records also are unaffected by a battery discharge or battery change. Once the memory is full, the next measurement or calculation overwrites the oldest record in a first in-first out (FIFO) scheme. Record #1 is the most recent measurement or calculation, and Record #20 is the oldest. The records are recalled sequentially, using the front-panel “+/-” button. Records cannot be deleted individually or in bulk.

To recall a record, press the “**up/down**” button. The value of the first (most recent) measurement or calculation will appear on the bottom line, and a “1” will appear over the “**up/down**” icon near the top of the display, below the battery charge indicator. Briefly press, or press and hold, the “+/-” button to navigate up or down through the memory to the desired record number. Repeatedly pressing the button briefly recalls stored records in reverse chronological order. Repeatedly pressing and holding the button recalls the records in chronological order. Tip: Pressing and holding the button with Record #1 displayed recalls Record #20.

SPECIFICATIONS

Measurement Range (indoor)	8 in. to 100 ft. (200mm to 30m)
Measurement Accuracy	±1/16 in. (±1.5mm)
Resolution	1mm
Display Unit Options	feet with decimal fraction (default), feet plus fractional inches, inches, meters
Response Time	2 seconds, max
Laser Type, Wavelength, Power	Class 2, 630 to 660nm, < 1mW
Operating Modes	Direct Distance Measurement, Distance Addition/Subtraction, Continuous Distance Measurement (Distance Tracking), Indirect Distance Measurement (Triangulation) with 2 or 3 inputs, Auto Height Measurement, Area and Perimeter Measurement, Volume Measurement
Display	4-line backlit LCD measuring 1-3/4 in. (45mm) diagonal
Memory	20 measurements
Splashproof and Dustproof	To IP54 standard
Auto Power Off	After 3 minutes of inactivity
Auto Laser Off	After 30 seconds of inactivity
Auto Backlight Off	After 10 seconds of inactivity
Battery Life	3000 measurements, typical
Operating Temperature	32° to 104°F (0° to 40°C)
Storage Temperature	14° to 140°F (-10° to 60°C) @ <85% R.H.
Power Source	2 “AAA” batteries
Dimensions	4.5 x 2.0 x 1.3 in. (115 x 52 x 32mm)
Weight	4.2 oz. (120g), excluding batteries

OPERATING & MAINTENANCE TIPS

Because the laser silently auto powers off after 30 seconds of inactivity while the DMRANGE unit remains powered on, you’ll often find that when you press the MEASURE/ON button expecting to make a measurement, all you have done is reactivate the laser. In this case, you have to press the button a second time to take a reading.

When measuring horizontal distances, keep the DMRANGE unit as horizontal as possible, using the digital angle reading on the top line of the display as a guide. When measuring long distances, use a target plate made of white paper or cardboard. Using a monopod or resting the DMRANGE unit on a surface (rather than holding in your hand) helps to steady the laser on distant targets.

The DMRANGE unit will almost always register an “Error 204” if the target is an LCD or plasma computer or TV screen. The calculation error results because the display absorbs the incoming beam and reflects nothing back to the DMRANGE unit.

The following errors can be corrected:

Code	Cause	Corrective Measure
Error 204	Calculation error	Repeat the measurement(s)
Error 252	Temperature too high	Cool down the DMRANGE unit
Error 220	Low battery	Install fresh batteries
Error 253	Temperature too low	Warm up the DMRANGE unit
Error 255	Received signal too weak/ Measurement time too long	Use white target plate
Error 256	Received signal too strong (target too reflective)	Use target plate
Error 500	Hardware/uncertainty error	Power the DMRANGE unit off and on

Replace the batteries when the on-screen “battery” icon indicates that their charge has been depleted. Use Alkaline batteries only. To avoid having old batteries leak and ruin the DMRANGE unit, remove the batteries when you do not expect to use the instrument for a long period of time (several months).

Clean the DMRANGE unit with wiping it with a damp soft cloth. Never use solvents or abrasives.

Keep the DMRANGE unit away from water, toxic environments and temperature extremes.

FCC STATEMENT

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

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 to a different circuit than the one the receiver is connected to.
- Consult your supplier or an experienced radio/TV technician for help.

Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.