

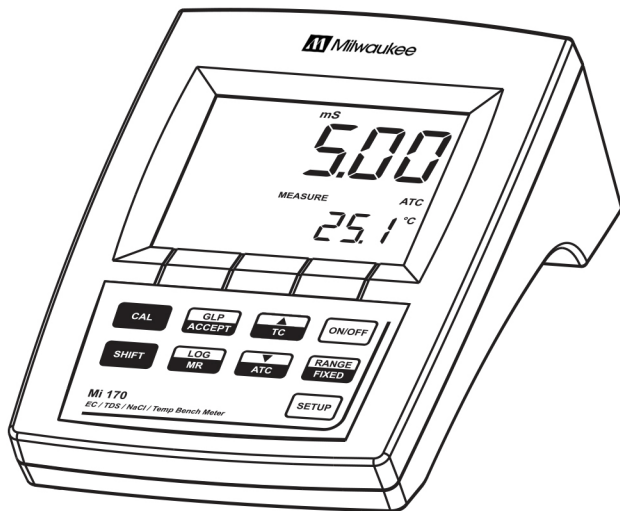
INSTRUCTION MANUAL

Bench Meter



■ Mi 170

EC/TDS/NaCl/Temperature



 **Milwaukee**

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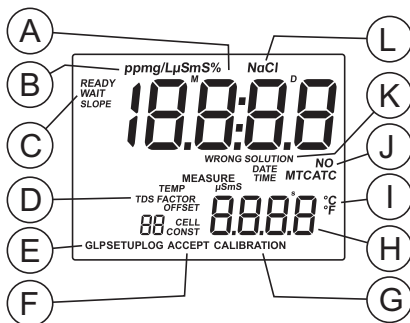
Instruction Manual Mi 170 Bench Meter

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FUNCTIONAL DESCRIPTION

DISPLAY

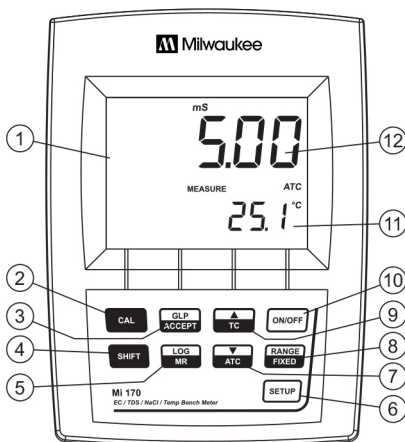
- A. PRIMARY DISPLAY
- B. MEASURING UNIT FOR PRIMARY DISPLAY
- C. CALIBRATION MESSAGES
- D. GLP TAGS
- E. MODE INDICATORS
- F. REQUIRE USER CONFIRMATION
- G. CALIBRATION MODE
- H. SECONDARY DISPLAY
- I. TEMPERATURE UNIT
- J. TEMPERATURE COMPENSATION MODE INDICATOR
- K. CALIBRATION MESSAGES
- L. MEASURING UNIT FOR PRIMARY DISPLAY



FUNCTIONAL DESCRIPTION

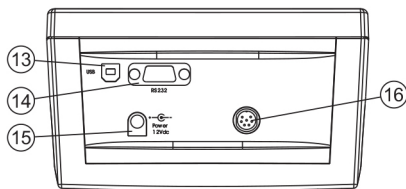
FRONT PANEL

1. Liquid Crystal Display (LCD)
2. CAL key, to enter/exit calibration mode
3. GLP/ACCEPT key, to display GLP data or to confirm value
4. SHIFT key, to select second key function
5. LOG/MR key, to store reading in memory or to enter/exit recall mode
6. SETUP key, to enter/exit setup mode or to toggle between delete one and all logged data
7. ▼/ATC key, to manually decrease temperature value or other parameters or to select temperature compensation mode
8. RANGE/FIXED key, to select measurement range / switch focused data or to freeze current reading on the LCD
9. ▲/TC key, to manually increase temperature value or other parameters or to view temperature coefficient value
10. ON/OFF key, to turn the meter ON and OFF
11. Secondary LCD
12. Primary LCD



REAR PANEL

13. USB connector
14. RS232 connector
15. Power supply socket
16. DIN connector for probe



GENERAL DESCRIPTION

Thank you for choosing Milwaukee Instruments. This instruction manual will provide you the necessary information for correct use of the meter.

Mi 170 is a logging microprocessor-based Conductivity, TDS, NaCl and Temperature bench meter.

The autoranging feature of the EC and TDS ranges automatically sets the instrument to the scale with the highest possible resolution.

The conductivity measurements are manually or automatically compensated for temperature effect, with the temperature sensor inside the conductivity probe. It is also possible to disable the temperature compensation and measure the actual conductivity. The temperature coefficient is user selectable.

