WARRANTY

ONE YEAR LIMITED WARRANTY

This HM Digital, Inc. ("the Company") product ("COM-100") is warranted to the purchaser against defective materials and workmanship for one (1) year from the date of purchase.

What is covered: Repair parts and labor, or replacement at the Company's option. Transportation charges for repaired or new product to be returned to the purchaser.

What is not covered: Transportation charges for the defective product to be sent to the Company. Any consequential damages, incidental damages, or incidental expenses, including damages to property. This includes damages from abuse or improper maintenance such as tampering, wear and tear, water damage, or any other physical damage. The COM-100 is watertight and completely submersible. However, please ensure that the battery compartment and probe gasket ring are firmly tightened before submersing in water. The warranty does not cover water damage to the COM-100 due to parts not securely closed.

How to obtain warranty performance: Include with the product your name, address, phone number, description of the problem, and proof of date of purchase (receipt, invoice, etc.) and return to:

HM Digital, Inc.
ATTN: Returns
5819 Uplander Way
Culver City, CA USA 90230

**** If a returned product does not include the abovementioned items, the Company reserves the right to refuse warranty service.***

Implied Warranties: Any implied warranties, including implied warranties of merchantability and fitness for a particular purpose, are limited in duration to five years from date of purchase. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. To the extent any provision of this warranty is prohibited by federal and state law and cannot be preempted, it shall not be applicable. This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state.

NOTE: Warranties are product-specific. Third-party products and products deemed by HM Digital as "accessories" are not covered under warranty. Third-party products include, but are not limited to, batteries and fittings. Accessories include, but are not limited to, lanyards and product boxes.

USER'S GUIDE

COM-100
EC / TDS / TEMPERATURE METER

CONTENTS

OVERVIEW

Thank you for purchasing HM Digital's COM-100. The COM-100 is a highly advanced handheld meter that is completely waterproof. The meter measures three parameters: Electrical Conductivity (EC), Total Dissolved Solids (TDS) and temperature. The COM-100 features three different conversion factors to convert from EC to TDS, using the KCl, 442™ or NaCl factors, as well as selectable modes for measurements in the µS, mS, ppm or ppt scales, making it extremely versatile for a wide range of applications. Though the meter is factory calibrated at 1413 µS (micro-Siemens), it also features digital calibration for easy and precise calibration to any point within its range.

CONTACT INFORMATION

If you have any problems or questions regarding your meter, please contact HM Digital, Inc.

HM Digital, Inc.
5819 Uplander Way
Culver City, CA 90230, USA

info@hmdigital.com
www.hmdigital.com
1-800-383-2777

SPECIFICATIONS

EC Range: 0 - 9990 µS; 0 - 9.99 mS
TDS Range: 0 - 8560 ppm (mg/L); 0 - 8.56 ppt (442); 0 - 5000 ppm (mg/L); 0 - 5.00 ppt (NaCl and KCl)
Temperature Range: 0.1 - 80°C; 32.1 - 176°F
Resolution:
EC: 0 - 99: 0.1 µS / 0.01 mS; 100 - 999: 1 µS / 0.10 mS; 1000 - 9990: 10 µS / 1.00 mS
TDS: 0 - 99: 0.1 ppm / 0.01 ppt; 100 - 999: 1 ppm / 0.10 ppt; 1000-9990: 10 ppm / 1.00 ppt
Temperature: 0.1 °C/F
Accuracy: +/- 2%
EC-to-TDS Conversion Factor: Pre-programmed, non-linear conversions for KCl, 442™ or NaCl solutions, selected by the user
Temperature Compensation: Automatic (ATC) with three temperature coefficients
Calibration: Digital calibration by push button (to any point within the range)
Auto Shut-Off: After 5 minutes
Probe: Detachable, with platinum electrodes
Display: LCD panel
Housing: Waterproof (submersible; IP-67 rated); floats
Power source: 3 x 1.5V button cell batteries (included), model LR44
Battery Life: Approximately 100 hours of usage (high ranges use greater power consumption)
Dimensions: 18.5 x 3.4 x 3.4 cm (7.3 x 1.3 x 1.3 inches)
Weight: 90.7g (3.2 oz) without case

