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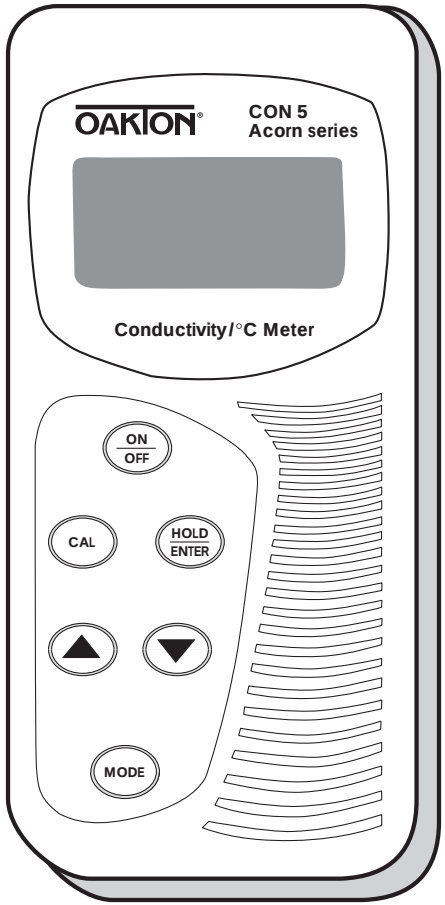
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OAKTON®

OPERATING INSTRUCTIONS

OAKTON WD-35606-00, -05

CON 5 and TDS 5
Acorn Series Meters



Printed in the U.S.A. 8/98

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1. Introduction

Thank you for purchasing an OAKTON® Acorn Meter. These meters are economical, microprocessor-based meters that deliver ±2% full scale accuracy.

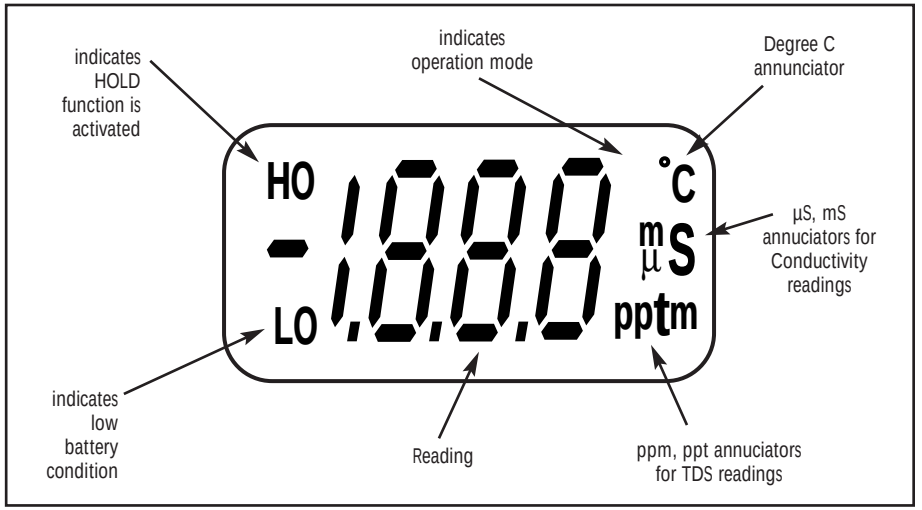
Some of the features of these meters are:

- Large LCD for clear and easy reading
- CON 5 series meters allow measurement in Conductivity and Temperature (°C)
- TDS 5 series meters allow measurement in TDS and Temperature (°C)

This instruction manual is organized for easy reference. For basic functions of this meter, read sections 2 through 5. These sections include basic instructions that will get you up and running quickly. The remaining sections of this manual (6 through 12) deal with probe maintenance, error messages and troubleshooting. This part of the manual also includes the Specifications, Accessories, Warranty and Return of Items section.