Mi170 includes also GLP capability and data transfer to a computer through a RS232 or a USB port.

In addition, the meter allows the user to enter an ID code to uniquely identify the instrument.

For accurate measurements, use *the* electrode holder supplied with the meter.

This Bench Meter is supplied with:

- MA 814D/1 EC/Temperature probe
- MA 9315 Electrode Holder
- Mi 5200 Application Software
- MA 9350 RS232 Connector cable (2 meters)
- 12 VDC Adapter
- Instruction Manual

SPECIFICATIONS

Range	EC	0.00 to 29.99 $\mu\text{S}/\text{cm}$
		30.0 to 299.9 $\mu\text{S}/\text{cm}$
		300 to 2999 $\mu\text{S}/\text{cm}$
		3.00 to 29.99 mS/cm
		30.0 to 200.0 mS/cm
		up to 500.0 mS/cm (uncompensated EC)*
	TDS	0.00 to 14.99 mg/L (ppm)
		15.0 to 149.9 mg/L (ppm)
		150 to 1499 mg/L (ppm)
		1.50 to 14.99 g/L (ppt)
		15.0 to 100.0 g/L (ppt)
		up to 400.0 g/L (uncompensated TDS)* with 0.80 conversion factor
	NaCl	0.0 to 400.0%
	Temp	-20.0 to 120.0 $^{\circ}\text{C}$ (-4.0 to 248.0 $^{\circ}\text{F}$)
Resolution	EC	0.01 $\mu\text{S}/\text{cm}$
		0.1 $\mu\text{S}/\text{cm}$
		1 $\mu\text{S}/\text{cm}$
		0.01 mS/cm
		0.1 mS/cm
	TDS	0.01 mg/L
		0.1 mg/L
		1 mg/L
		0.01 g/L
	NaCl	0.1%
	Temp	0.1 $^{\circ}\text{C}$ (0.1 $^{\circ}\text{F}$)
Accuracy (@ 20 $^{\circ}\text{C}$ / 68 $^{\circ}\text{F}$)	EC	$\pm 1\%$ of reading \pm (0.05 $\mu\text{S}/\text{cm}$ or 1 digit)
	TDS	$\pm 1\%$ of reading \pm (0.03 mg/L or 1 digit)
	NaCl	$\pm 1\%$ of reading
	Temp	± 0.4 $^{\circ}\text{C}$ (± 0.8 $^{\circ}\text{F}$)

(*) Uncompensated conductivity (or TDS) is the conductivity (or TDS) value without temperature compensation.

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Calibration	EC	1 point slope calibration with 6 memorized solutions available: 84.0 $\mu\text{S}/\text{cm}$, 1413 $\mu\text{S}/\text{cm}$, 5.00 mS/cm , 12.88 mS/cm , 80.0 mS/cm , 111.8 mS/cm ; 1 point offset calibration: 0.00 $\mu\text{S}/\text{cm}$
	NaCl	1-point, with MA 9050 calibration solution
	Temp	2-point, at 0 and 50 °C (32 and 122 °F)
Temperature Compensation		Automatic or manual, from -20.0 to 120.0 °C (-4.0 to 248.0 °F)
Temperature Coefficient		Selectable from 0.00 to 6.00%/ °C (EC and TDS only)
TDS factor		0.40 to 0.80 (default value is 0.50)
Probe		MA 814D/1
Computer Interface		RS232/USB opto-isolated
Power supply		12 VDC power adapter
Dimensions		230 x 160 x 95 mm (9.0 x 6.3 x 3.7")
Weight		0.9 kg (2.0 lb.)
Environment		0 to 50 °C (32 to 122 °F) ; max RH 95%
Warranty		3 years

This instrument is in compliance with the CE Directives.

OPERATIONAL GUIDE

INITIAL PREPARATION

Plug the 12 VDC adapter into the power supply socket.

Connect the EC/TDS probe to the 7-pin connector. Make sure the probe sleeve is properly inserted and tighten the threaded ring.

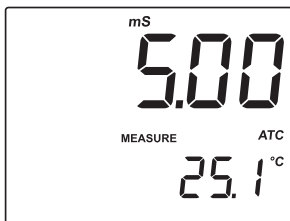
Turn the instrument on by pressing ON/OFF. All LCD tags are displayed and a beep is heard while the instrument performs a self test.

The reference temperature is displayed on the LCD for a few seconds and the instrument enters in the same range as it was at power off.

CONDUCTIVITY MEASUREMENTS

Make sure the instrument has been calibrated before taking conductivity measurements.

- Immerse the probe into the solution to be tested. The sleeve holes must be completely submerged. Tap the probe repeatedly to remove any air bubbles that may be trapped inside the sleeve.
- If necessary, press the RANGE/FIXED key until the display changes to EC mode.
- The conductivity value is displayed on the primary LCD and the temperature on the secondary LCD, along with the reference temperature.



