SONIN®

Multi-Measure® Combo Pro

Electronic Distance Measuring Tool

Pocket Reference Guide

#10300 CE

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Phone: 800-223-7511 • Website: www.sonin.com

Printed in China 055-1400-0070 Rev.2

PLEASE READ THIS FIRST:

Your choice of the SONIN COMBO PRO shows you are a professional who demands quality and value from your tools. Please take a few minutes to read this manual. Your SONIN COMBO PRO has many easy-to-use features that will make your measuring tasks faster and easier once you understand them.

The SONIN COMBO PRO is actually two measuring tools in one. It can take measurements by bouncing sound waves off flat hard surfaces such as walls or ceilings from 1 ft 6 ins (46cm) up to 60 ft (18m) in the **"SINGLE UNIT MODE"** or from 3 ft (1 m) up to 250 ft (75m) by sending infrared light signals to the **Target** (included) and receiving sound waves back from the **Target** in **"DUAL UNIT MODE"**.

Use the **"SINGLE UNIT MODE"** primarily for indoor measurements or whenever you are measuring to a suitable, hard, flat surface, less than 60 ft (18m) away.

Use the **"DUAL UNIT MODE"** when you need to measure distances greater than 60 ft (18m), when there is no suitable surface to bounce the signal off of, or when there are obstacles partially blocking the measuring path. [If you can see the Target (and it is within range), the COMBO PRO can take a measurement.]

KEYS AND THEIR FUNCTIONS:

OFF Determines whether the unit is operating in "Single Unit" or "Dual Unit" mode. The Receiver will not turn on until either ⏏ or ⏏ is pressed.

Measures from bottom of unit – icon will appear in the lower right corner of the display.

Measures from top of unit – icon will appear in the lower right corner of the display.

Using either button: Press and **HOLD** to track measurements - for continuous readings while moving. Fastest way to measure but no reading validation. Useful for locating correct surfaces when there are obstacles in the way.

Press and **RELEASE** to validate measurement only when unit is held absolutely still. **Most accurate mode**. Useful in environments when obtaining a stable reading can be difficult. Validates all measurement before displaying. Filters out noise from machinery and other sources.

M Turns on Memory. Cycles through memory registers.

MIN Stores data displayed into blinking memory registers.

MR Recalls memory from blinking memory registers.

X **Multiplies** measurements for area and volume. Stores and recalls ⊗ memory.

\+ **Adds** linear distances, areas and volumes. Stores and recalls ⊕ memory.

− **Subtracts** linear distances, areas and volumes.

C UNITS **Clear/Convert/Off Button.** Press and immediately release to clear display. Press

and hold for two seconds to change display units. Press twice to turn unit off.

Press and Hold C UNITS key for more than 2 seconds to change display units. The display will cycle between m, ft:in, ft:ft and yd. Release C UNITS key to select desired mode.

GETTING STARTED TAKING MEASUREMENTS "SINGLE UNIT MODE":

1) Install a fresh 9V alkaline battery in rear of unit. Push contacts firmly in place.
2) Select **"SINGLE UNIT MODE"** by sliding the switch on the side of the unit to the position.
3) Aim cone at a hard, flat, unobstructed surface such as a wall or mirror.
4) Make certain you have a clear path to the surface (wall). (See FIG. 1.)

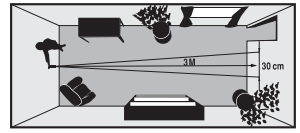
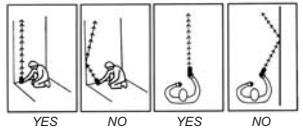


FIG. 1 - The sound waves emitted from this unit spread 1 ft (30 cm) for every 10 ft (3m) measured.

5) Hold Receiver perpendicular to the surface. (See FIG. 2.)



(FIG. 2)

6) Press ⏏ or ⏎ until a consistent measurement appears (about 2 seconds). The unit will continue to take and display rapid measurements as long as the button is held. Release button to freeze the measurement.

   Press and release ⏏ or ⏎ to validate measurement.

   NOTE: When a measurement is taken in "single unit mode", the ▮ icon will appear in the upper left hand of the LCD.

7) Your unit is factory preset to display metric. To set your display to desired mode (m, ft:in,ft:ft or yds) Press and hold C UNITS button until desired mode displays, then release.

   NOTE: Unit will now default to your preset mode even after unit is turned off.