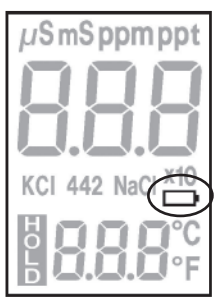
CARE, MAINTENANCE & TECHNIQUES

The COM-100 requires very little maintenance. You may need to change the batteries or clean the unit or the electrodes from time to time. In addition, please note these general techniques:

1. Do not store the unit in high temperature or direct sunlight.
2. Do not touch the platinum electrodes. Skin oils may adversely affect the reading. If you do touch the electrodes, clean immediately with alcohol or distilled water.
3. After repeated usage in high TDS water, it is advised to clean the electrodes to prevent residue build-up.
4. For best results, always stir or tap the meter in the water sample to dislodge any air bubbles or remove any lingering electrical charges.
5. Water volume, positioning of the electrode in the water sample, and temperature may affect the reading.
6. Do not keep the meter in very hot water for extended periods of time.
7. If testing two water samples in a wide range (e.g., 15 ppm and 3000 ppm), make sure to rinse the electrodes with DI or distilled water or alcohol after each test to ensure accurate readings and prevent build-up of TDS on the electrodes.
8. The COM-100 is waterproof. However, prior to completely submersing the meter into water, always ensure the blue probe gasket ring and battery compartment are secured tightly. The warranty does not cover water damage due to parts that are not secured properly.

Changing the batteries:

When the meter displays a flashing battery symbol, your batteries are getting weak and should be replaced soon.



To change the batteries:

1. Twist open the battery compartment on the top of the meter.
2. Remove the three batteries.
3. Insert new batteries in the direction as depicted inside the compartment. The COM-100 uses battery model LR44 (or equivalent).
4. Close the battery compartment. Make sure it is tightly closed to retain waterproofness.

*NOTE: Do not reverse the polarity of the batteries. This may **short circuit** the meter.*

Cleaning:

To clean the unit, use a soft rag or towel. Wipe with water and a mild soap.

To clean the electrodes, use rubbing alcohol and a cotton swab. Lightly clean the electrodes. Rinse with DI or distilled water. Air dry.

Electrode Replacement:

If your electrode has been damaged, you can purchase a new one without needing to purchase a new meter. To replace the electrode:

1. Remove the blue electrode gasket ring by twisting it counter-clockwise.
2. Gently pull the electrode off the unit.
3. Gently insert the new electrode into the unit. Be sure to align the grooves and six pins properly. Never force the electrode into the unit!
4. Make sure the rubber ring is properly positioned on the electrode.
5. Screw the blue gasket ring back onto the unit by twisting it clockwise. Tighten.

TAKING MEASUREMENTS

The COM-100 can take measurements in Electrical Conductivity (EC), Total Dissolved Solids (TDS) and Temperature. Please make sure to read the Switching Modes section to ensure that your meter displays the desired readings.