Notes:

- If the reading is out of range, the closest full-scale value (200.0 for MTC/ATC mode or 500.0 for uncompensated conductivity) will be displayed blinking.
- If SHIFT&FIXED keys are pressed to freeze the LCD range and the reading goes out of range, the full-scale value of the frozen range will be displayed blinking.

The EC reading is affected by temperature. Three options for temperature compensation are available in EC measurement mode.

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Note: The compensation is referenced at the selected reference temperature (see SETUP for details, page 26).

Automatic (ATC): The EC probe has a built-in temperature sensor; the temperature value is used to automatically compensate the EC/TDS reading (from -20.0 – 120.0 °C).

Manual (MTC): The temperature value, shown on the secondary LCD, can be manually set with the UP and DOWN arrow keys. The “°C” tag blinks when this option is active.

No Compensation (NOTC): The temperature value is displayed, but is not taken into account and “°C” tag blinks. The reading displayed on the primary LCD is the uncompensated EC or TDS value. To select the desired option, press the SHIFT&▼/ATC keys until the option is displayed on the LCD.

Notes:

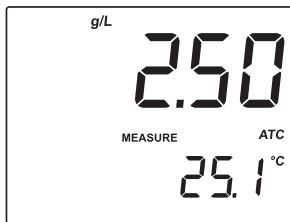
- The default compensation mode is **ATC**.
- If no temperature probe is detected, **ATC** mode can not be selected and the instrument displays “----” on the secondary LCD.

If temperature compensation is active, measurements are compensated using the temperature coefficient (default value 1.90 %/°C). To change the temperature coefficient, enter the setup mode and select the “tc” item (see SETUP for details, page 26). The current temperature coefficient can be quickly viewed by pressing the SHIFT&▲/TC keys. The value is briefly displayed on the secondary LCD.

- If the temperature reading is out of the -20.0 to 120.0 °C (-4.0 to 248.0 °F) interval and **ATC** option is selected, the “°C” tag will blink and the closest interval limit will be displayed.
- Press the UP and DOWN arrow keys to change the displayed temperature value. This value is used to compensate the EC/TDS reading.

TDS MEASUREMENTS

- Press the RANGE/FIXED key until the display changes to TDS mode.
- The TDS reading will be displayed on the primary LCD and the temperature reading on the secondary LCD, along with the reference temperature.

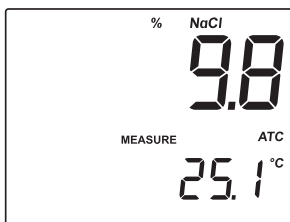


Notes:

- If the reading is out of range, the full-scale value (100.0 for **MTC/ATC** mode or 400.0 for uncompensated TDS) will be displayed blinking.
- If the **SHIFT&RANGE/FIXED** keys are pressed to freeze the LCD range and the reading goes out of range, the full-scale value of the frozen range will be displayed blinking.

NaCl MEASUREMENTS

- Press the **RANGE/FIXED** key to enter NaCl measurement mode.
- The instrument will display the NaCl reading on the primary LCD and the temperature on the secondary LCD, along with the reference temperature.



AUTORANGING

The EC and TDS scales are autoranging. The meter automatically sets the scale with the highest possible resolution.

By pressing the **SHIFT&RANGE/FIXED** keys, the autoranging feature is disabled and the current range is frozen on the LCD. The "Auto" "OFF" (autoranging disabled) message will be displayed on the LCD for a few seconds. To restore the autoranging option, press the **SHIFT&RANGE/FIXED** keys again. The "Auto" "On" (autoranging enabled) message will be displayed on the LCD for a few seconds.

Note: Autoranging is automatically restored if the range is changed, if the setup or calibration modes are entered and if the meter is turned off and back on again.

EC/TDS CALIBRATION

EC calibration is a one-point procedure. Selectable calibration points are 0.00 μS for offset and 84.0 μS , 1413 μS , 5.00 mS, 12.88 mS, 80.0 mS, 111.8 mS for slope.

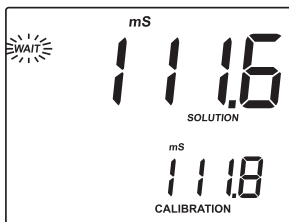
Rinse the probe with calibration solution or deionized water. Immerse the probe into the solution. The sleeve holes must be completely submerged. Tap the probe repeatedly to remove any air bubbles that may be trapped inside the sleeve.

To enter EC calibration, select the EC range and press CAL.

