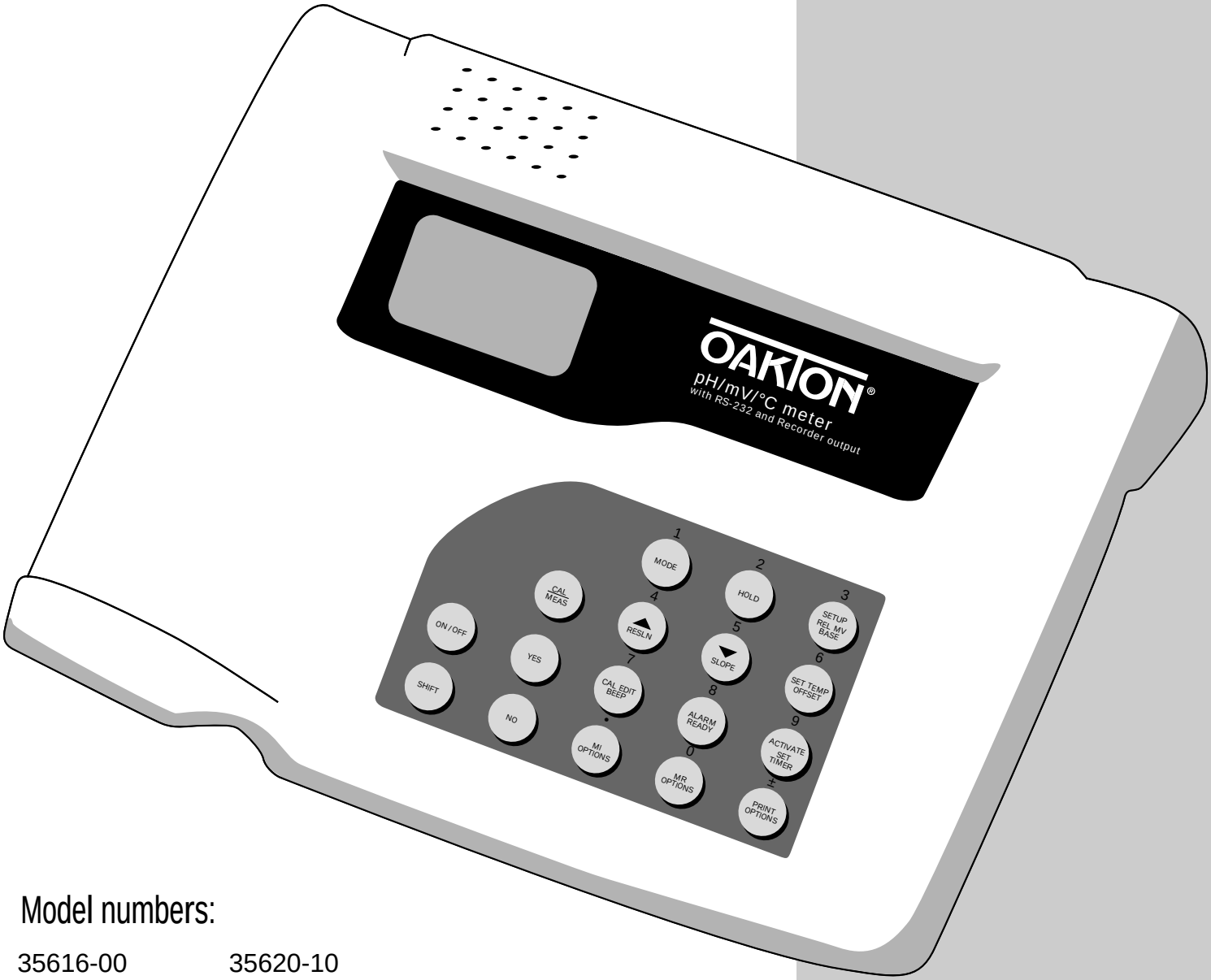
OAKTON®

pH/mV/Rel mV/°C Benchtop Meters

and

pH/mV/Ion/°C Benchtop Meters



Model numbers:

35616-00	35620-10
35616-03	35620-13
35616-05	35620-15
35616-08	35620-18
35616-01	35620-11
35616-02	35620-12
35616-06	35620-16
35616-07	35620-17

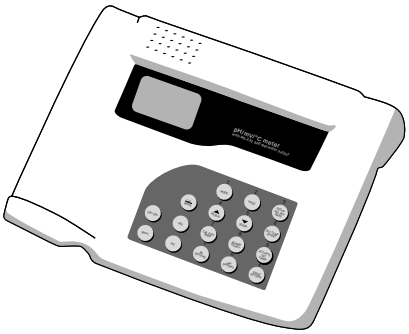
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Quick tip

let the mini table of contents in the outer margins of this manual guide you instantly to the right section!



1. Introduction

Thank you for selecting the OAKTON® pH/mV°C meter or OAKTON pH/mV/Ion/°C meter. This manual provides instructions for the 35616- and 35620-series meters. Each section includes illustrations that show you which button to press for each major function.

Getting started (sections 2 through 12)

To perform the basic functions of this meter, read sections 2 through 12 of this manual. These sections include basic instructions (about keypad functions, connecting the electrodes, calibration, measuring, etc.) that will get you up and running quickly. These sections are indicated in the outer margins as *Starting Up, Calibration, Measurement,* and *Temperature.*

Advanced functions (sections 13 through 22)

To perform the advanced functions of this meter, read sections 13 through 22 of this manual. Advanced functions include the setup programs ("Auto-Off", setting the time and date, memory clear and reset, selecting RS-232 parameters, etc.), setting the high and low point alarms, memory input and recall, and other special features that will let you fine tune the efficiency of your meter. These sections are indicated in the outer margins as *Setup Functions, Offset/Slope, Alarm/Timer,* and *Memory Input/Recall.*

RS-232/printer output (section 23)

To setup the parameters for RS-232 and printer output, read section 23 of this manual. This section applies only to meters with RS-232/printer capability.

Maintenance, troubleshooting, etc. (sections 24 through 31)

The remaining sections of the manual deal with electrode maintenance, error messages, and troubleshooting. This part of the manual also includes specifications, accessories, warranty, and return of items.

introduction
keypad functions
starting up
calibration
measurement
temperature
setup functions
resolution/ READY/offset/ slope
alarm/ timer
memory input/recall
printing/ RS-232
electrode care and maintenance
trouble shooting/error messages
pH buffer temperature tables
specifications/ accessories
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2. Keypad functions

The large membrane keypad makes the instrument easy to use. Each button, when pressed, has a corresponding graphic indicator on the display. While in the measurement function, the primary display shows the readings for pH, relative mV, mV and Ion Concentration. The secondary display shows the temperature readings simultaneously with the primary display (**Figure 1)**

NOTE: The secondary display shows "Ion"(not temperature) in Ion concentration mode.

The meter also has primary and secondary functions.
To perform primary functions, press the appropriate function key. During operation, the meter assumes the primary functions are active.
To perform secondary functions, press **SHIFT** first, and then the appropriate function key.

Numeric key values
Some keys also have numeric values. Do not press **SHIFT** to enter numeric values. The instrument knows when to enter a numeric value (for calibration, setting temperature, etc.). and when to activate a primary or secondary function.

ON/OFF

Primary function: Powers the meter on or off. The meter always starts-up in the pH measure **(MEAS)** mode. When the meter is **OFF,** the display shows current time whenever the AC adapter is plugged in.
Secondary function: None.
Numeric value: None.

SHIFT

Primary function: Press to perform secondary functions.
Secondary function: None.
Numeric value: None.

CAL/MEAS

Primary function: Press to toggle between the calibration modes and measure functions. Also, exit from the setup mode and secondary functions.
Secondary function: None.
Numeric value: None.

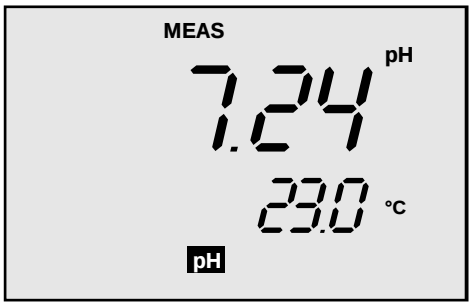
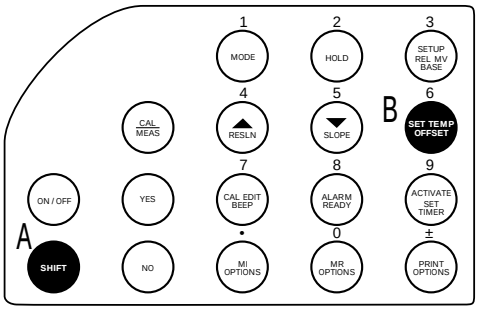


Figure 1 above shows primary display (here displaying pH) and secondary display (shows temperature).