HELPFUL MEASURING HINTS FOR "SINGLE UNIT MODE" MEASURING:

1) Measurements cannot be taken through glass or off of soft or padded surfaces.
2) The SONIN COMBO PRO's range and ability to measure in tight spaces can be increased. Stand in the middle of the distance to be measured and add measurements taken in opposite directions.
3) When measuring in confined spaces (hallways), try to measure down the center line and midway between the floor and ceiling.
4) To find a specific distance from a wall, walk toward or away from the wall while holding down ⏏ or ⏎ .
5) When the surface being measured to has protrusions and recesses, you can determine where the beam is hitting. Move sideways parallel to the target surface, while holding

down the measure button. You will see the distance increase for recesses and decrease for protrusions.

6) Be sure the surface you are measuring to is hard, flat and uniform. Some surfaces such as stucco or clapboard may scatter signals.
7) When using tracking mode, the unit may lock on to a stronger (usually closer) measurement. If this happens, release the measure button and try again.
8) REMEMBER:
   ⏏ Measures from bottom of unit.
   ⏎ Measures from top of unit.

TAKING A MEASUREMENT IN "DUAL UNIT MODE":

1) Install a fresh 9V alkaline battery in rear of **Receiver** and **Target**. Push contacts firmly in place.
2) Select **"DUAL UNIT MODE"** by sliding the switch on the side of the **Receiver** to the ▮▮ position.
3) Move the switch on the side of the **Target** to the **ON** position. Light on front of Target will blinking slowly indicating target is on.
4) Place the **Target** at one end of the distance to be measured.

   NOTE: The measurement will be taken to the back of the Target.

5) Walk with the **Receiver** to the other end of the distance to be measured and aim the **Receiver** directly at the face of the **Target** Aiming at an angle to the face of the **Target** will decrease the maximum distance the COMBO PRO can measure.
6) Make certain you have a clear path to the **Target**.

7) Press ⏏ or ⏎ until a consistent measurement appears (about 5 seconds). The unit will continue to take and display rapid measurements as long as the button is held. Release the button to freeze the measurement.

   Press and release ⏏ or ⏎ to validate measurement.

   NOTE: When a measurement is taken in "Dual Unit Mode", the ▮▮ icon will appear in the upper left hand of the LCD.

8) Your unit is factory preset to display metric. To set your display to desired mode (m, ft:in, ft:ft or yds) Press and hold C UNITS button until desired mode displays, then release.

   NOTE: Unit will now default to your preset mode even after unit is turned off.

HELPFUL HINTS FOR "DUAL UNIT MODE" MEASURING:

1) Make certain there is a clear line of sight between the **Receiver** and the **Target**.
2) Use validate mode when taking measurements near traffic, construction or other noise sources.
3) The **Target** is not affected by noise. If there are loud noise sources such as machinery, traffic, etc., arrange the measurement so the **Receiver** is furthest from the noise source.
4) Use **"DUAL UNIT MODE" Operation** even for short measurements [under 60 ft (18m)] if there are obstacles in the path of the measurement. **"SINGLE UNIT MODE"** Operation requires a path 1 ft (30 cm) wide for each 10 ft (3m) of measured distance.

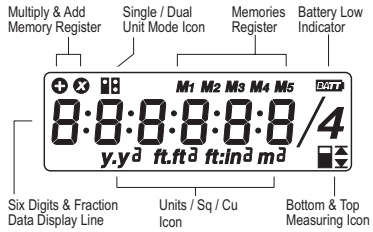
   For example, at 60 ft (18m), **"SINGLE UNIT MODE" Operation** requires a path 6 ft (1.8m) wide and high. **"DUAL UNIT MODE" Operation** only requires that the Receiver is

able to "see" the **Target**.

5) If the wind is gusting, make certain you use validate mode for measurements. See the section on **ENVIRONMENTAL CONDITIONS**.
6) When measuring distances beyond the maximum range (see section on **ENVIRONMENTAL CONDITIONS**) break the measurement into 2 or more measurements and use the **ADD** function to sum them.

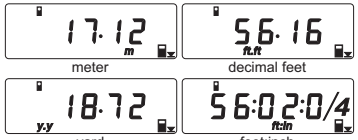
   REMEMBER:
   Your COMBO PRO will automatically power down and lose all measurements 7 minutes after the last key press.

READING THE DISPLAY:



The SONIN COMBO PRO can display measurements in 4 modes.

To change the display units or convert a displayed value from one set of units to another, press and hold C UNITS . The displayed value will change with the units. Release C UNITS when the desired units are displayed. If you release C UNITS before the reading changes units, the display will clear and the reading will be erased unless first stored (see **MEMORIES**).