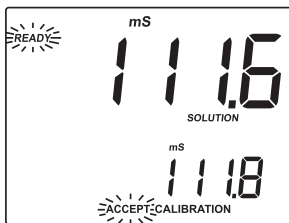
Note: The TDS reading is automatically derived from the EC reading and no specific calibration for TDS is needed. Pressing CAL when TDS range is selected has no effect.

For zero calibration, just leave the dry probe in the air. This calibration is performed in order to correct the reading around 0.00 μS . The slope is evaluated when the calibration is performed in any other point.

The primary LCD will display the EC reading and the secondary LCD will display the closest calibration solution, along with "CALIBRATION" tag. The "WAIT" tag will blink until the reading is stable.



When the reading is stable and close to the selected calibration solution, "READY" and "ACCEPT" tags will blink on the LCD.



Press the GLP/ACCEPT key to confirm calibration.

The instrument stores the calibration value and returns to measurement mode.

Notes:

- If the uncalibrated reading is too far from the expected value, the “WRONG” and “SOLUTION” tags will blink. Calibration can not be confirmed. In this case check if the correct calibration solution has been used.
- If the meter is in **ATC** mode and the solution temperature is out of the 0.0 to 60.0 °C (32.0 to 140.0 °F) interval, the “WRONG” “SOLUTION” “°C” tags and the temperature will be displayed blinking.
- For best results choose an EC calibration solution value close to the sample to be measured.
- It is possible to set the cell constant value directly, without following the calibration procedure. To set the cell constant, enter SETUP mode and select “CEL” (see SETUP for details, page 26).

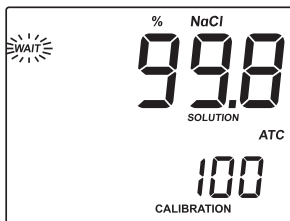
NaCl CALIBRATION

NaCl calibration is a one-point procedure at 100.0% NaCl. Use the Mi xxxx calibration solution (sea water solution) as a 100% NaCl standard solution.

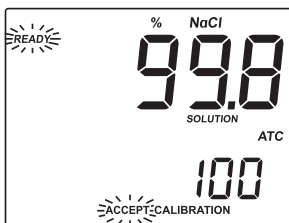
Rinse the probe with some of the calibration solution or deionized water. Immerse the probe into the MA 9050 solution. The sleeve holes must be completely submerged. Tap the probe repeatedly to remove any air bubbles that may be trapped inside the sleeve.

To enter NaCl calibration select the NaCl range and press CAL.

The primary LCD will display the NaCl reading in percentage and the secondary LCD will display “100”, along with “CALIBRATION” tag. The “WAIT” tag will blink until the



reading is stable.



When the reading is stable, the “READY” and “ACCEPT” tags will blink on the LCD. Press the GLP/ACCEPT key to confirm calibration. The instrument stores the calibration value and returns to measurement mode.

Notes:

- If the reading is too far from the expected value, the “WRONG” and “SOLUTION” tags will blink. Calibration cannot be confirmed.
- If the temperature of the buffer is out of the 0.0 – 60.0 °C (32.0 – 140.0 °F) temperature interval, the “WRONG” “SOLUTION” and “°C” tags will be displayed blinking.
- If a new EC calibration is performed, the NaCl calibration is automatically cleared. Thus, a new NaCl calibration is required.

GOOD LABORATORY PRACTICE (GLP)

GLP is a set of functions that allows storage and retrieval of data regarding the maintenance and status of the electrode.

All data regarding EC and NaCl calibration is stored for the user to review when necessary.

LAST EC CALIBRATION DATA

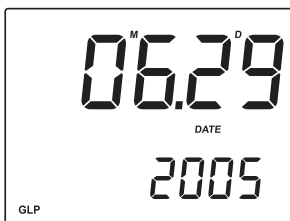
Last EC calibration data is stored automatically after a successful calibration. To view the EC calibration data, press the GLP/ACCEPT key when the instrument is in EC measurement mode.

The instrument will display the time (hh:mm:ss) of the last calibration.



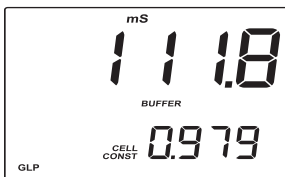
Press the UP and DOWN arrow keys to view the next logged calibration parameters (pressing the UP key):

- The date (MM.DD.YYYY).



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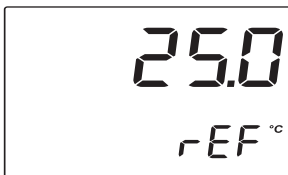
- The EC calibration solution on the primary LCD and the cell constant on the secondary LCD.



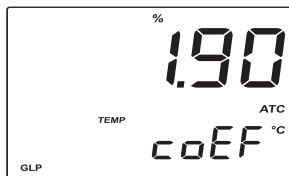
- The EC calibration offset on the primary LCD.