2. Display and Keypad Functions

The Acorn has a large custom LCD with the following indicators:



The Acorn has six keys on its splashproof keypad. These keys are ON / OFF, HOLD / ENTER, CAL , ▲ (UP), ▼ (DOWN) and MODE.

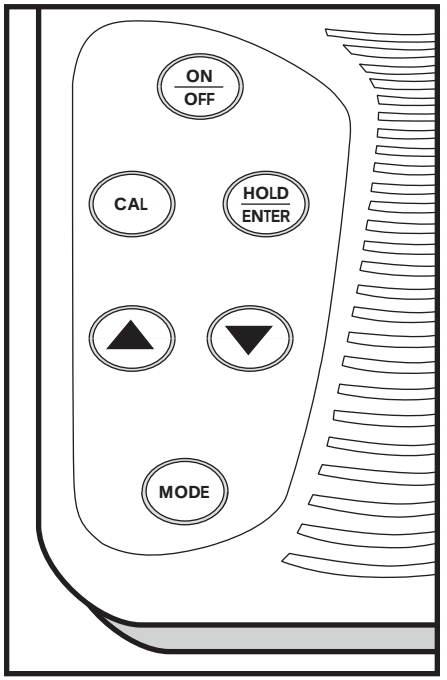
ON/OFF: Powers meter on and shuts unit off. Meter directly enters measurement mode when you turn it on.

CAL: Allows calibration of the meter for Conductivity / TDS and Temperature

HOLD/ENTER: Freezes the measured reading.; confirm calibration value or option selected.

▲ (UP) / ▼ (DOWN): Scrolls up or down to the values you want for calibration.

MODE: Selects the parameter of measurement: Conductivity / TDS or temperature.



3. Preparation

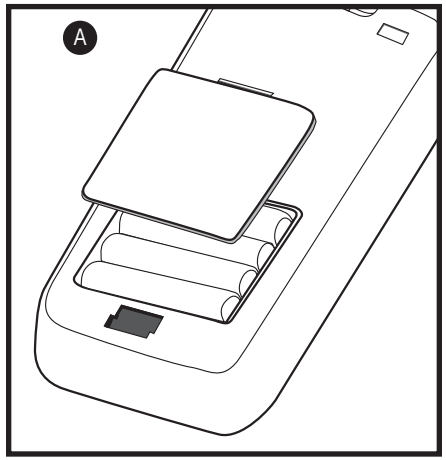
3.1 Inserting the batteries

The battery compartment is found at the back of the instrument. To open the battery compartment, push the lid up

See figure A

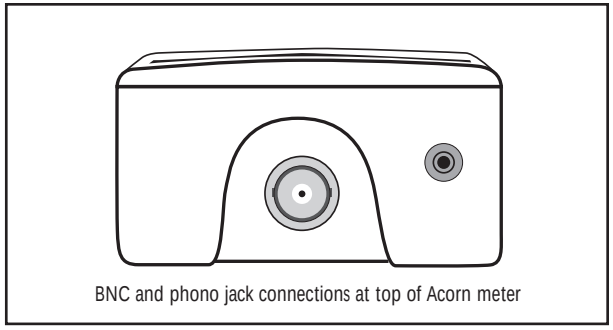
Note the polarity of battery before inserting the batteries into position. After replacement, place the cover back into its position and press down until it locks tight.

A "LO" annunciator in the LCD alerts you when battery power is running low. Replace batteries with a fresh set as soon as possible.



3.2 Connecting the Conductivity/TDS and Temperature Probe

The Acorn CON 5 and TDS 5 come with a combination Conductivity / TDS and temperature probe. This probe has two connectors: a BNC connector for the Conductivity / TDS element, and a phono jack connector for the temperature element. To connect the Acorn meter to your probe, align the post of the meter's BNC connector with the slots on the probe's BNC connector, push together and twist the electrode connector 1 / 2 turn until it clicks into place. Insert the phono jack connection into the socket on the meter. To remove, simply rotate the BNC connector counter-clockwise until it unlocks, and slide the connector off the socket. The phono jack connection can be removed with a simple pull.