To perform secondary functions:

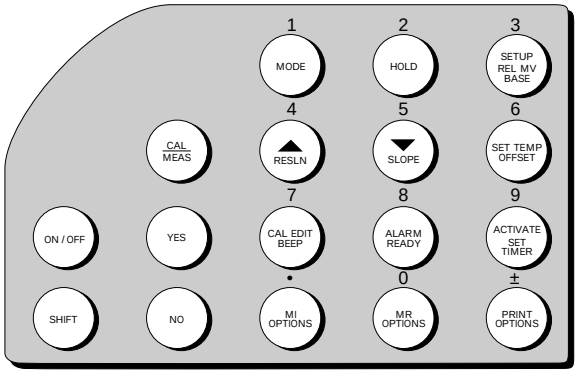
A. press SHIFT key to access secondary function

B. press specific key for that function (example: the SET TEMP/OFFSET button's secondary function is to display the offset of the pH electrode)

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alarm/ timer
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pH buffer temperature tables
specifications/ accessories
warranty/ return items

YES

Primary function: Enter numeric values, confirm calibration points, or confirm and scroll the program options in setup mode.
Secondary function: None.
Numeric value: None.



NO

Primary value: Use to cancel an incorrectly selected numeric value.
Secondary function: None.
Numeric value: None.

MODE

Primary value: Selects the four measurement modes: pH, mV, relative mV, and Ion Concentration.
Secondary function: None.
Numeric value: 1.

HOLD

Primary value: Freezes the displayed value and displays the **HOLD** annunciator. Press the key again to release display. **HOLD** is active only in Measurement mode. While in Hold mode, you can press **PRINT** to print, or **MI** to store values.
Secondary function: None.
Numeric value: 2.

SETUP/REL MV BASE

Primary function: Lets you enter Setup mode. Lets you customize most the functions of the instrument. Setup mode options are described in section 13, page 21-25.
NOTE: select **CAL/MEAS** anytime to exit from the setup mode.
Secondary function: Displays the rel mV base for two seconds, then meter automatically resumes normal operation. Value displays in primary field of LCD. To change the rel mV base, enter the rel mV mode and press **CAL: see page 13 for full instructions.** Press **SHIFT** + **MV BASE**.
Numeric value: 3.

▲ /RESLN

Primary function: Selects the next higher buffer in pH calibration mode. Also use to scroll through setup mode options.
Secondary function: Switch resolution of measured pH. Automatically toggles from 0.01 to 0.1, or 0.1 to 0.01. Press **SHIFT** + **RESLN.**
NOTE: In the mV, relative mV, and Ion concentration modes, the meter automatically displays the highest resolution possible up to 3½ digits.
Numeric value: 4.

▼ /SLOPE

Primary function: Selects the next lower buffer in the pH calibration mode. Also use to scroll through setup mode options.
Secondary: Displays percentage slope of the pH electrode (pH mode), or slope in mV per tenfold increase of ion concentration (Ion mode). Percentage slope is calculated as the average of the segments between the calibrated points. Value displays for two seconds before the meter reverts to its normal display.
Press **SHIFT** + **SLOPE.**
Numeric value: 5.

SET TEMP/OFFSET

Primary function: Press to calibrate ATC temperature probe or to set manual temperature. Enter desired temperature value with numeric keys. Then press **YES** to confirm the value, or **NO** to reenter the value. Press **CAL/MEAS** to exit Set Temp mode.

NOTE: This key is active only in the Measurement mode.

Secondary function: Displays the offset of the pH electrode connected to the meter in mV. After two seconds, the meter automatically returns to Measurement mode.

Press **SHIFT** + **OFFSET.**

Numeric value: 6.

CAL EDIT/BEEP

Primary function: Active in pH and Ion calibration mode only. Press this key to enter a customized pH buffer value. Enter the buffer value with the numeric keys. Press **YES** to accept, confirm, and exit calibration. Press **NO** to re-enter the value.

Secondary function: Turns on or off beep you hear when pressing the keypads. Press **SHIFT** + **BEEP.**

Numeric value: 7.

ALARM/READY

Primary function: Enter the high and low alarm values. Depending on the instrument mode, you can enter the high and low alarm limits for mV, rel mV, and pH. Enter the values with the numeric keys, and then press **YES** to confirm or **NO** to re-enter the values. If the measured value is not within the low and high alarm limits, the instrument will emit three beeps. To turn off the alarms, press **+/-** twice in alarm setting function. Alarms are active only in the measurement function.

NOTE: You cannot set Ion Concentration alarms.

Secondary function: Turns on or off the ready function. The meter toggles automatically between on or off, and then automatically resumes normal operation. Press **SHIFT** + **READY.**

Numeric value: 8.

ACTIVATE/SET TIMER

Primary function: Press to start time countdown. After reaching the set time interval, the meter beeps continuously and holds last measured reading on the LCD. Press any key to resume normal operation.

Secondary function: Sets the timer interval. Meter displays the last set value. The first two digits are hours and the next two digits are minutes. Minimum timer value is one minute. Maximum timer value is 23 hours and 59 minutes. When you enter time and press **YES,** the meter will confirm the entered value or prompt for re-entry if confirmation failed. Press **SHIFT** + **SET TIMER.**

Numeric value: 9.

MI/OPTIONS

Primary function: Stores the displayed value in memory. The meter can store up to 16 measurements along with corresponding temperature measurements. You can store any combination of pH, mV, relative mV, or Ion measurements. This function is active in the measurement and hold functions only.

NOTE: Ion concentration values are stored as mV values; meters with direct concentration mode store up to 13 value sets in memory.

Secondary function: Set the different data logging modes that automatically store displayed values in memory. The MEM annunciator appears. Press **SHIFT** + **MI/OPTIONS.** There are two options.

Data log on ready (when reading is stable): Current selection will display **READY** and **ON/OFF.** Use ▲ or ▼ to alter. Press YES to confirm selection and go to the next selection.

Set time interval for data log. Current time interval will be displayed first (if there is no time interval set, the display reads "- - - -"). To change the time interval, use the numeric keys. To clear an existing value, press +/–. Press **NO** to re-enter the value; press **YES** to accept the value and exit.

NOTE: Minimum = 1 minute. Maximum = 23 hours, 59 minutes.

Numeric value: Decimal point.

MR/OPTIONS

Primary function: Recall stored values, in last-in-first-out sequence. The meter displays recalled values according to the current mode. If there are no stored values in memory, the ERR annunciator appears**.** To recall all stored values, press **MR** repeatedly. To exit from **MR** mode, press **CAL/MEAS.** In the **MR** mode, you can also select **PRINT** to send recalled values to the RS-232 output. Active only in the measurement function.

Secondary function: Output values stored in memory, and clear the stored values from memory. Press **SHIFT** + **MR/OPTIONS.**

This function group contains two options.

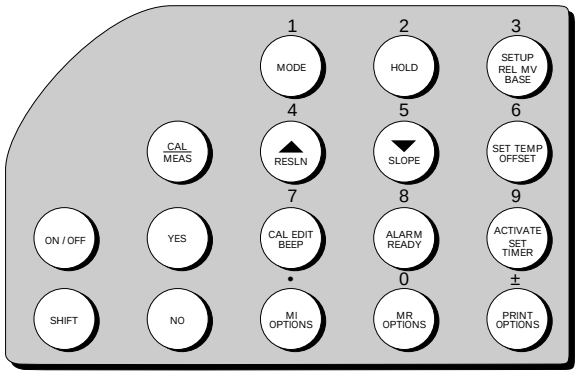
1. Output all memory data to printer or computer: The meter first displays the current selection. Use ▲ or ▼ to change the selection to on or off. If you select **on** to output data, the instrument will send all memory data through the RS-232/printer output. Press **YES** to confirm the selection (on or off) and go to the next option.

2. Clear memory: Press ▲ or ▼ to turn on or off the memory clear function. If you select **on** to clear memory, the meter will erase all the stored values. Press **YES** to enter the selection (on or off) and return to Measurement mode.

Numeric value: 0.

PRINT/OPTIONS

Primary function: Lets you output data through the serial port. You can select baud rate, parity, and stop bits in the Setup function. See page 25 for directions. You can access **PRINT** from the Measurement, Hold, or Memory recall functions. The printer icon will appear on the display.



Secondary function: Set the different output modes. Press **SHIFT** + **PRINT/OPTIONS.**

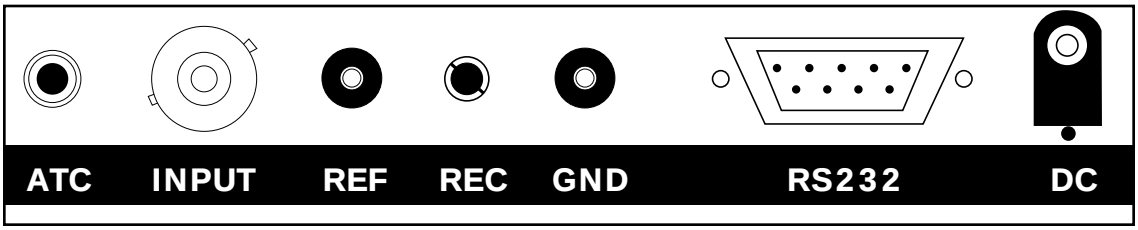
There are two options.

Print on ready: The current selection will appear on the display (**READY).** Press ▲ or ▼ to turn "Print on Ready" on or off. If you select **on**, the meter will send displayed data through the RS-232 output when the value is stable (when the ready indicator lights). Press **YES** to confirm the selection and go to the next selection.

Print on time interval: Current time interval will be displayed first (if there is no time interval set, the display reads "- - - -"). To change the time interval, use the numeric keys. To clear an existing value, press +/–. Press **NO** to re-enter the value; press **YES** to accept the value and exit.

NOTE: Minimum time interval = 1 minute; Maximum time interval = 23 hours, 59 minutes

Numeric value: +/–.