- The reference temperature on the primary LCD.



- The temperature coefficient on the primary LCD, along with the temperature compensation mode.



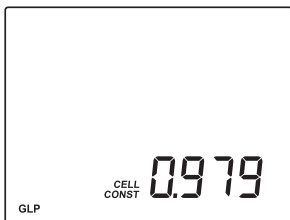


- The instrument ID.

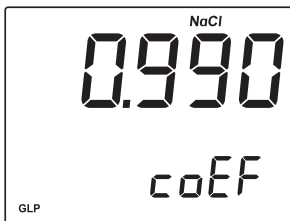
LAST NaCl CALIBRATION DATA

Last NaCl calibration data is stored automatically after a successful calibration. To view the NaCl calibration data, press the GLP/ACCEPT key when the instrument is in NaCl measurement mode. The instrument will display the time (hh:mm:ss) of the last calibration as in EC GLP mode. Press the UP and DOWN arrow keys to view the next logged calibration parameters (pressing the UP key):

- The date (MM.DD.YYYY) as in EC GLP mode.



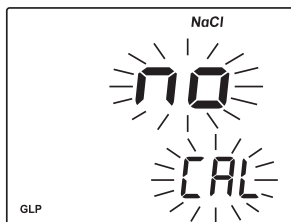
- The cell constant.



- The salinity coefficient.
- The temperature coefficient on the primary LCD, along with the temperature compensation mode as in EC GLP mode.
- The reference temperature on the primary LCD as in EC GLP mode.
- The instrument ID as in EC GLP mode.

Notes:

- Press the GLP/ACCEPT key at any moment and the instrument will return to measurement mode.
- If calibration has not been performed for the selected range, the instrument displays “no CAL” message blinking.



LOGGING

Up to 50 LOG samples can be stored into memory for each measurement range (EC, TDS and NaCl).

LOGGING THE CURRENT DATA

To store the current reading into memory press the LOG/MR key while in measurement mode.

The instrument will display the current date (MM.DD) on the primary LCD and the record number on the secondary LCD, along with "LOG" tag (see example below: record No. 25, dated June 29).

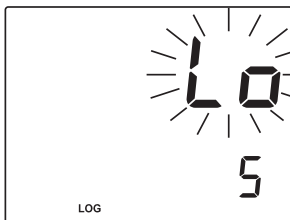


The instrument displays then the amount of free log space for about one second and returns to normal measurement mode (e.g. 18 records free).



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If there are less than 6 memory locations remaining, the record number and “Lo” message will blink to alert the user.



If the log space is full, “FULL LOC” message will be displayed and no more data will be saved.

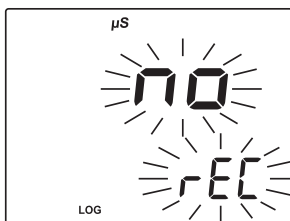


When the LOG/MR key is pressed while in measurement mode, a complete set of information is stored.

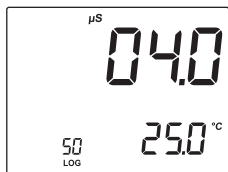
VIEW LOGGED DATA

Press the SHIFT&LOG/MR keys to retrieve the information stored while in measurement mode.

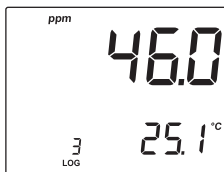
If no data were logged, the instrument displays “no rEC” message for the selected range.



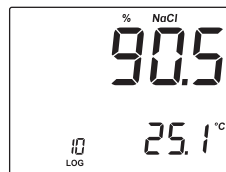
Otherwise, the instrument will display the **EC**, **TDS** or **NaCl** value on the primary LCD and the temperature on the secondary LCD, along with last stored record number and "LOG" tag.



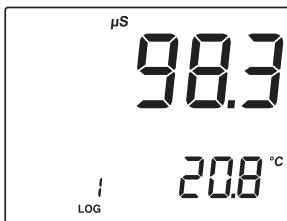
or



or

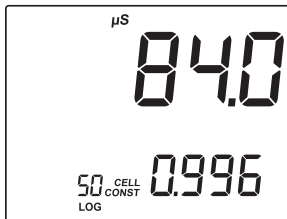


Pressing the arrow keys, the instrument will display the same parameter but for a different record:



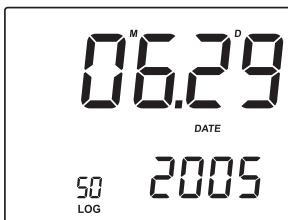
Press the RANGE/FIXED key and the instrument will display the next logged parameter:

- The conductivity value on the primary LCD and the cell constant on the secondary LCD.