1) If the unit is unable to take a "good" measurement the display will show one of the following:

	BLANK SCREEN Make certain the Receiver switch is in the or the position. Check/replace battery. If unit still doesn't work, call your SONIN Dealer.
BATT	When the BATT symbol appears on the display, replace the battery.
Error 1	Out of Range or No Return Signal.
Error 2	No Valid Reading.

Possible causes for Error 1 and Error 2 include:

a) Measurement out of range [1.5 to 60 ft (0.46 to 18.2 m) without **Target**, 3 to 250 ft (1 m to 75 m) with **Target**].

b) Unit is not perpendicular to the surface or **Target**. (See Fig. 2.)

c) Surface is not hard and flat.

d) Interference from nearby noise sources. Try to position the **Receiver** as far from the noise source as possible or turn off the machinery causing the noise (see section on **ENVIRONMENTAL CONDITIONS**).

e) **Receiver** or **Target** was moved during the measurement. The distance between the two units must not be change during the reading.

f) Excessive wind.

g) **Target** is not turned on.

h) The **Target** is being triggered by an infrared light signal other than the **Receiver**. If direct sunlight is "blinding" the **Target**, exchange the position of the **Receiver** and the **Target** so the light is coming from behind the **Target**.

Error 3	Math error - square or cube result overflow.

COMPUTATION FUNCTIONS:

To make the computations in the descriptions below, the ▲ button symbol indicates taking an actual measurement (length, width or height) with either the ▲ or the ⏫ button.

X	**Multiplying:** The unit multiplies linear measurements to compute areas and volumes. The ⊗ symbol will appear in the upper left corner of the display.
+	**Adding:** The unit adds linear measurements, areas or volumes. The ⊕ symbol will appear in the upper left corner of display.
−	**Subtracting:** The unit subtracts linear meaurements, areas or volumes. The ⊕ symbol will appear in upper left corner of display.

Adding distances: ▲ + ▲ +
(Display shows ***y.y*** , ***ft.ft*** , ***ft:In*** or ***m***)
(Continue until you are done adding distances.)

Subtracting distances: ▲ + ▲ −
(Display shows ***y.y*** , ***ft.ft*** , ***ft:In*** or ***m***)
(Continue until you are done subtracting distances.)

Multiplying to compute areas:
▲ X ▲ X
(Display shows ***y.y²***, ***ft.ft²*** or ***m²***)

Multiplying to compute volumes:
▲ X ▲ X ▲ X
(Display shows ***y.y³*** , ***ft.ft³*** or ***m³***)

To add areas:
▲ X ▲ X +
▲ X ▲ X +
(Display shows total area)
(Continue until you are done adding areas.)

To add Volumes:
▲ X ▲ X ▲ X +
▲ X ▲ X ▲ X +
(Display shows total volume)
(Continue until you are done adding volumes.)

Note: The SONIN COMBO PRO can only add like units of measure.

MEMORIES:

Your SONIN COMBO PRO has SEVEN Memories. 5 Memory Registers - M1, M2, M3, M4 and M5 and two calculation memories in ⊕ and ⊗ .

To Access M1 - M5 Memory Registers:
Press M Key Once to Turn On Memory. If any memory is already stored, the icon will appear on the LCD showing where there is stored data, otherwise it remains blank indicating all memory registers are empty.

Continue to press and release the M key to access the memory registers. The icons will blink when accessible. (i.e. ***M1*** , ***M2*** , ***M3*** , ***M4*** and/or ***M5*** blinking)

NOTE:

1) When M1 - M5 icons are blinking and the C UNITS key is pressed, it will clear the memory in that register.

2) If you plan to store a new measurement, you must first take the measurement before entering into memory.

3) To Exit Memory, continuously press the M key until Memory Registers no longer appear on the LCD, NOTE: the unit will automatically exit memory mode when you clear the memory, store to memory or recall the memory.

To Store Memory:

Take a measurement. Press and release the M key until you reach the desired memory register. Then, while blinking, press the M+ key once to store the displayed reading. The memory icon will now turn off to indicate that it has data stored to that register and back to the measuring mode.

Example: To store in M3
Press ▲ once, and press M 4 times - (the ***M3*** icon will blink) then press M+ . Your measurement will be stored in M3.

To Recall Memory:

Press and release the M key until you reach the desired memory register. Then, while blinking, press the MR key. This will recall the data stored in that memory register.

Example: To recall from M3
Press M until ***M3*** is blinking. While blinking press MR key. Memory stored in M3 will display on LCD.

To Clear All Stored Memory :

Press M key until all 5 Memory icons are blinking. Then press C UNITS key. All memory stored will be erased and your unit will automatically go back to measuring mode.