3. Starting up the meter

Back panel connections

See **Figure 2** above.

Connect the DC adapter from an AC power source to the power jack (DC).

Connect a combination pH electrode to the BNC input connector (INPUT). The meter can accept any pH, ORP, or ISE electrode with a BNC connector. Make sure the connector is clean and dry.

If you are using half-cells or the combination U.S. Standard electrode, connect the measuring half-cell to the BNC connector (INPUT) and the reference half-cell to REF.

Connect an automatic temperature compensation electrode to the Input jack marked ATC. Temperature compensation is manual when the ATC probe is disconnected. To calibrate for manual temperature compensation, see section 12, page 20.

Connect your recorder to the jack on the meter (REC).

Connect a computer or printer to the RS-232 serial port. See section 23, pages 38-51, for additional information about the RS-232 function.

Figure 2 above shows the back panel connections of the pH meter.
From left to right:
- ATC input jack
- input for BNC connector
- connector for reference half-cell
- jack for recorder
- ground
- RS-232 serial port
- DC power jack

Grounding

Grounding is not necessary for most laboratory applications. However, industrial applications such as electroplating do require grounding. If you have any questions about ground connection, contact your OAKTON distributor.

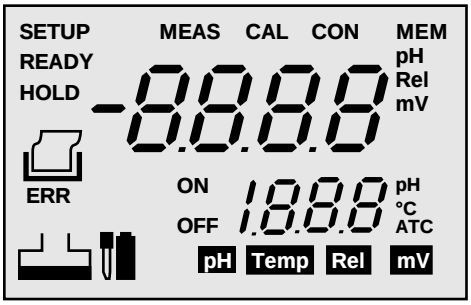


Figure 3
As soon as you attach power adapter, the meter will display a diagnostic test of all readouts for a few seconds.

Turning on and off the meter

As soon as you attach your DC power adapter to the meter, the meter will beep. Then, the display will show a diagnostic test of all the readouts for a few seconds**(Figure 3).** The display will then immediately show the time **(Figure 4).**

To access the meter functions, press **ON/OFF.** The meter will beep, the display will show another diagnostic test, and then open in the pH Measurement mode.

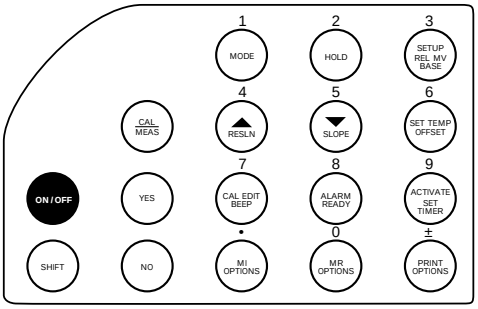
See section 4, pages 11–14, to begin calibration.

To turn off the meter, press **ON/OFF.** The display will again show the diagnostic test, and then show a date and time. Remove the power adapter from the DC jack, and the date and time will go off.



Figure 4
The display will then immediately show time.

Quick tip
Turn to section 13, page 24 to see how to set the current date and time on your meter



Press ON/OFF to begin working with your pH meter.

4. pH calibration

This instrument stores up to 5 calibration points to ensure accuracy. You can perform 5-point calibration in any order with standard pH buffers: 1.68, 4.01, 7.00, 10.01, and 12.45. This meter features auto buffer recognition at these 5 values for faster calibration. Or, you can enter your own custom pH buffer values (see step 5 below for instructions).

Calibrating tip

For best results, perform at least a 2-point calibration using standard buffers that bracket (one above and one below) the expected sample range. A 1-point calibration can also be used, but make sure that the buffer value is close to the sample value being measured.

DO NOT REUSE SOLUTIONS AFTER CALIBRATION. Contaminants in the solution can affect the calibration, and eventually the accuracy of the measurements. If, however, the accuracy of an application is less stringent, you can keep the solution in a PVC container that is stored in a cool, dark place. All new calibrations will over-ride existing stored calibration data. To erase calibration values in memory, use the **SETUP** mode. See section 13, page 24.

For 1-point pH calibration

1. **Turn the meter on.** The meter automatically enters pH measurement mode when meter is switched on.
2. **Rinse the electrode thoroughly** with deionized water or a rinse solution. **DO NOT WIPE THE ELECTRODE**; this causes a build-up of electrostatic charge on the glass surface.
3. **Dip the electrode into the standard** pH 7.00 buffer (or the buffer value closest to your expected value of the sample).
4. **Press CAL/MEAS** and the display will show **CAL.** The primary display will show the measured reading while the smaller secondary display will automatically indicate the pH 7.00 (or other value) standard buffer solution **(Figure 5).** If necessary, use the ▲ and ▼ keys to select other standard pH buffer values.
5. **If using a non standard pH calibration buffer,** press **CAL EDIT** to enter the exact value of the pH buffer**.** The annunciator in the lower left of the display will flash. Press the numeric keys to enter your non standard pH buffer value (the value will appear in the secondary display). Press **YES** to confirm. Skip to step 8. If you make a mistake, press **NO** and the secondary display will reset to the original value and allow you to enter the value again.
6. **Wait for the measured pH value to stabilize.** The **READY** indicator will display when the reading stabilizes. (If the READY indicator is not activated, see section 7, page 16).

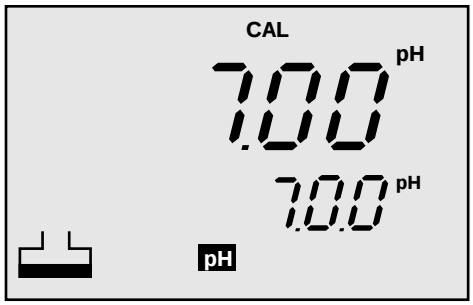
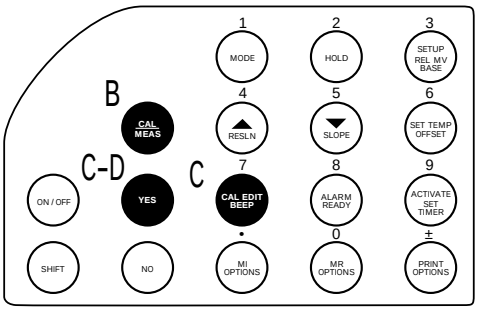


Figure 5
Primary display (top) shows the measured reading; secondary display (bottom) shows pH standard buffer solution (pH 1.68; 4.01; 7.00; 10.01; 12.45). You can select a non-standard calibration point—see step 5.

Calibration Tip: Acceptable Custom Calibrarion points

You can only program one value (preprogrammed or custom) per range. For example, if you calibrate to pH 7.00 and then to pH 6.00, the 6.00 calibration will replace the 7.00 calibration.

Range	Preprogrammed pH Value	Custom pH Value
1	1.68	0.68-2.68
2	4.01	3.00-5.00
3	7.00	6.00-8.00
4	10.00	9.00-11.00
5	12.45	11.45-13.45



For pH calibration:

A. Dip electrode into buffer.

B. Press CAL/MEAS to enter CAL mode. Primary display shows measured reading; secondary display shows pH standard buffer value.

C. If using a buffer other than the five standard pH buffers, press CAL/EDIT and enter numeric values to select desired value.

D. Press YES to confirm calibration.

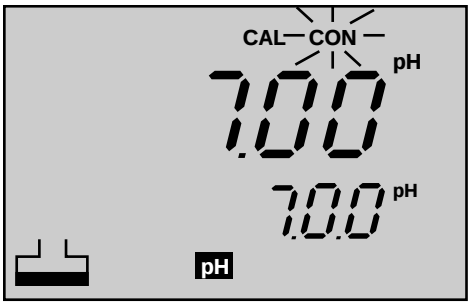


Figure 6
When you press YES to confirm calibration, the CON indicator blinks.

7. Press YES to confirm calibration. The **CON** indicator blinks for one second and disappears **(Figure 6).** The meter is now calibrated at the buffer indicated in the primary display.

OR indicator

The OR indicator blinks if the selected buffer value is not within ±0.50 pH of the measured pH value. The indicator also flashes if the buffer used is not the same as the buffer value on the secondary display.

The secondary display automatically scrolls to the next buffer calibration option. If you want to calibrate at another point, go to "multi-point pH calibration" below. If not, continue to step 8.

8. Press CAL/MEAS to return to measurement mode. 1-point calibration is now completed.

For multi-point pH calibration (up to 5 points)

If your 1-point calibration began with the default buffer value of pH 7.00, then the meter automatically scrolled up to the next value, 10.01. The next value automatically shown will be 12.45, then the meter will wrap around to 1.68, 4.01, and back again to 7.00.

1. To manually select the next buffer you wish to calibrate, press the ▲ and ▼ keys to scroll through the buffer selection options. The options are shown on the secondary display (pH 1.68, 4.01, 7.00, 10.01, and 12.45).

2. Follow steps 2 through 7 of the 1-point calibration instructions on pages 11-12. DO NOT do not press CAL/MEAS until all calibration is completed.

3. Repeat steps 2 through 7 above until all buffer values you want to use (up to 5 values) are entered. DO NOT press **CAL/MEAS** until all calibration is completed.

4. Press CAL/MEAS to return to the measurement function. Display now shows **MEAS.**

NOTE: You can view previous calibration data stored in the meter with the Set-Up function. See page 23 for directions.