EC/TDS Measurements

1. Remove the cap.
2. Press the 'ON/OFF' button. The display will become active.
3. The default mode of the meter is for EC in the µS scale. To change the mode, press and hold the 'HOLD/MODE' button (see the Switching Modes section for more information). The unit will cycle through the eight possible modes:
   a. EC - µS
   b. EC - mS
   c. TDS - ppm (with KCl conversion factor and temperature coefficient)
   d. TDS - ppm (with 442™ conversion factor and temperature coefficient)
   e. TDS - ppm (with NaCl conversion factor and temperature coefficient)
   f. TDS - ppt (with KCl conversion factor and temperature coefficient)
   g. TDS - ppt (with 442™ conversion factor and temperature coefficient)
   h. TDS - ppt (with NaCl conversion factor and temperature coefficient)
4. Release the 'HOLD/MODE' button when the display shows the desired mode.
5. Dip the meter into the water sample or solution to be tested.
6. Lightly swirl the meter and tap it against the bottom of the beaker to ensure the removal of trapped air bubbles or electric charges.
7. The meter will display a reading almost immediately. Keep the meter in the water until the reading stabilizes (approx. 30 seconds) for an accurate reading. *NOTE – **Newer meters may take up to 2 minutes to fully stabilize.** This time will decrease with usage as the sensor adapts.*
8. To view the reading out of the water, quickly press the 'HOLD/MODE' button while the meter is in the water. This will hold the reading on the screen. Quickly pressing the 'HOLD/MODE' button again will release it.
9. Press the 'ON/OFF' button to turn the meter off.
10. Shake any excess water off the meter and rinse with distilled or de-ionized water. Put the cap back on.

Temperature Measurements

The temperature reading is always displayed on the LCD panel during measurement mode, and is shown simultaneously for either EC or TDS readings. It is not shown when the meter is in calibration mode. The default temperature reading for the meter is in Celsius. To change the temperature mode, quickly press the 'TEMP/CAL' button to switch from Celsius to Fahrenheit or from Fahrenheit to Celsius.

1. Remove the cap.
2. Press the 'ON/OFF' button. The display will become active.
3. The temperature reading is always displayed on the LCD panel (except in calibration mode), and is shown simultaneously for either EC or TDS readings.
4. The default mode for temperature is Celsius. To change the temp mode, quickly press the 'TEMP/CAL' button to switch from Celsius to Fahrenheit or vice-versa.
5. Dip the meter into the water sample or solution to be measured.
6. The temp reading will change immediately (unless the solution is at room temperature). For very hot or cold liquids, the reading may take slightly longer to stabilize.
7. Press the 'ON/OFF' button to turn the meter off.
8. Shake any excess water off the meter and rinse with distilled or de-ionized water. Put the cap back on.

SWITCHING MODES

Electrical Conductivity (EC) and Total Dissolved Solids (TDS) Overview: While EC and TDS are often used synonymously, there are important differences to note. EC, when applied to water, refers to the electrical charge of a given water sample. TDS refers to the total amount of substances dissolved in the water other than the pure H_2O. The only true way of measuring TDS is to evaporate the water and weigh what's left. Since this is very difficult to do for the average person, we can estimate the TDS level by measuring the EC of the water. Every digital TDS meter in the world first measures the EC of the water and then converts that measurement to TDS.

All elements have some electrical charge. Since different elements have different charges, it is necessary to convert the EC to TDS using a scale that mimics the charge of that water type. The following are the most common water samples, and for the COM-100, each has its own non-linear conversion factor:

KCl: Potassium Chloride is the international standard to calibrate instruments that measure conductivity. The COM-100 is factory calibrated with a 1413 µS (micro-Siemens) KCl solution. The meter's default mode is EC-µS.
442™: Developed by the Myron L Co., 442™ simulates the properties of natural water (rivers, lakes, wells, drinking water, etc.) with a combination of 40% Sodium Bicarbonate, 40% Sodium Sulfate and 20% Chloride.
NaCl: Sodium Chloride is used in water where the predominate ions are NaCl, or whose properties are similar to NaCl, such as seawater and brackish water.

→ Measurements in EC (µS or mS) do not have a conversion factor.

How temperature affects the reading: Temperature greatly affects both the EC and TDS readings. The international standard temperature for EC and TDS readings is 25º Celsius. Without compensation, the EC and TDS readings will increase when the temperature is greater than 25º and decrease when the temperature is lower than 25º. The COM-100 is equipped with Automatic Temperature Compensation (ATC). The meter will automatically adjust the reading to what it would be at 25º. Each TDS conversion factor uses a specific ATC coefficient. The EC modes (µS or mS) use the Potassium Chloride (KCl) ATC coefficient.