To store in ⊕ :

Press ▲ , then + (the ⊕ symbol will appear in the upper left corner of the display)

To store in ⊗ :

Press ▲ , then X (the ⊗ symbol will appear in the upper left corner of the display)

NOTES:

1) Turning the unit off will erase both memories.
2) If ⊕ memory is empty (no ⊕ symbol in upper left corner of display) a measurement can be stored by pressing [+] button.
3) If ⊗ memory is empty (no ⊗ symbol in upper left corner of display) a measurement can be stored by pressing [X] button.
4) Subsequent measurements can be added to or subtracted from measurement in ⊕ by pressing [+] or [−] button, respectively. The resulting value (sum or difference) is displayed.
5) Subsequent measurements can be multiplied by the stored value (measurement or area) in ⊗ by pressing [X] button. The resulting value (area or volume) is displayed.
6) Other operations such as computing the area formed by the sum of two distances multiplied by a third distance are also possible.

   For example: [▲] [+] [▲] [+] [X] [▲] [X]
7) The SONIN COMBO PRO can only add like units of measure. If ⊕ contains a distance and the display shows an area, pressing the [+] button will cause the area to be stored in ⊕ and the previously stored distance to be lost.

TO RETRIEVE A STORED VALUE IN ⊗ AND ⊕

1) Clear the display by pressing and immediately releasing the [C UNITS] button.
2) Once you have cleared the display, press the [+] or [X] button to retrieve the reading stored in that memory.

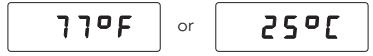
TEMPERATURE COMPENSATION:

Because temperature affects the speed of sound, the SONIN COMBO PRO has automatic temperature compensation for greater accuracy. In order to make the most of this feature, wait 1 minute for each 1°F (2 minutes for each 1°C) of temperature difference between cool and warm locations.

DISPLAYING TEMPERATURE TO IMPROVE ACCURACY: Since temperature affects accuracy, the SONIN COMBO PRO is most accurate when its internal temperature matches the air temperature.

To display temperature: press and hold [+] key, then press [⏏] key, the internal temperature will appear on the display immediately (in °C when m display units are selected or in °F if selected display units are ft:in, ft:ft, yds).

For Example:



To go back to measurement mode, press and release [C UNITS] key or press the measure key directly.

HINT: To speed equalization of the SONIN COMBO PRO's internal temperature versus air temperature, wave the unit back and forth in the air to circulate room temperature air through the unit. For additional information, see "Temperature" in the section on **Environmental Conditions**.

LOW BATTERY INDICATOR:

Replace the battery when the BATT symbol appears on the LCD.

SPECIFICATIONS:

Range Without Target:
Min: 1.5 ft (0.46m)
Max: 60 ft (18.2 m)
Actual: Will vary depending on environmental conditions.

Range With Target:
Min: 3 ft (0.91m)
Max: 250 ft (76.2 m)
Actual: Will vary depending on environmental conditions.

Accuracy:
Single Unit Mode: 99.5% ± 1/4 in (± 1 cm)
Dual Unit Mode: 99.5% ± 1/2 in (± 1 cm)

These accuracies are possible when environmental conditions are as follows:
Temperature: 32 to 86°F (0 to 30°C)
Relative Humidity: 30 to 70%
Altitude: -328 ft to +328 ft (-0.1 to +0.1 km)
Wind Speed: Still Air

EXAMPLES: SINGLE UNIT MODE
At 15 ft (4.57 m) your reading will be within 1 1/4 ins (3 cm). At 60 ft (18.2 m) your reading will be within 3 3/4 inches (10 cm).

EXAMPLES: DUAL UNIT MODE
At 15 ft (4.57 m) your reading will be within 1 1/2 ins (3 cm), At 60 ft (18.2 m) your reading will be within 4 inches (10 cm).

Resolution:
1/4 in (0.01 m, 0.01 ft or 0.01 yd)

Ultrasonic Frequency:
40 kHz without Target,
25 kHz with Target

Battery:
9 volt (alkaline recommended)

Current Consumption:
8 - 13 mA
(Approximately 50 hours continuous use with a new 9 volt alkaline battery)

Operating Temperature:
32 to 100°F (0 to 38°C)

Auto Shut-off:
Approximately 7 minutes after last key press.

Size:
Receiver: 5 7/8 x 2 7/8 x 1 3/4 inches (147 x 75 x 45 mm)
Target: 4 3/4 x 3 x 1 1/16 inches (121 x 75 x 27 mm)

Weight:
Receiver: 6.2 oz (175 g) without battery
Target: 4.0 oz (115 g) without battery

ENVIRONMENTAL CONDITIONS THAT COULD AFFECT PERFORMANCE:

IMPORTANT: Ultrasonic Distance Measuring, Tools work best for quick and easy measuring and estimating. They are not intended for precision work, although they can be very accurate under optimal conditions.