5. Relative mV Calibration

1. **While in the measurement function, press MODE** to enter relative mV mode. The primary display indicator shows "**Rel mV**". If you have never calibrated mV or if the meter has been reset, the value shown is the same as the absolute mV value. Once calibrated, the value shown will be relative mV. The secondary display shows the temperature (**Figure 7).**
2. **Press CAL**. The calibration indicator shows on the display. The rest of the display stays the same.
3. **Press the numeric keys to adjust the displayed mV value** to the mV value to be subtracted from the reading.
4. **Press YES to confirm the calibration.** The LCD will now show the adjusted reading.

   NOTE: If you press **YES** without entering an mV value with the numeric keys, the meter will subtract the entire reading value displayed—that is, it will zero the mV reading. The LCD will then show 0 mV.

The meter is now calibrated for relative mV measurements.

When you press **YES,** the meter automatically returns to the measurement mode. The primary display now shows the relative mV readings.

TO RECALL THE SELECTED BASE VALUE,
press **SHIFT** and **REL mV BASE.**

TO ERASE CALIBRATION VALUES IN MEMORY,
use the **SETUP** function. See section 13, page 21.

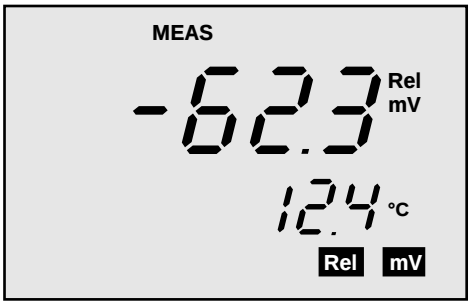
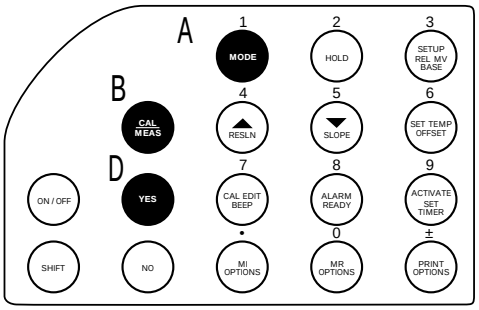


Figure 7
Upon entering the relative mV mode, the primary display shows either the relative mV value (if already calibrated) or the absolute mV value (if not calibrated yet). The secondary display shows temperature.



Calibrating Relative mV

A. press MODE (if necessary) to enter relative mV mode.

B. press CAL

C. press numeric keys to adjust displayed mV value to the mV value to be subtracted from reading

D. press YES to confirm calibration and return to measurement mode.

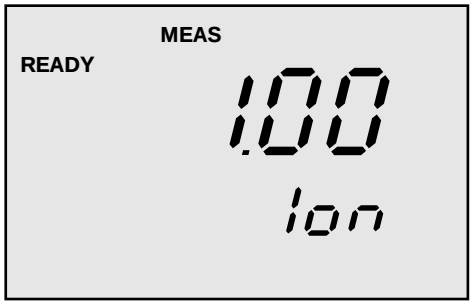


Figure 8
In Ion Measurement mode, the primary display (top) shows the ion concentration reading and the secondary display (bottom) shows "Ion".

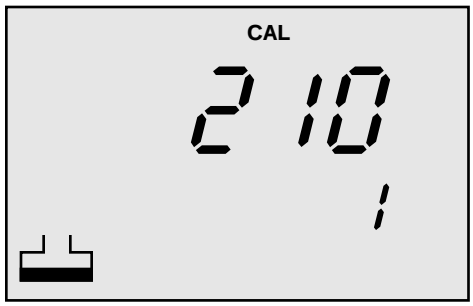
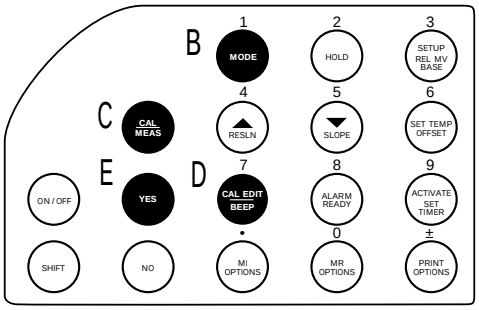


Figure 9
In Ion Calibration mode, the primary display (top) shows the ion concentration reading in mV and the secondary display (bottom) shows the number of the calibration point (1-5).



For Ion Calibration:

A. Dip electrode into calibration standard.

B. Press MODE until you enter Ion Concentration mode.

C. Press CAL/MEAS to enter CAL mode. Primary display shows mV reading; secondary display shows the number of the calibration point.

D. Let electrode stabilize. Press CAL EDIT and then enter concentration value.

E. Press YES to confirm concentration value.

F. Repeat steps D and E with different calibration standards until calibration is complete. Then, press CAL/MEAS.

6. Ion Calibration

This calibration is for models with direct concentration mode only. For best accuracy, calibrate your meter to AT LEAST two points with similar concentrations to the solutions you want to test. You can calibrate up to five points.

1. **Prepare at least two calibration standards** in accordance with the electrode instructions or your approved methods. Bring the calibration standards to ambient temperature.
2. **If the meter is not on, plug it in and press the ON/OFF button.** The meter will be in pH Measurement mode.
3. **Press the MODE button three times** to switch to Concentration Measurement mode. The word "Ion" will be displayed in the secondary display **(Figure 8).**
4. **Dip electrode in the first calibration standard.** Make sure to start with the calibration standard that has the lowest concentration and move up to the standards that have higher concentrations.
5. **Press CAL/MEAS to enter Calibration mode.** The top display shows the mV value of the solution and the bottom display shows "1," indicating the first calibration standard **(Figure 9).**
6. Allow the instrument sufficient time to stabilize*. Once the display is stable, **press CAL EDIT and then enter the concentration value of the calibration standard.** Use the numeric keys to enter any number between 0 and 9999†. This number can indicate any units you choose—make sure you use the same type of units you want to view in Measurement mode.
7. **Press YES to confirm the number you have entered,** or press NO to reenter the value.
8. **Follow steps 4-7 for each of the next calibration points.** Make sure to rinse off the electrode with deionized water before placing it in the next calibration standard.
9. When you have finished calibration, **press CAL/MEAS twice to return to Measurement mode.** The top display now shows the correct concentration value and the bottom display shows "Ion".

* Electrode response in low concentrations is much slower than response in high concentrations or in pH mode. Therefore, the READY indicator may come on prematurely. Allow sufficient time to ensure the READY indicator is genuine, or turn off READY indicator (see page 16).

† If you press the decimal point while entering the concentration value, you must enter all four digits. For example, if you want to enter the value 10.00, either press 1, 0, YES, or press 1, 0,. ,0, 0, YES.

7. Measurement:
Ready, Continuous, and Hold functions

> *Electrode tip*
> During measurement, the electrode can be hand-held or attached to an electrode holder for more stable operation. Be sure to remove the electrode's protective rubber cap before measurement.

Measuring with READY indicator on.

The **READY** indicator appears on the top left corner of the display when the reading is stable.

NOTE: see page 16 for directions on how to activate or deactivate the ready indicator.

Before taking measurements, rinse the electrode with deionized or distilled water. This will remove impurities that have adhered to the electrode body. If the pH electrode has dehydrated, soak it for 30 minutes in a 2M - 4M KCl solution. If you have an ion selective electrode, refer to its manual for proper electrode pretreatment.

1. **After calibration, press CAL/MEAS** to enter the measurement function. The **MEAS** indicator shows on the top center of the LCD. Use the **MODE** button to choose pH, mV, relative mV or ion concentration mode.
2. **Dip the electrode into the sample.** The sensor or glass bulb of the electrode must be completely immersed into the sample. Stir the electrode gently to create a homogeneous sample.
3. **When the reading is stable, the READY indicator will display (Figure 10).**

NOTE: The **READY** indicator is based on stability of the mV output over time. At low ISE concentrations, slow electrode response may lead to false **READY** indications. Disregard or turn off the **READY** indicator for low level ion measurements.

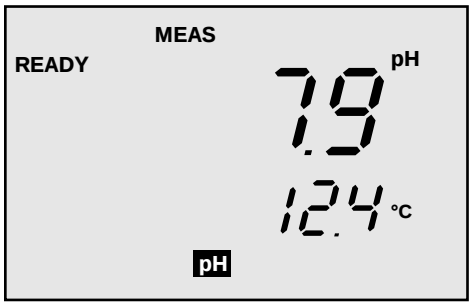
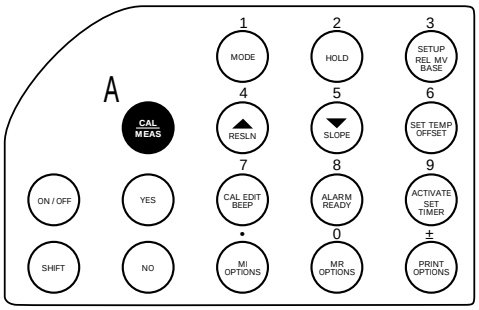


Figure 10
READY indicator displays when reading has stabilized

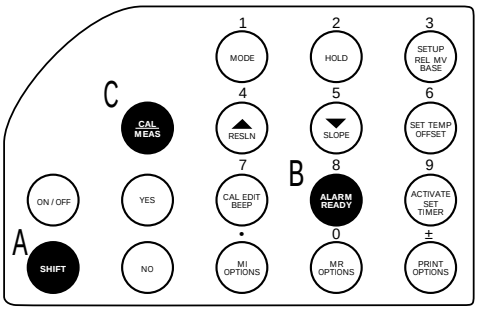


Measuring with READY mode

A. press CAL/Meas to enter measurement function (if necessary).

B. Dip electrode into sample.

C. READY indicator shows when reading has stabilized.



Measuring in continuous mode:

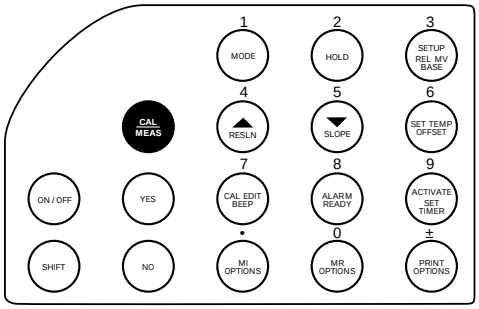
A. press SHIFT button to access secondary function of ALARM/READY key.