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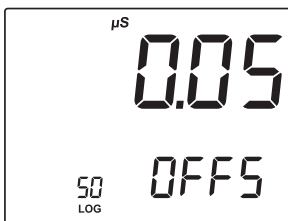
- The date: month and day on the primary LCD and the year on the secondary LCD, along with "DATE" tag.



- The time: hour and minutes on the primary LCD and the seconds on the secondary LCD, along with "TIME" tag.

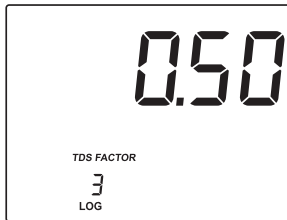


- For EC range: the offset on the primary LCD.



or

- For TDS range: the TDS factor.

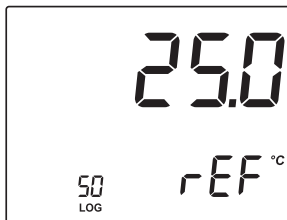


or

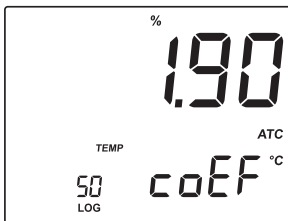
- For NaCl range: the salinity coefficient.



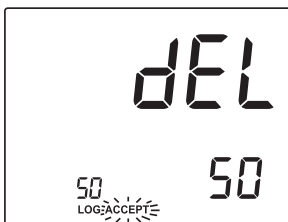
- The reference temperature.



- The temperature coefficient and compensation mode.



- The “dEL” message on the primary LCD and the record number on the secondary LCD, along with “ACCEPT” tag blinking.



Notes:

- If one of the arrow keys is pressed while “dEL” message is displayed, the next/previous record number will be selected.
- If the SETUP key is pressed, the secondary LCD will toggle between the record number and “ALL” message.
- Press the GLP/ACCEPT key to delete the selected or all records.
- If “dEL ALL” option was selected, all records for the selected range are deleted and the instrument returns to measurement mode.
- After deleting a record, the “nuLL” message is displayed on the LCD for the selected record.

Press the SHIFT&LOG/MR keys to leave RECALL mode at any time.

SETUP

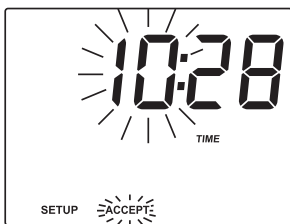
Setup mode allows viewing and modifying the following parameters:

- Cell Constant
- TDS Factor
- Temperature Coefficient
- Reference Temperature
- Current Time (hh:mm)
- Current Date (MM.DD.YYYY)
- Beep Status
- Baud Rate (serial communication)
- Instrument ID
- Temperature Unit

To enter SETUP mode, press and hold the SETUP key for about 2 seconds while in normal measurement mode.

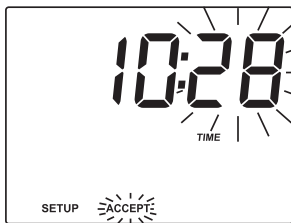
Select the desired setup parameter using the UP and DOWN arrow keys.

Press the CAL key if you want to change the item value. The selected item (e.g. hour, in setting up the correct time) and "ACCEPT" tag will start blinking.



Press the arrow keys to change the displayed value.

If there is another item to be set (e.g. minutes), press the RANGE/FIXED key. The other item will start blinking.



Press the arrow keys to change the displayed value.

Press the GLP/ACCEPT key to accept the value or the CAL key to escape.

Press the arrow keys to select the next/previous parameter.

Press the SETUP key to exit SETUP menu at any time.

The following table lists the SETUP parameters, their valid values range and the factory settings (default):

Item	Description	Valid values	Default
CELL	Cell Constant	0.500 to 1.700	1.000
tdS	TDS Factor	0.40 to 0.80	0.50
tc	Temperature Coefficient	0.00 to 6.00%/°C	1.90
rEF	Reference Temperature	20.0 or 25.0 °C	25.0
TIME	Time (hh:mm)	00:00 to 23:59	00:00
DATE	Date (MM.DD.YYYY)	01.01.2000-12.31.2099	01.01.2005
bEEP	Beep Status	ON/OFF	OFF
bAud	Baud Rate	600; 1200; 2400; 4800; 9600	2400
In Id	Instrument ID	0000 to 9999	0000
iEMP	Temperature Unit	°C or °F	°C

TEMPERATURE CALIBRATION (for technical personnel only)

The Mi170 is factory calibrated for temperature.

Milwaukee's temperature probes are interchangeable and no temperature calibration is needed when they are replaced.

If the temperature measurements are inaccurate, temperature recalibration should be performed.

For an accurate recalibration, contact your dealer or Milwaukee Instruments, or follow the instructions below.