BNC and phono jack connections at top of Acorn meter

3.3 Switching the meter on

Press the ON / OFF key to power up your meter. All the LCD segments display for a few seconds as the meter goes through a self-diagnostic test. The LCD then switches into Conductivity / TDS measurement mode. Wet the probe for 10 minutes before calibrating or taking readings in order to saturate the probe surface and minimize drift.

If the temperature probe is not connected, the temperature reading (°C) defaults to 25°C.

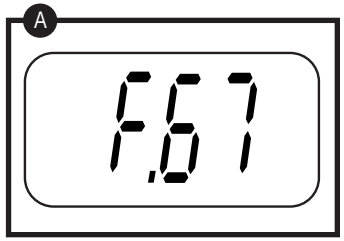
3.4 Setting the Conductivity-to-TDS conversion factor (Acorn TDS 5 only)

The Acorn TDS 5 is set to a default conversion factor of 0.67. This should give good results for most applications (including natural waters and other applications that calibrate to 442 standard solutions). You can adjust the factor for different salts, chemicals, or nutrient solutions using the following procedure.

1. Turn meter on.
2. Press Hold / Enter key. The "HO" indicator will appear in the upper left corner and the reading will freeze.
3. Press CAL key. Display will show "F.67" indicating the current factor.

   See figure A

   If the factor has been changed from the factory default, a number other than F.67 will appear.
4. Adjust factor using ▲ / ▼ keys.
5. Press Hold / Enter to confirm.



4. Calibration

4.1 Conductivity / TDS calibration

This instrument is capable of up to three-point calibration to ensure accuracy across the entire range of the meter. You need only **one** calibration for measurement of the entire range of the meter. If a range is not calibrated, the meter automatically detects the closest range calibrated and uses the calibration information. However, **only the ranges that have been calibrated have maximum accuracy.** Calibrate to all ranges to ensure highest accuracy throughout all measurement ranges.

When to calibrate

If you are measuring in solutions with conductivity lower than 100 µS or TDS lower than 50 ppm, calibrate the meter at least once a week to get specified ±2% full scale accuracy. If you are measuring in the mid ranges and you wash the probe in deionized water and store it dry, calibrate the meter once a month. If you take measurements at extreme temperatures, calibrate at least once a week

Use only the supplied conductivity / TDS probe or replacement probe WD-35606-50.

NOTE: **Do not reuse solutions after calibration.** Contaminants in the solution can affect the calibration, and the accuracy of the measurements.

Preparing for calibration

Select a conductivity or TDS standard near the sample value you are measuring. If this is not possible, choose a calibration solution value that is approximately 2 / 3 the full scale (F.S.) value of the measurement range. For example, in the 200 to 1999 µS range, use a 1413 µS solution for calibration. **Note:** the Acorns will not accept calibration values less than 40 µS (20 ppm).

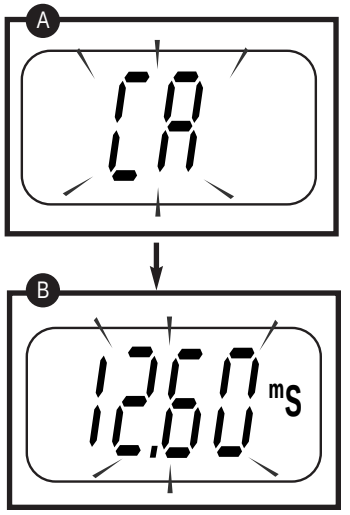
Wet the probe for 10 minutes prior to calibration to saturate the probe and minimize drift.

It is not necessary to reset the meter before calibration. All new calibrations will automatically override existing calibration.