B. press ALARM/READY to turn off the ready function.

C. press CAL/MEAS to enter measurement function (if necessary).

D. Dip electrode into sample.

E. press SHIFT button and ALARM/ READY button to turn the ready function on again.



To freeze a reading:

A. Press HOLD button once while in measurement function.

B. Press HOLD again to release.

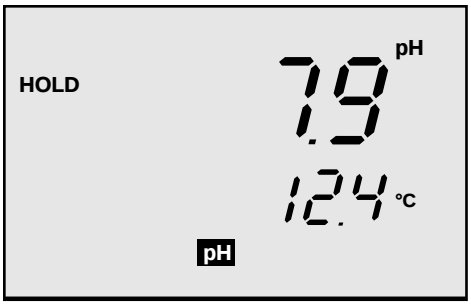


Figure 11
Use the HOLD function to freeze your reading.

Measuring in the continuous mode

While the **READY** indicator assures stable readings, the continuous mode provides instantaneous readings for faster operation. Continuous mode readings, however, are not as stable. To turn off the **READY** indicator:

1. **Press the SHIFT button** to access the secondary function of the ALARM/READY key.
2. **Press the ALARM/READY key** to turn the Ready function off. The display will read "ON" or "OFF" to indicate whether the READY indicator has been turned on or off.
3. **After calibration, press CAL/MEAS** to enter the measurement function. The **MEAS** indicator shows on the top center of the LCD. Use the **MODE** button to choose pH, mV, relative mV or ion concentration mode.
4. **Dip the electrode into the sample.** The sensor or glass bulb of the electrode must be completely immersed into the sample. Stir the electrode gently to create a homogeneous sample.
5. To turn the Ready function back on, press the **SHIFT** button and then the **ALARM/READY** button.

Holding a reading (HOLD function)

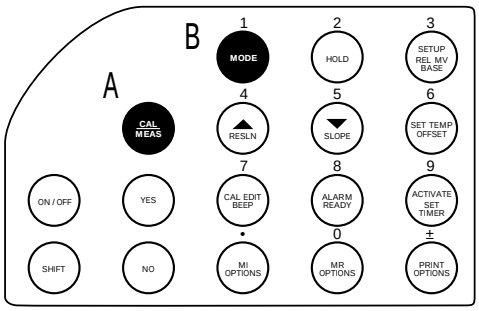
This feature lets you freeze the value of the reading for a delayed observation. **HOLD** can be used any time when in **MEAS** mode.

1. To hold a measurement, simply press the **HOLD** key once while in the measurement function. **"HOLD"** will appear on the display **(Figure 11).**
2. To release the held value, press **HOLD** again. Continue measurements.

8. Measuring pH

When you first turn on the instrument, the meter enters directly into pH measurement mode.

1. **After calibration, press CAL/MEAS** to enter the measurement function. The **MEAS** indicator shows on the top center of the LCD.
2. **Press the MODE button** to choose the pH mode. The "pH" indicator will appear at the bottom of the display.
3. **Dip the electrode into the sample.** The sensor or glass bulb of the electrode must be completely immersed into the sample. Stir the electrode gently to create a homogeneous sample.
4. **The primary display will show the pH reading,** and the secondary display will show the temperature. If the READY indicator is active, it will signal when the reading is stable.



Measuring pH:

A. press CAL/MEAS button to enter measurement function (if necessary).

B. press MODE button until meter is in pH mode.

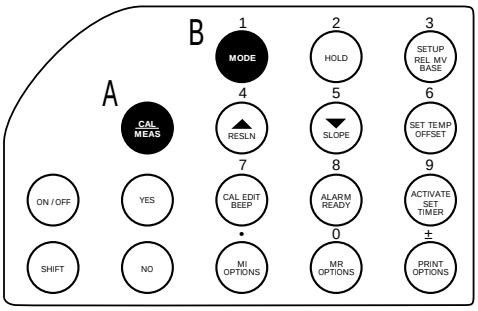
C. Dip electrode in sample.

D. READY indicator (if selected on) shows when reading has stabilized.

9. Measuring mV

1. **After calibration, press CAL/MEAS** to enter the measurement function. The **MEAS** indicator shows on the top center of the LCD.
2. **Press the MODE button** to choose the mV mode. The "mV" indicator will appear at the bottom of the display.
3. **Dip the electrode into the sample.** The sensor or glass bulb of the electrode must be completely immersed into the sample. Stir the electrode gently to create a homogeneous sample.
4. **The primary display will show the mV reading,** and the secondary display will show the current temperature reading. If the READY indicator is active, it will signal when the reading is stable.

NOTE: Resolution is 0.1 mV within a ± 399.9 mV range, and 1 mV up to ±1999 mV. If mV readings are out of range, the display will show **"Ur"** or **"Or"** in the primary display.



Measuring mV:

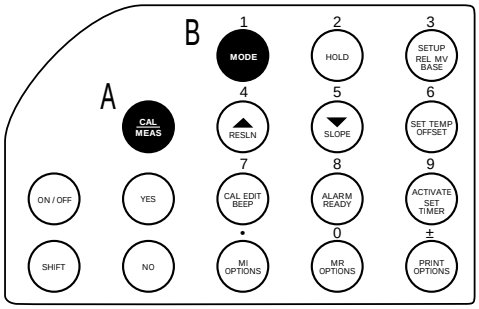
A. press CAL/MEAS button to enter measurement function (if necessary).

B. press MODE button until meter is in mV mode.

C. Dip electrode in sample.

D. READY indicator (if selected on) shows when reading has stabilized.

introduction
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alarm/ timer
memory input/recall
printing/ RS-232
electrode care and maintenance
trouble shooting/error messages
pH buffer temperature tables
specifications/ accessories
warranty/ return items



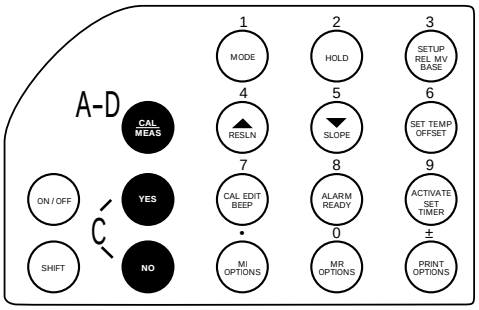
Measuring relative mV:

A. press CAL/MEAS button to enter measurement function (if necessary).

B. press MODE button until meter is in rel mV mode.

C. Dip electrode in sample.

D. READY indicator (if selected on) shows when reading has stabilized.



To change base value in relative mV:

A. press CAL/MEAS button so display shows “CAL”.

B. use numeric keys to enter new value.

C. Press YES to confirm or NO to clear and reenter.

D. Press CAL/MEAS to return to measurement function.

10. Measuring relative mV

Quick tip—Rel mV readings
If you have not calibrated the meter for relative mV, your rel mV reading will be the same as the standard mV reading.

1. **After calibration, press CAL/MEAS** to enter the Measurement function. The **MEAS** indicator shows on the top center of the LCD.
2. **Press the MODE button** to choose the Relative mV mode. The “Rel mV” indicator will appear at the bottom of the display.
3. **Dip the electrode into the sample.** The sensor or glass bulb of the electrode must be completely immersed into the sample. Stir the electrode gently to create a homogeneous sample.
3. **The primary display will show the Rel mV** reading, and the secondary display will show the temperature. If the READY indicator is active, it will signal when the reading is stable.

Once you enter Rel mV mode, the base value held in memory (determined in “Calibrating Rel mV”; section 5, page 13) is subtracted from the measured mV value. The default setting for this base value is 0 mV.

To calibrate Relative mV (change the base value):

1. **Press CAL/MEAS while you are in Relative mV Measurement mode.** The display will show **CAL.**
2. **Use the numeric keys to enter the new base value.**
3. **Press YES to confirm the value** and return to the Calibration function. If you make a mistake, press **NO** to clear and reenter the value.
4. **Press CAL/MEAS** to return to Measurement function. All measurements will now be subtracted from the new base value.
5. **To recall the selected base value,** press **SHIFT** and **REL mV BASE.** The value will show for two seconds and then return to the Measurement function.