- Prepare a vessel containing ice and water and another one containing hot water (at a temperature of around 50 °C). Place insulation material around the vessels to minimize temperature changes.
- Use a calibrated thermometer with a resolution of 0.1 °C as a reference thermometer.
- With the instrument off, press and hold down the CAL & LOG/MR keys, then power on the instrument. The "CALIBRATION" tag will appear and the secondary LCD will show 0.0 °C.
- Immerse the temperature probe in the vessel with ice and water as near as possible to the reference thermometer. Allow a few seconds for the probe to stabilize.
- Use the UP and DOWN arrow keys to set the reading on the secondary LCD to that of ice and water, measured by the reference thermometer. When the reading is stable and close to the selected calibration point, the "READY" and "ACCEPT" tags will blink.
- Press the GLP/ACCEPT key to accept the calibration point. The secondary LCD will show 50.0 °C.
- Immerse the temperature probe in the second vessel as near as possible to the reference thermometer. Allow a few seconds for the probe to stabilize.
- Use the UP and DOWN arrow keys to set the reading on the secondary LCD to that of the hot water, measured by the reference thermometer.
- When the reading is stable and close to the selected calibration point, the "READY" and "ACCEPT" tags will blink.
- Press the GLP/ACCEPT key to accept the calibration point. The instrument returns to measurement mode.

Note: If the reading is not close to the selected calibration point, "WRONG" tag will blink. Change the temperature probe and restart calibration.

ECSOLUTIONS TEMPERATURE DEPENDENCE

The conductivity of an aqueous solution is a measure of its ability to carry an electrical current by means of ionic motion. The conductivity invariably increases with increasing temperature. It is affected by the type and number of ions in the solutions and by the viscosity of the solution itself. Both parameters are temperature dependent. The dependency of conductivity on temperature is expressed as a relative change per Celsius degrees at a particular temperature, commonly as %/°C.

The following table lists the temperature dependence of Milwaukee EC calibration solutions.

°C	°F	MA 9060 ($\mu\text{S}/\text{cm}$)	MA 9061 ($\mu\text{S}/\text{cm}$)	MA 9063 ($\mu\text{S}/\text{cm}$)	Mi xxxx ($\mu\text{S}/\text{cm}$)	MA 9065 ($\mu\text{S}/\text{cm}$)	MA 9069 ($\mu\text{S}/\text{cm}$)
0	32.0	7150	776	64	48300	65400	2760
5	41.0	8220	896	65	53500	74100	3180
10	50.0	9330	1020	67	59600	83200	3615
15	59.0	10480	1147	68	65400	92500	4063
16	60.8	10720	1173	70	67200	94400	4155
17	62.6	10950	1199	71	68500	96300	4245
18	64.4	11190	1225	73	69800	98200	4337
19	66.2	11430	1251	74	71300	100200	4429
20	68.0	11670	1278	76	72400	102100	4523
21	69.8	11910	1305	78	74000	104000	4617
22	71.6	12150	1332	79	75200	105900	4711
23	73.4	12390	1359	81	76500	107900	4805
24	75.2	12640	1386	82	78300	109800	4902
25	77.0	12880	1413	84	80000	111800	5000
26	78.8	13130	1440	86	81300	113800	5096
27	80.6	13370	1467	87	83000	115700	5190
28	82.4	13620	1494	89	84900	117700	5286
29	84.2	13870	1521	90	86300	119700	5383
30	86.0	14120	1548	92	88200	121800	5479
31	87.8	14370	1575	94	90000	123900	5575

PC INTERFACE

Data transmission from the instrument to the PC can be done with the **Mi 5200** Windows® compatible software, when using the RS232 or USB serial interface. **Mi5200** also offers graphing and on-line help feature.

Data can be exported to the most popular spreadsheet programs for further analysis.

To connect the instrument to a PC through the RS232 port, use the MA9350 cable connector.

To connect the instrument to a PC through the USB port, use a standard USB cable. Make sure that your instrument is switched off and plug one connector of the cable to the instrument RS232/USB connector and the other to the serial port of your PC.

Notes:

- Other cables than **MA 9350** may use a different configuration. In this case, communication between instrument and PC may not be possible.
- Keep only one cable connected (RS232 or USB) during PC communication to avoid possible errors.
- If you are not using Martini Instruments **Mi 5200** software, please see the following instructions.

SENDING COMMANDS FROM PC

It is also possible to remotely control the instrument with any terminal program. Use **MA 9350** cable to connect the instrument to a PC, start the terminal program and set the communication options as follows: 8, N, 1, no flow control.

COMMAND TYPES

To send a command to the instrument follow the next scheme:

<*> <command> <CR>

where: <*> is the command prefix.

<command> is the command code.

Note: Either small or capital letters can be used.