Calibrating for Conductivity or TDS

1. Pour approximately 3 cm of the chosen Conductivity / TDS standard into two separate containers.
2. Gently stir the probe in one of the containers of your standard. This standard acts as a rinse solution, removing contaminants that offset the calibration.
3. Dip the rinsed probe into the other container of your standard.
4. Turn meter on. Meter will automatically enter Conductivity / TDS mode.
5. Tap probe on the bottom of the container to remove air bubbles. Let the probe stabilize to the solution temperature.
6. Press the CAL key. The meter will blink with the factory calibrated value.

   See figure A B
7. Press ▲ (up) or ▼ (down) key until the displayed value matches your standard solution.
8. Press enter key to confirm. The meter will exit calibration, and return to measurement mode.



Repeat for all ranges for maximum accuracy.

	Range	Resolution	Accuracy
Conductivity	0.0 to 199.9 µS* 200 to 1999 µS 2.00 to 19.99 mS	0.1 µS 1 µS 0.01 mS	±4 µS ±40 µS ±0.4 mS
TDS	0.0 to 99.9 ppm* 100 to 999 ppm 1.00 to 9.99 ppt	0.1 ppm 1 ppm 0.01 ppt	±2 ppm ±20 ppm ±0.2 ppt

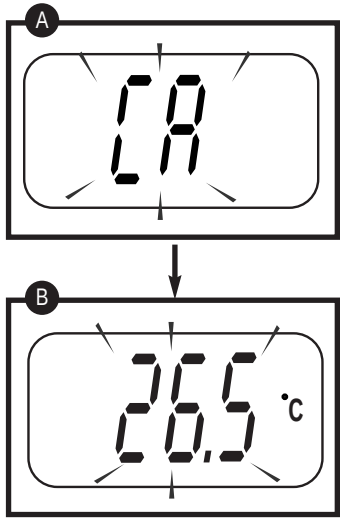
*Minimum calibration value 40 µS (20 ppm).

4.2 Temperature calibration

The built-in temperature sensor included in the probe is factory calibrated. Over time, the temperature calibration may drift and require recalibration. If you replace the probe you should calibrate temperature prior to Conductivity / TDS calibration.

1. Connect your probe to the meter.
2. Press the MODE key until "°C" appears in the LCD.
3. Compare displayed value to a NIST certified thermometer or other thermometer known to be accurate. For best accuracy, place probe and thermometer in a constant temperature bath.
4. Press the CAL key. the LCD shows "CA" and the reading flashes.

   See figures A B
5. Press the ▲ (up) or ▼ (down) key until the display shows the correct temperature. Maximum adjustment if ±5°C from the factory default.
6. Press ENTER key to confirm calibration. The LCD displays "CO", and the meter then reverts to measurement mode.



5. Measurement

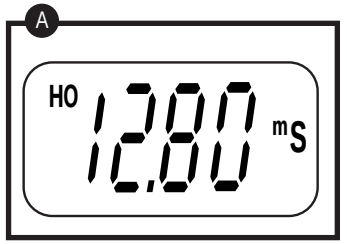
5.1 Taking Measurements

1. Rinse probe with distilled water to remove any impurities.
2. Turn meter on. Meter will automatically go into Conductivity / TDS measurement mode. Press MODE key to toggle between Conductivity / TDS and temperature measurement modes.
3. Dip probe into sample. Make sure the tip of the probe is completely immersed into the sample. Stir probe gently to create a homogenous sample. Tap probe to remove air bubbles.

5.2 Hold function

1. Press the HOLD key once. The LCD shows "HO" to indicate the HOLD function is activated

   See figure A
2. Press HOLD key again to deactivate the HOLD function and return to measurement mode.



6. Probe care and maintenance

Keep your conductivity probe clean.

For best accuracy, soak a dry probe at least 5 to 10 minutes before use. Rinse the probe before use, and gently swirl it while you take readings.

Wash the probe with deionized or tap water before storing it.

Never scratch the stainless steel portions with a hard substance.