For additional information on TDS, please visit www.tdsmeter.com and click on "What is TDS?".

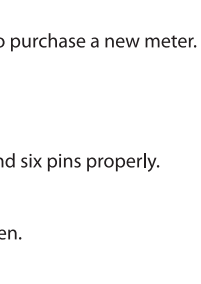
Defaults: EC (µS) and the temperature reading in Celsius.

Switching EC and TDS Modes:

The COM-100 has two different modes for EC. EC can be measured in two scales: **µS (micro-Siemens)** or **mS (milli-Siemens)**. 1000 µS = 1 mS.

The COM-100 has six different modes for TDS. TDS can be measured in two scales: **ppm (parts per million)** or **ppt (parts per thousand)**, with three selectable conversion factors for each scale: **KCl**, **442™** or **NaCl**. 1000 ppm = 1 ppt.

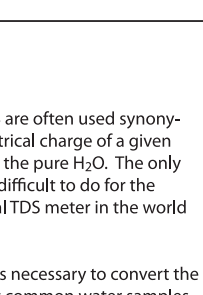
Example: mS mode



To change the EC or TDS mode:

1. With the power on, press and hold the 'HOLD/MODE' button. The display will cycle through the modes in the order listed below. *NOTE – the scale icons appear above the measurement reading, and the conversion factor icons appear below the measurement reading. Since EC does not use a conversion factor, the conversion factor icons will not appear for the EC modes.*
   a. EC – µS
   b. EC – mS
   c. TDS – ppm (KCl)
   d. TDS – ppm (442™)
   e. TDS – ppm (NaCl)
   f. TDS – ppt (KCl)
   g. TDS – ppt (442™)
   h. TDS – ppt (NaCl)
2. When the meter displays the desired selection, release the 'HOLD/MODE' button.
3. The meter is now ready for use in your selected mode. The meter will keep this setting until changed again.

Example: ppm-442 mode



Switching Temperature Modes:

The temperature reading is always displayed on the LCD panel during measurement mode, and is shown simultaneously for either EC or TDS readings. It is not shown when the meter is in calibration mode. The default temperature reading for the meter is in Celsius. To change the temperature mode, quickly press the 'TEMP/CAL' button to switch from Celsius to Fahrenheit or from Fahrenheit to Celsius.

CALIBRATION

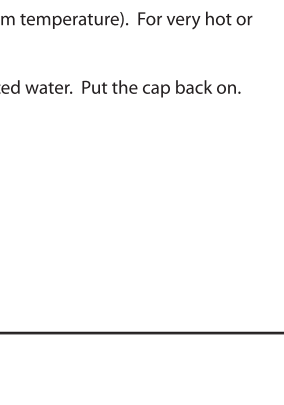
The COM-100 is factory calibrated to a 1413 µS KCl solution. The COM-100 will retain its calibration for a very long time, but there may be cases when it is necessary to recalibrate the meter. Additionally, though factory calibration will be suitable for most applications, it may be necessary to recalibrate the meter for more accurate results.

EC and TDS meters should be calibrated as close as possible to the range that will be measured. For example, if you are typically measuring the TDS levels of filtered water and tap water, it is recommended to recalibrate at a lower level. HM Digital's 342 ppm NaCl solution is highly recommend for this. For hydroponics, pools and aquarium testing, it may not be necessary to recalibrate the meter, or you may wish to recalibrate using HM Digital's 1000 ppm (2000 µS) NaCl solution. If you are unsure if your meter needs to be calibrated, always consult a professional prior to changing the calibration of the meter. Incorrectly calibrating the COM-100 may result in inaccurate measurements.