Humidity - Humidity and temperature can affect the range and accuracy of all ultrasonic distance measuring tools. They may give measurements that are longer or shorter than their specifications (depending on atmospheric conditions). The range is longest in high temperature/high humidity and low temperature/low humidity and range is shortest in high temperature/low humidity and low temperature/high humidity.

Humidity effects on accuracy are greatest at high temperatures and negligible at low temperatures. At 100°F (38°C) and 99% R.H., the distance measurement will be short by 0.6%. At 100°F (38°C) and 0% Relative Humidity, the distance measurement will be long by 0.6%. At 32°F (0°C) the distance measurement will essentially not be affected by humidity.

Temperature - Your SONIN COMBO PRO has unique automatic temperature compensation to ensure consistency of measurements between 32°F and 100°F (0°C to 38°C). The response rate of this circuitry enables you to move between warm and cold areas and measure with reasonable accuracy. However, we recommend that you do not leave your SONIN COMBO PRO in very cold or very hot conditions (e.g. sunlight in a car), as the unit will then require more time to adjust to air temperature.

As long as the internal temperature is equal to the air temperature, accuracy is unaffected. Wait for the unit's internal temperature to equal the air temperature or, add 1% of the measured distance for each 10°F (5.5°C) that the measured temperature is below the actual temperature; subtract 1% of the measured distance for each 10°F (5.5°C) that the internal temperature is above the air temperature. (See section on **DISPLAYING TEMPERATURE** for instructions on how to obtain a temperature measurement from your SONIN COMBO PRO.)

Altitude/Barometric Pressure - Altitude and barometric pressure can affect the range and accuracy of all ultrasonic distance measuring tools.

As the altitude increases (barometric pressure decreases), the range is reduced. As altitude decreases (barometric pressure increases), the range is increased.

To correct for altitude (pressure) effects on accuracy, subtract 0.4% of the measured distance for each 1000 ft/ - 0.6" Hg (0.3 km/-15mm Hg) you are above sea level. Add 0.4% of the measured distance for each 1000 ft/ +0.6" Hg (0.3km /+15mm Hg) you are below sea level (sea level = 760mm Hg).

Noise - High frequency noise from machinery, engines, computers, stereos, TV sets, etc. can affect the reading and you may get random readings. Stand away from or shut off this type of equipment when measuring.

Outdoor Measurements - Your SONIN COMBO PRO is designed for indoor and outdoor use, provided there is only light wind. A strong wind will tend to affect accuracy and/or range.

FIELD CALIBRATION:

This unit was calibrated under the circumstance of 760 mmHg atmosphere and 50% relative humidity, if the unit is not used under such environmental conditions, it may produce an error. The built in user's calibration mode is designed for the user working under other than standard conditions such as high altitudes. After the unit is calibrated all environmental errors are compensated and the accuracy is improved.

To Field Calibrate unit -

1) Turn the switch to the position.
2) Place unit 10 feet (or 3 meter) from the bottom of the unit to a flat vertical surface.
3) Press and hold both (+) and (-) keys then press (⏏) key, the unit will turn on and process calibration immediately.
4) When calibration is completed 10.00 ft.ft (or 3.00 m) will displayed on the LCD.
5) Then turn off the unit and turn on again, the new calibrated data will now used in all measures.

NOTE - BEFORE CALIBRATING UNIT:

1) It is imperative that the unit be exactly 10 feet (imperial) or 3 meter (metric) from the bottom of the unit to a flat vertical surface.
2) Verify the temperature of the unit is within ± 1°C of the ambient temperature.

TO RESET BACK TO FACTORY DEFAULT SETTING:

1) Turn OFF unit and turn in ON again.
2) Press and hold (UNITS) key then press (⏏). The LCD will display rESEt (RESET). the factory default setting now restored to the unit.
3) Then turn OFF unit and turn ON again to resume measuring.

FCC NOTE:

This device has been tested and found to comply with the limits for a Class B 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 device generates, uses and can radiate radio frequency energy and, if not 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 device 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 separation between the device and receiver

This Class B Digital Apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

TECHNICAL ASSISTANCE

If you have any questions or need technical assistance, e-mail to:

technicalsupport@sonin.com

CUSTOMER SERVICE

SONIN takes pride in offering unmatched customer service to owners of SONIN products. If you have any questions or would like additional information, please call:

1 - 800 - 223 - 7511 (USA)

or e-mail to:

customerservice@sonin.com