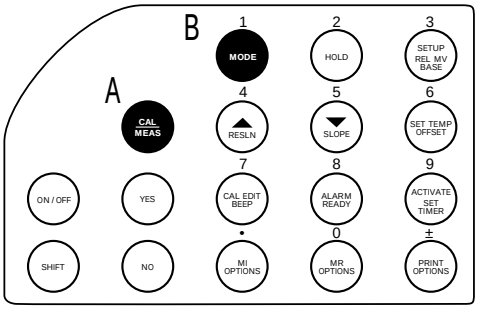
11. Measuring Ion Concentration

1. **After calibration, press CAL/MEAS** to enter the Measurement function. The **MEAS** indicator shows on the top center of the LCD.
2. **Press the MODE button** to choose the Ion Concentration mode. The secondary display will read "Ion".
3. **Prepare samples as necessary** (i.e., add Ionic Strength adjuster). Sample preparation varies depending on ion type—see your electrode manual for details on the specific electrode that you are using.
4. **Dip the electrode into the sample.** The sensor or glass bulb of the electrode must be completely immersed into the sample. For best results, use a magnetic stirrer to ensure a homogenous sample.
5. **The primary display will show the current Ion concentration reading,** while the secondary display will show the word "Ion". If the READY indicator is active, it will signal when the reading is stable.

NOTE: Temperature does not display in Ion Measurement mode.

Ion tip

Concentration readings are not temperature compensated. Try to avoid temperature fluctuations in your standards and samples.

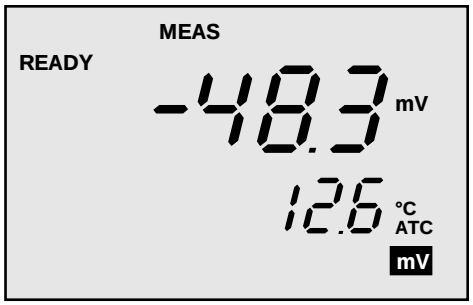


A. press CAL/MEAS button to enter measurement function (if necessary).

B. press MODE button until meter is in Ion Concentration mode.

C. Dip electrode in sample.

D. READY indicator (if selected on) shows when reading has stabilized.



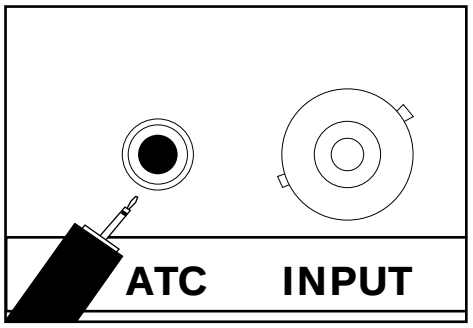


Figure 12
Plug temperature probe into ATC jack at back of unit. The ATC indicator will show on LCD (above).

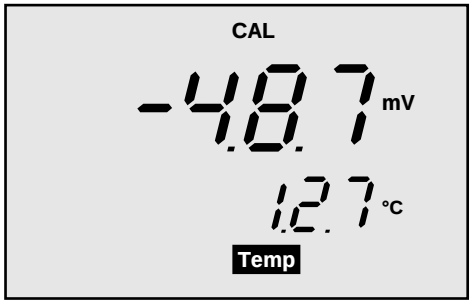
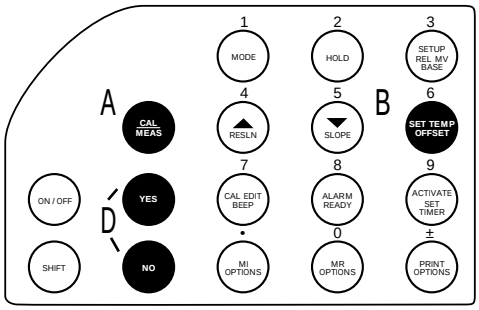


Figure 13



For manual temperature calibration:

A. press CAL/MEAS to enter measurement mode (if necessary).

B. press SET TEMP to select temp mode.

C. press numeric keys to set desired temperature value.

D. press YES to confirm; NO to reenter.

12. Automatic Temperature Compensation (ATC) and Manual Temperature Compensation

Automatic temperature compensation

Automatic temperature compensation only functions in the pH measurement mode when the temperature probe is plugged into the meter.

1. **For automatic temperature compensation (ATC), simply plug in the temperature probe in the phone jack (Figure 12).** The ATC indicator will show on the LCD. If the ATC indicator does not show, then the probe is not connected to the meter or is faulty.

You should calibrate your temperature probe when you replace it. To calibrate the temperature probe:

1. **Plug the new temperature probe into the phone jack on the back of the meter.**
2. **Place the temperature probe and a reference thermometer in a water bath.** Compare the temperature reading on the meter to the temperature reading on the reference thermometer.
3. **Subtract the meter's temperature reading from the true temperature** to find the required temperature offset value.
4. **Press the SET TEMP key** to select temperature calibration mode.
5. **Press the numeric keys to set the desired temperature value.** If you make a mistake, press **NO** to reset to the original value, then reenter the desired value again.
6. **Press YES to confirm selected temperature.** The display will return to its previous mode.

Manual temperature compensation

You can select manual temperature compensation in the pH mode. NOTE: Probe must be disconnected.

1. **Make sure you are in the measurement function.** You can be in any mode (pH, mV, rel mV, or Ion). Press **SET TEMP** to select temperature mode. **TEMP** is displayed at the bottom of the display **(Figure 13).**
2. **Press the numeric keys to set the desired temperature value.** If you make a mistake, press **NO** to reset to the original value, then reenter the desired value again.
3. **Press YES to confirm selected temperature.** The display will return to its previous mode. The meter is now prepared for temperature compensation without the temperature probe.

For pH buffer/temperature tables, see section 27, page 55.

13. Setup function

SETUP function
This function lets you view and customize meter parameters.

SETUP function

The **SETUP** function lets you view and customize meter parameters. Press the SETUP key to enter SETUP mode.
SETUP mode has four main programs:

- **viewing previous pH calibration data:**
  last time calibrated;
  last calibrated buffer points;
  last calibration temperature.
- **selecting meter operations:**
  resetting the memory;
  activating the "Auto-Off" functions.
- **setting clock functions:**
  setting the time;
  setting the date.
- **selecting communication data:**
  when using an optional printer or computer.
  print meter parameters;
  set baud rate, parity and stop bit

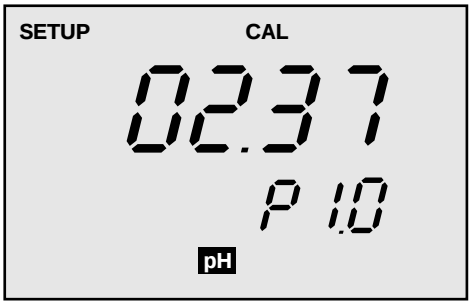
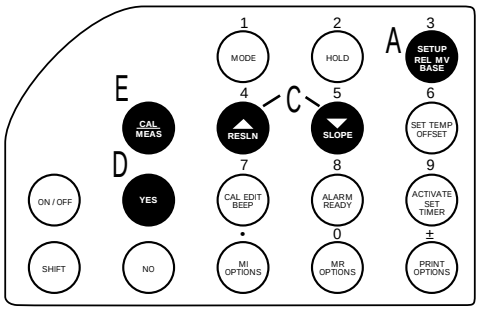


Figure 14



General instructions for all programs

Please read the next three sections before operating SETUP functions. Refer to *"SETUP functions at a glance,"* page 22 for a quick review.

1. **To enter SETUP mode,** press the **SETUP** key while in any measurement mode (pH, mV, relative mV or Ion). The meter automatically enters **Program 1, Option 0: P1.0 (Figure 14).** You can only access **SETUP** from the Measurement mode.
2. **Use ▲ or ▼ keys to select options,** if changes are required.
3. **Press YES to confirm the option** in each program. The display then automatically scrolls to the next program in sequence. When you press **YES** for the last option **(P4.2),** the display returns to the measurement function **(MEAS).**
4. **To exit the program at any time, press CAL/ MEAS and return to the measurement function.**

To operate SETUP functions:

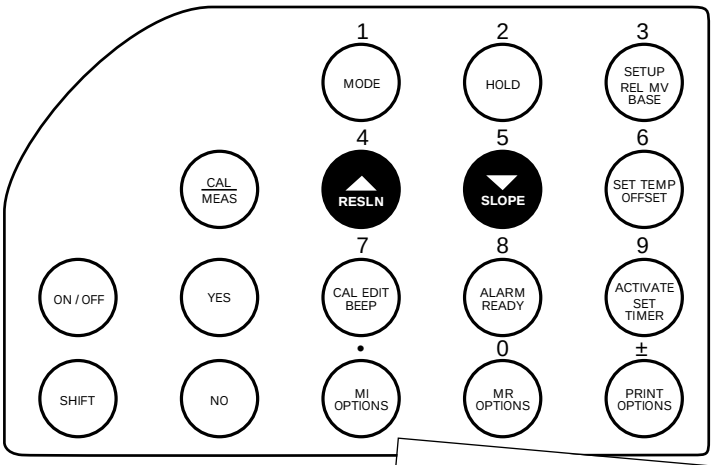
A. press SETUP key.
B. Meter automatically enters PROGRAM 1, option 0 (P 1.0; see figure 12 above).
C. press ▲ or ▼ keys to select options.
D. press YES to confirm option. Display scrolls to next program.
E. press CAL/MEAS to return to measurement function at any time.