Do not strike the probe against any hard surface.

Do not soak your probe in your solutions for an extended period of time. Readings will rise over a continuous period of time if you soak your probe.

Do not immerse the probe in oily solutions. To remove oils, films or oxidation, clean electrode with alcohol.

Clean the probe by immersing it in an agitated mild detergent bath. Wipe probe with soft tissue paper. Rinse thoroughly in tap water and then in deionized water. Recalibrate the meter after cleaning the probe.

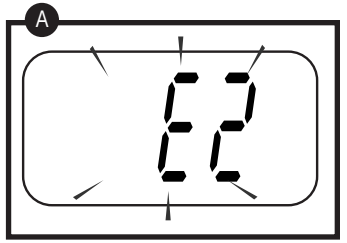
7. Error Messages

Error Message in LCD display	Indicates	Solution
E 2	Microproccesor error	Recalibrate instrument
E 3		Turn meter off and then on again. Return meter if necessary.*
Ur	Temperature under range (<0°C) or faulty temperature sensor.	Warm solution. Replace temperature sensor.
Or	Conductivity over range (>19.99 mS); Temperature over range (>50°C) or faulty temperature sensor.	Cool solution. Replace temperature sensor.

You will see the Error message in the primary display (the row of digits that show you your measurements).

See figure A

To eliminate errors, switch off the meter and switch it on again. If error persists, or the meter shows incorrect values, return the meter.*



*See page 18 for information on Return of Items

7. Troubleshooting

Problem	Cause	Solution
LO annunciator on LCD	Low battery	Replace batteries with fresh set
Power on but no display	Batteries not in place	Insert batteries
	Batteries not in correct polarity (+ and -)	Re-insert batteries with correct polarity
	Weak batteries	Replace batteries
Unstable reading	Probe not deep enough in sample	Place probe deeper in sample
	Broken probe	Replace probe
	External “noises” or induction caused by by nearby electric motor	Remove or switch off interfering motor
	Dirty probe	Clean probe
Slow response	Dirty probe	Clean probe
Display locked	Electrical discharge near meter	Switch meter off and turn on again. Remove battery and insert again
Not able to calibrate	Dirty / oily probe	Clean probe (see “Probe Care & Maintenance” pg 12)
	Calibration standard out of acceptable calibration range	Select standard between 40 µS (20 ppm) and 19.9 mS (9.9 ppt)

8. Specifications

Mode	Conductivity / CON 5	TDS / TDS 5	Temperature
Range	0.0 to 199.9 µS 200 to 1999 µS 2.00 to 19.99 mS Auto-ranging	0.0 to 99.9 ppm 100 to 999 ppm 1.00 to 9.99 ppt Auto-ranging	0.0 to 50°C
Resolution	0.1 µS 1 µS 0.01 mS	0.1 ppm 1 ppm 0.01 ppt	0.1°C
Accuracy	±2% of full scale		±0.5°C
Calibration	up to 3 points against appropriate calibration solutions		±5.0°C

TDS Factor: User adjustable 0.5 to 0.85

Display: Single line LCD

Cell constant: 1

Temperature Compensation: Automatic (ATC), 0.0 to 50.0 °C

Reference temperature: factory set at 25°C

Temperature coefficient: factory set at 2% per C

Inputs: BNC, phono jack

Auto shutoff: after 17 minutes

Hold Function indicator: HO

Error Message display: Err

Low battery indication: LO

Operating temperature: 0 to 50°C

Power: 4 x AAA Alkaline batteries (>60 hours)

Dimensions: Meter only: 5.5" x 2.7" x 1.3" (14 x 7 x 3.5 cm);
Boxed: 9.25" x 6.5" x 3" (23.5 x 16.5 x 7.6 cm)

Weight: Meter only: 0.5 lb (210 g); Boxed: 1 lb (420 g)

9. Accessories

WD-35606-00 Additional CON 5 Series Acorn Meter (Conductivity / °C)
with combination Conductivity / Temperature probe

WD-35606-05 Additional TDS 5 Series Acorn Meter (TDS / °C)
with combination TDS / Temperature probe

Replacement probes and accessories

WD-35606-50 Replacement probe, 4"L x 0.47 OD (100 x 12 mm).
Shpg wt. 0.44 lb / 199 g)

WD-35606-80 Protective Rubber Boot, encases meter in sturdy rubber to protect it from drops and dings. Also features meter stand for convenient benchtop use.