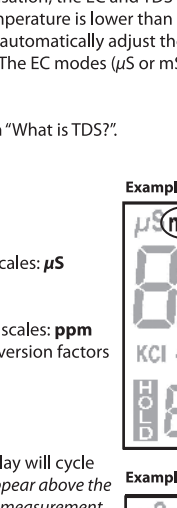
When to recalibrate the COM-100: You will need to recalibrate if the factory calibration isn't suitable for your application (see above) or if the calibration has shifted. This can happen based on time, usage or care of the meter. The only method of determining if the COM-100 is calibrated properly is to obtain a bottle of laboratory-certified EC or TDS calibration solution and check the meter against the solution value. The COM-100 can be calibrated to any brand or value EC or TDS calibration solution within the meter's range. Always calibrate to a fresh solution.

The COM-100 features digital calibration. To recalibrate the meter:

1. Turn the meter on by pressing the 'ON/OFF' button.
2. Make sure the meter is in the mode that matches the solution. If not, change the mode to match the solution. (For example, if you are calibrating to a 442™ solution for TDS, change the mode to ppm-442. See Switching Modes on page 4 for more information.)
3. Dip the meter into a laboratory-certified EC or TDS calibration solution. Lightly stir and tap the meter on the bottom of the glass to remove any air bubbles or lingering electrical charges.
   NOTE - If the measurement matches the calibration solution value, then your COM-100 is already properly calibrated. Stop here!
4. Press and hold the 'TEMP/CAL' button. The temperature display will change to a 'CAL' image.
5. The meter will automatically adjust to a reading within a range of the calibration solution.
6. Change the reading so that it matches the calibration solution. For example, if your calibration solution is 342 ppm, decrease the reading until it reads '342'. To increase the reading, press the 'UP' button (TEMP/CAL). To decrease the reading, press the 'DOWN' button (HOLD/MODE).
   NOTE - If the calibration reading is lowered or raised to the minimum or maximum level within the range, the screen will display the 'minimum calibration reached' icon or 'maximum calibration reached' icon, respectively. Note that this occurs only within the range of the solution the meter is currently in. When 'CAL' does not flash, it means calibration is in the middle of the range. The meter does not restrict calibration.
7. To set the calibration, press and hold the 'TEMP/CAL' button until the screen reverts back to the measurement mode.
8. Your meter is now recalibrated.

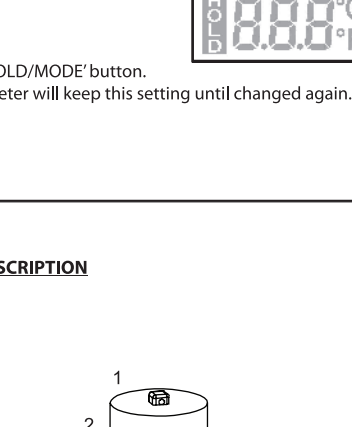


HOUSING AND SCREEN DESCRIPTION



Housing

1. Lanyard hook
2. Battery compartment
3. LCD display
4. Button panel
5. Power button
6. Calibration mode, temperature mode, calibration up button
7. EC/TDS mode, hold, calibration down button
8. Electrode gasket ring
9. Detachable electrode (sensor)



LCD Display

1. EC mode (µS)
2. EC mode (ms)
3. TDS mode (ppm)
4. TDS mode (ppt)
5. EC/TDS measurement
6. Calibration solution / conversion factor selected
7. Hold mode (appears when HOLD is pressed)
8. Temperature measurement
9. Celsius/Fahrenheit mode
10. Low battery indicator
11. 'x10' mode (appears when greater than 999)

COM-100 USER'S GUIDE ADDENDUM

MODE SELECTION GUIDE

The COM-100 includes 6 different measurement modes allowing for a variety of uses and greater versatility and accuracy.

The different modes serve to digitally calculate conductivity and TDS levels found in nature. Since different applications will naturally involve different types of water (fresh water, brackish water, salt water, etc.), proper mode selection is very important. Mode selection will also affect accuracy within a particularly range. For certain applications, such as drinking water and water treatment, a *lower* level of EC/TDS is typically preferred, while for other applications, such as for fish and plants, a *higher* level of EC/TDS is preferred.