Setup functions at a glance

Press **YES** to confirm and scroll to each setup function. Press **CAL/MEAS** to exit at any time.

Program	Function	Activation Keys	Options	Default Setting
Viewing previous pH calibration data				
P1.0	Last calibration time	—	Indication only	—
P1.1	Last calibration month	—	Indication only	—
P1.2	Last calibration date	—	Indication only	—
P1.3	Last calibration year	—	Indication only	—
P1.4	Display calibrated buffers	▲ or ▼	Indication only	"- - - -" (no cal)
P1.5	Calibration temperature	—	Indication only	25°C
Selecting meter operations				
P2.0	Reset—clears all memory!	▲ or ▼	ON, OFF	OFF
P2.1	Optional auto-off	▲ or ▼	ON, OFF	ON
Setting time and date				
P3.0	Set time	numeric	—	—
P3.1	Set month	numeric	—	—
P3.2	Set day	numeric	—	—
P3.3	Set year	numeric	—	—
Selecting communication data (RS-232 output)*				
P4.0	Print meter parameters	▲ or ▼	ON, OFF	OFF
P4.1	Baud rate	▲ or ▼	2.4, 4.8, 9.6, 19.2 Kbps	9.6 Kbps
P4.2	Parity	▲ or ▼	1, 2, 0	2
P4.3	Stop bit	▲ or ▼	1, 2	2

***The RS-232 settings for the meters with direct concentration mode are permanently set a baud rate of 9600, parity of 2 and stop bit of 1.



When using the setup functions...
use the arrow keys highlighted above to toggle between options; or use the numeric keys to input numbers. Remember, certain setup functions provide information only, and have no customizing options

Program 1:
Viewing previous pH calibration data

Program 1 tells you the time and date of your last pH calibration. It also lets you see the calibrated buffer values and the calibration temperature of your last pH calibration.

P1.0 Time of last pH calibration.
Indication only. No options.
Press **YES** to go to next program.

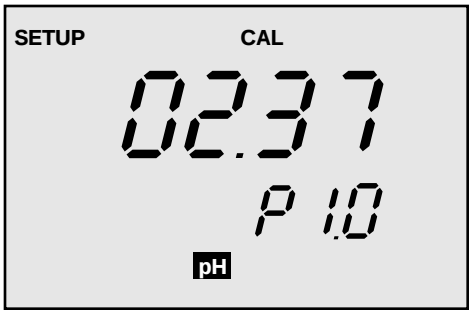
P1.1 Month of last pH calibration.
Indication only. No options.
Press **YES** to go to next program.

P1.2 Date of last pH calibration.
Indication only. No options.
Press **YES** to go to next program.

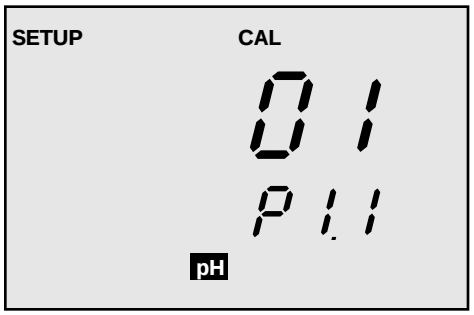
P1.3 Year of last pH calibration.
Indication only. No options.
Press **YES** to go to next program.

P1.4 Display Calibrated pH buffer values:
Lets you view all current calibration points (up to 5). Use ▲ or ▼ key to scroll through the five calibrations. If you have not made prior calibrations, the display will show "- - - -". Press **YES** to go to next program.

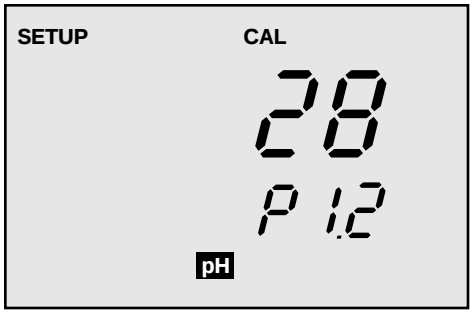
P1.5 Display Calibration temperature:
Indicates temperature at the last calibration. Default setting is 25°C. No options to set. Press **YES** to go to next program.



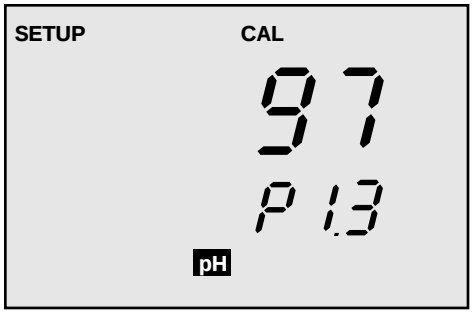
P 1.0: Time of last calibration



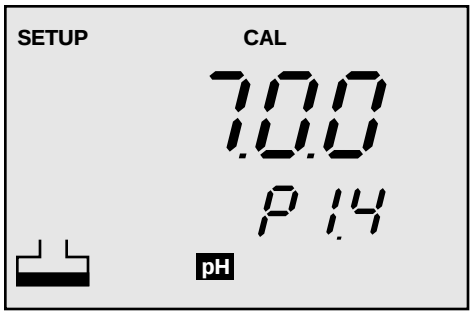
P 1.1: Month of last calibration



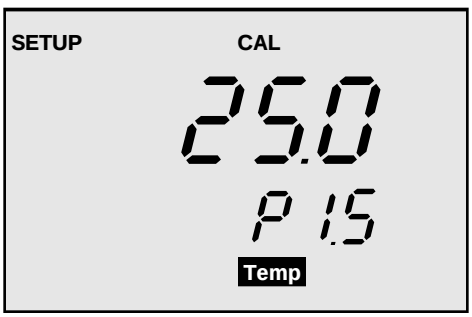
P 1.2: Date of last calibration



P 1.3: Year of last calibration



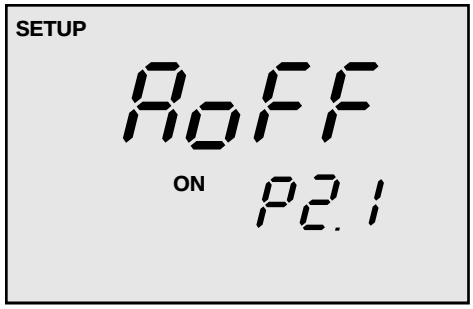
P 1.4: Display calibrated buffer values



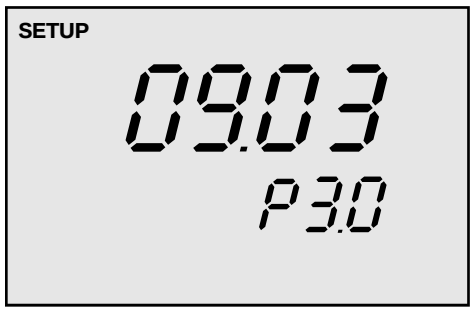
P 1.5: Display calibration temperature



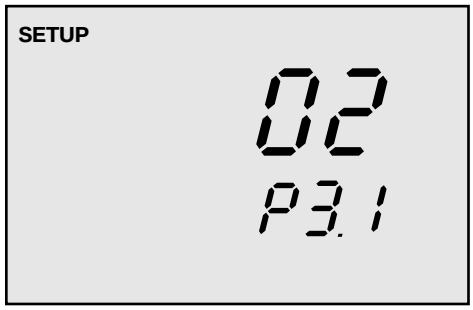
P 2.0: Memory reset



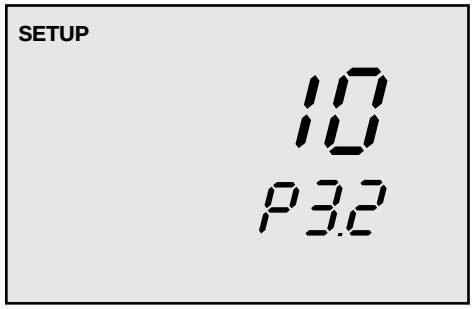
P 2.1: Auto off



P 3.0: Display and set time



P 3.1: Display and set month



P 3.2: Display and set day

Program 2:
Selecting meter operations (memory reset; auto-off)

Program 2 has two options for customizing:

P2.0 Memory reset:

The Memory Reset feature is useful if you want to recalibrate to a different electrode and select entirely new **SETUP** options. ***Selecting ON resets all stored meter data: previous pH, mV and relative mV memory values; calibration data; and setup data will be lost.*** Only the clock memory (month, day, and year) is retained.

If you select **ON ,** the meter immediately switches off, the clock function appears, and you must switch the meter back on before proceeding with any other meter functions. All previous settings will return to their default settings.

If reset is required: press ▲ or ▼ arrows to select **ON** and then press **YES** to activate. See Figure 13.
If you want to retain current meter data: select **OFF,** press **YES** and go to the next program.

Warning

Be careful not to accidentally reset your meter. If your meter shows the reset function **ON** *as you scroll through the setup functions, pressing* **YES** *will erase all memory in the meter. Press the ▲ or ▼ arrows to turn reset* **OFF** *(shown in figure 13 at right).*

P2.1 Auto-Off:

To conserve energy, this function automatically shuts off the meter within 30 minutes after the last key has been pressed. The clock functions will then appear. Default setting is **ON.** Use ▲ or ▼ to select **ON** or **OFF.** Press **YES** to confirm.