UNIT CHANGE COMMAND

CHU xx Change the instrument unit according with the parameter value (xx):

- xx=06 EC range
- xx=07 TDS range
- xx=08 NaCl range

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The instrument will answer for this command with:

<STX> <answer> <ETX>

where: <STX> is 02 ASCII code character (start of text)

<ETX> is 03 ASCII code character (end of text)

<answer>:

<ACK> is sent for a recognized command

<CAN> is sent when the instrument is logging

<Err6>/<Err8> is sent when the command is incorrect or the instrument is not in measurement mode.

COMMANDS REQUIRING AN ANSWER

The instrument will answer for these commands with:

<STX> <answer> <checksum> <ETX>

where the checksum is the bytes sum of the answer string sent as 2 ASCII characters.

All the answer messages are with ASCII characters.

REC Causes the instrument to send a complete set of readings in according with the EC range.

RTD Causes the instrument to send a complete set of readings in according with the TDS range.

RNC Causes the instrument to send a complete set of readings in according with the NaCl range.

MDL Requests the instrument model name and firmware code (16 ASCII chars).

INF Requests the calibration data and the setup parameters.

SAM Requests the number of logged samples (12 chars).

LDEC Requests the xxxth EC record logged data.

LDTD Requests the xxxth TDS record logged data.

LDNC Requests the xxxth NaCl record logged data.

LAEC Requests all EC Log on demand.

LATD Requests all TDS Log on demand.

LANC Requests all NaCl Log on demand.

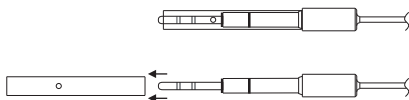
Notes:

- "Err8" is sent if the instrument is not in measurement mode.
- "Err6" is sent if the requested range is not available.
- "Err4" is sent if the requested set parameter is not available.
- "Err3" is sent if the Log on demand is empty.
- Invalid commands will be ignored.

PROBE MAINTENANCE

Rinse the probe with clean water after measurements. If a more thorough cleaning is required, remove the probe sleeve and clean the probe with a cloth or a nonabrasive detergent. Make sure to reinsert the sleeve onto the probe properly and in the right direction. After cleaning the probe, recalibrate the instrument.

Take great care while handling the probe.



TROUBLESHOOTING

SYMPTOMS	PROBLEM	SOLUTION
Reading fluctuates up and down (noise).	EC probe sleeve not properly inserted; air bubbles inside sleeve.	Insert the sleeve. Tap the probe to remove air bubbles.
Display shows EC, TDS or NaCl reading blinking.	Reading out of range.	Recalibrate the meter; Check the sample is within measurable range; Make sure the autoranging feature is not enabled.
Meter fails to calibrate or gives faulty readings.	Broken EC probe.	Replace the probe.
Meter fails to calibrate NaCl.	Incorrect EC calibration.	Recalibrate the meter in EC range. Set cell constant to 1.
At startup the meter displays all LCD tags permanently	One of the keys is blocked.	Check the keyboard or contact your dealer.
"Err xx" message displayed at start up.	Internal error.	Contact your dealer or Milwaukee Instruments.

ACCESSORIES

MA 9060	12880 $\mu\text{S}/\text{cm}$ Calibration Solution (230 ml bottle)
MA 9061	1413 $\mu\text{S}/\text{cm}$ Calibration Solution (230 ml bottle)
MA 9063	84 $\mu\text{S}/\text{cm}$ Calibration Solution (230 ml bottle)
MA 9065	111.8 mS/cm Calibration Solution (230 ml bottle)
MA 9069	5000 $\mu\text{S}/\text{cm}$ Calibration Solution (230 ml bottle)
MA xxxx	80000 $\mu\text{S}/\text{cm}$ Calibration Solution (230 ml bottle)
MA xxxx	NaCl 100% Calibration Solution (230 ml bottle)
MA 9310	12 VDC Adapter, 220 V
MA 9311	12 VDC Adapter, 110 V
MA 9315	Electrode Holder
MA 814D/1	EC/Temperature Probe
MA 9350	RS232 connection cable (2 meters)

For your Safety don't use or store the instrument in hazardous environments. To avoid damages or burns, do not perform any measurement in microwave ovens.

WARRANTY

This instrument is warranted against defects in materials and manufacturing for a period of 3 years from the date of purchase. Electrodes are warranted for 6 months.

If during this period the repair or replacement of parts is required, where the damage is not due to negligence or erroneous operation by the user, please return the instrument, electrode and probe to either distributor or our office and the repair will be effected free of charge.

Damage due to accidents, misuse, tampering or lack of prescribed maintenance is not covered by the warranty.

Milwaukee instruments reserves the right to make improvements in design, construction and appearance of its products without advance notice.

THANK YOU FOR CHOOSING



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