The following are ***suggested*** modes for various applications. Your specific needs may require a different mode than what is listed below. If you are measuring liquids based on another company's instructions, then change the COM-100's mode to those specific instructions. For example, if you are mixing nutrients or fertilizer, and the instructions call for the NaCl scale in TDS, switch the COM-100 to the ppm-NaCl mode.

ppm = TDS (Total Dissolved Solids)
µS = EC (Electrical Conductivity)

Drinking Water (Filtered or Tap): ppm-442 or ppm-NaCl
Filtration/Purification Systems: ppm-442 or ppm-NaCl
Hydroponics/Gardening: Consult fertilizer or nutrient requirements
Aquariums and Reef Tanks: ppm-NaCl or ppm-KCl
Colloidal Silver: ppm-NaCl or ppm442
Pools & Spas: ppm-NaCl
Car & Window Washing: ppm-442 or ppm-NaCl
Coffee: ppm-442 or ppm-NaCl

*** For instructions on how to switch modes, see page 4 of the user's guide.*

ABOUT TDS and EC

Modes and their conversion factors

EC modes: There is no conversion for electrical conductivity. The three EC modes in the COM-100 differ only in their ATC programs. The standard EC mode is KCl.

When converting EC to TDS, the COM-100 uses the non-linear scales, as they would occur in nature, thereby giving you more accurate readings than meters that use linear scales.
TDS - NaCl: 0.47 to 0.50
TDS - 442: 0.65 to 0.85
TDS - KCl: 0.50 to 0.57

Converting between different scales

PPM → µS: Simply change the mode on the meter. There is no math required.
PPM → PPT: Divide by 1000 (1000 ppm = 1 ppt)
µS → mS: Divide by 1000 (1000 µS = 1 mS)

*** For more information on TDS, visit www.tdsmeter.com.*

FREQUENTLY ASKED QUESTIONS (FAQs)

What should the TDS of my water be?
→ A TDS level is specific for each application and particular usage. If you are using the COM-100 to test the water pertaining to a particular device, object or operation, contact the manufacturer of that object. For example, if you are using the COM-100 to test the efficacy of a water filtration system, contact the manufacturer of that system for preferred TDS levels. If you are testing the water for a pool, plants, fish, etc. contact a specialist for your specific application.

What is the difference between µS and µS/cm?
→ There is no difference between µS and µS/cm. µS is a simple abbreviation and is used to save space.

What is the difference between ppm and mg/L?
→ ppm is an expression of quantity, and an abbreviation for "parts per million." Mg/L (milligrams per liter) is an expression of weight. Both are used as scales for TDS, but ppm is considerably more popular. There is no conversion between the two. (226 ppm = 226 mg/L)

What is the difference between a parameter and a scale?
→ A parameter is the characteristic being measured. A scale is a particular range applied to the measurement of that parameter. For example, temperature is a parameter. Fahrenheit or Celsius is a scale.

Is "EC" a parameter or a scale?
→ "EC" is a parameter. It stands for Electrical Conductivity. There are a number of scales used in EC, most commonly micro-Siemens (µS) or milli-Siemens (mS). For example, if a particular application calls for water with "2.0 EC," this is an incorrect determination. Most likely, the application is calling for an EC level of 2.0 mS. 2.0 mS = 2000 µS.

Is the COM-100 waterproof?
→ Yes. Ensure the blue sensor gasket ring and blue battery compartment are screwed on tightly.

TROUBLESHOOTING

Problem	Potential Solution(s)
The meter will not power on.	1. Change the batteries. 2. Double-check the polarity of the batteries.
The display shows "---".	1. The EC/TDS level of the water is out of range of the meter. 2. The sensor is not connected. 3. The sensor is dirty or damaged.
Incorrect readings.	1. Recalibrate the meter. 2. Switch modes.

For additional information on water testing, visit www.hmdigital.com.

HM Digital, Inc.