OAKTON calibration solutions (1 pint bottles)

Conductivity solutions have ±1% accuracy at 25°C. Shpg wt 1.1 lb / 510 g per bottle.

WD-00653-16 Conductivity 84 µS solution.
TDS values: 40.38 ppm KCl; 38.04 ppm NaCl; 50.50 ppm 442

WD-00653-47 Conductivity 447 µS solution.
TDS values: 225.6 ppm KCl; 215.5 ppm NaCl; 300.0 ppm 442

WD-00653-18 Conductivity 1413 µS solution.
TDS values: 744.7 ppm KCl; 702.1 ppm NaCl; 1000 ppm 442

WD-00653-15 Conductivity 1500 µS solution.
TDS values: 757.1 ppm KCl; 737.1 ppm NaCl; 1050 ppm 442

WD-00653-27 Conductivity 2070 µS solution.
TDS values: 1045 ppm KCl; 1041 ppm NaCl; 1500 ppm 442

WD-00653-20 Conductivity 2764 µS solution.
TDS values: 1382 ppm KCl; 1414.8 ppm NaCl; 2062.7 ppm 442

WD-00653-89 Conductivity 8974 µS solution.
TDS values: 5101 ppm KCl; 4487 ppm NaCl; 7608 ppm 442

WD-00606-10 Conductivity 12,880 µS solution.
TDS values: 7447 ppm KCl; 7230 ppm NaCl; 11,367 ppm 442

WD-00653-50 Conductivity 15,000 µS solution.
TDS values: 8759 ppm KCl; 8532 ppm NaCl; 13,455 ppm 442

OAKTON "Singles" calibration solution pouches 20 / box.

Conductivity solutions have ±1% accuracy at 25°C. Shpg wt 1 lb / 454 g per box.

WD-35653-00 Deionized rinse water solution pouches

WD-35653-10 Conductivity 447 µS solution.
TDS values: 225.6 ppm KCl, 215.5 ppm NaCl, 300.0 ppm 442.

WD-35653-11 Conductivity 1413 µS solution.
TDS values: 744.7 ppm KCl, 702.1 ppm NaCl, 1000 ppm 442.

WD-35653-12 Conductivity 2764 µS solution.
TDS values: 1382 ppm KCl, 1414.8 ppm NaCl, 2062.7 ppm 442.

WD-35653-13 Conductivity 15,000 µS solution.
TDS values: 8759 ppm KCl, 8532 ppm NaCl, 13,455 ppm 442.

To order OAKTON accessories, contact your OAKTON distributor.

15. Warranty

OAKTON warrants this meter to be free from significant deviations in material and workmanship for a period of one year from date of purchase. OAKTON warrants this probe to be free from significant deviations in material and workmanship for a period of six months from date of purchase. If repair or adjustment is necessary and has not been the result of abuse or misuse within the warrantied time period, please return—freight prepaid—and correction will be made without charge. OAKTON alone will determine if the product problem is due to deviations or customer misuse.

Out-of-warranty products will be repaired on a charge basis.

16. Return of items

Authorization must be obtained from your OAKTON distributor before returning items for any reason. When applying for authorization, please include data regarding the reason the items are to be returned. For your protection, items must be carefully packed to prevent damage in shipment and insured against possible damage or loss.

NOTE: We reserve the right to make improvements in design, construction, and appearance of products without notice.