Program 3:
Setting the time and date

Program 3 has four options for customizing.

P3.0 Display and set time:

use numeric keys to set time. Press **YES** to confirm.

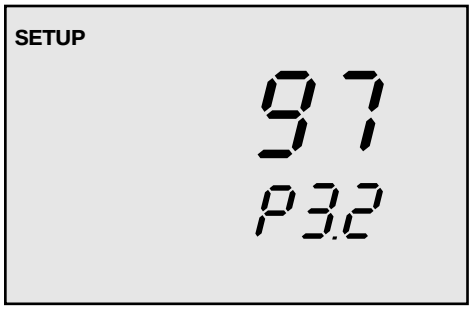
P3.1 Display and set month:

use numeric keys to set month. Press **YES** to confirm.

P3.2 Display and set day:

use numeric keys to set day of month. Press **YES** to confirm.

P3.3 Display and set year:
use numeric keys to set year. Press **YES** to confirm. Meter will continue on to Program 4 on meters with RS-232 option, or return to measurement mode on meters without RS-232.



P 3.,3: Display and set year

Program 4:
Selecting communication data (RS-232 output)

Program 4 lets you set up the meter communication parameters when operating it with either your optional printer or PC.

NOTE: *The RS-232 settings for the pH/Ion/mV/°C models are permanently set a baud rate of 9600, parity of 2 and stop bit of 1.*

This program has four options. Set these options to match your printer or PC requirements.

P4.0 Print Meter Parameters:

Press ▲ or ▼ to select **ON** or **OFF**. If you select **ON,** the meter will download through the RS-232 output the current date and time; last calibration date and time; electrode slope and offset; last calibration temperature; calibration values stored in memory; and relative mV base.

NOTE: To select ON, the meter needs to be attached to your computer or printer.

P4.1 Baud rate:

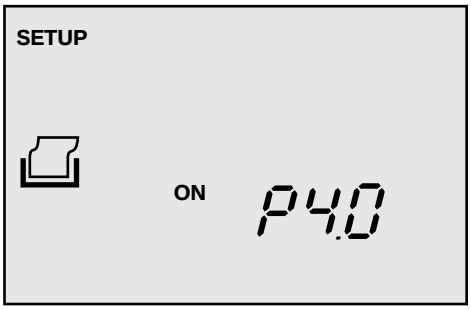
Press ▲ or ▼ to select a baud rate of 2.4, 4.8, 9.6, or 19.2 Kbps (2400, 4800, 9600, or 19200 bps). The default setting is 9.6 Kbps (9600 bps). Press **YES.**

P4.2 Parity:

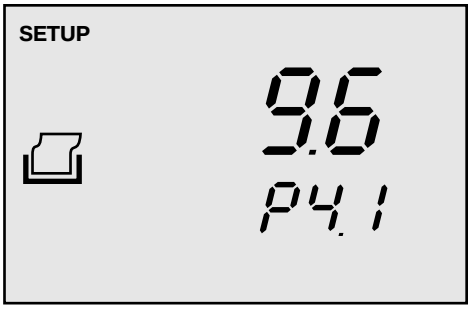
Press ▲ or ▼ to select parity of 2 even, 1 odd, or 0 none. Default setting is 2. Press **YES** to confirm and to go to next program.

P4.3 Stop bit:

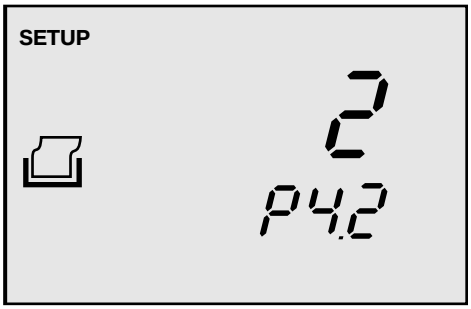
Press ▲ or ▼ to select the stop bit of 1 or 2. Default setting is 2. Press **YES.** Display will automatically return to measurement function **(MEAS).**



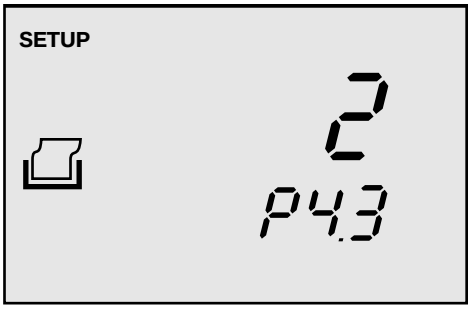
P 4.0: Print meter parameters



P 4.1: Baud rate



P 4.2 Parity



P 4.3: Stop bit

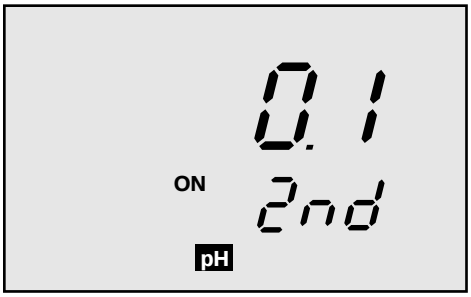
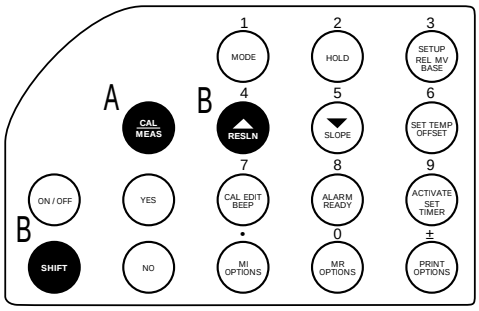


Figure 15



To Switch pH resolution

A. press CAL/MEAS key to enter measurement function (if necessary).

B. press SHIFT key, then RESLN key to see last set resolution (see Figure 14 above).

C. Each time you press SHIFT and RESLN, meter toggles between 0.1 and 0.01.

14. Switching the pH resolution

1. **Be sure you are in the pH measurement function (MEAS).**
2. **Press SHIFT then RESLN.** The display will show the last set resolution **(Figure 15).**
3. **Each time you press SHIFT and RESLN, the meter automatically toggles to the opposite setting.** If you press the keys and the display shows **ON 0.01,** then the resolution will change to 0.1 for the next measurements. If you press the keys and the display shows **ON 0.1,** the resolution will change to 0.01 for the next measurements.
4. The display will only show for a few seconds and then return to the measurement function **(MEAS).**

NOTE: In the mV, relative mV, and Ion concentration modes, the meter automatically displays the highest resolution possible up to 3½ digits.

15. Setting the Ready indicator

The **READY** indicator shows on the display when a reading stabilizes. Select **YES** to turn **READY** indicator on. Select **NO** during titration or when you need to detect instantaneous pH, mV, or ion concentration changes.

1. **Be sure you are in the measurement function (MEAS).**
2. **Press SHIFT and then press READY.** The display will show the last **READY** setting **(Figure 16).**
3. **Each time you press SHIFT and READY, the meter automatically toggles to the opposite setting.** If you press the keys and the display shows **ON,** then the Ready function activates. If you press the keys and the display shows **OFF,** the Ready indicator deactivates.
4. The display will only show for a few seconds and then return to the measurement function **(MEAS).**

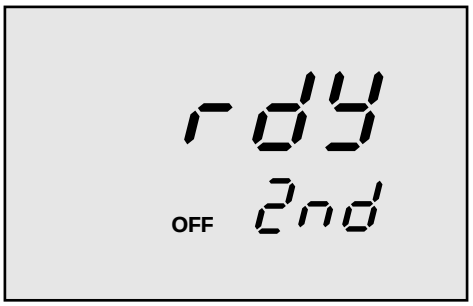
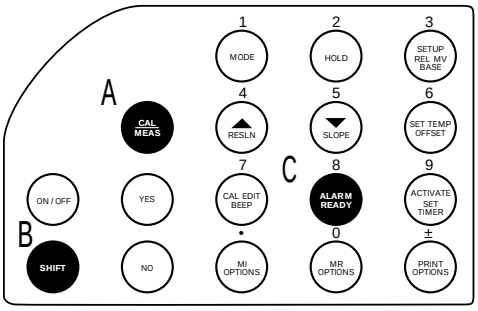


Figure 16



To set READY indicator:

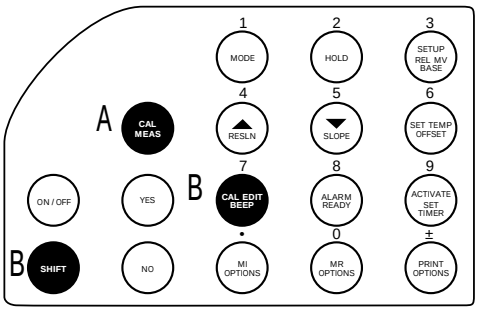
A. press CAL/MEAS key to enter measurement function (if necessary).

B. press SHIFT key, then READY key to see last READY setting (see Figure 15 above).

C. Each time you press SHIFT and READY, meter toggles between ON and OFF.



Figure 17



To set audible beep:

A. press CAL/MEAS key to enter measurement function (if necessary).

B. press SHIFT key, then BEEP key to see last setting.

C. Each time you press SHIFT and BEEP, meter toggles between ON and OFF.

16. Setting the audible beep

If the beep function is set to **ON,** the instrument will beep every time you press a function key.

1. **Be sure you are in the Measurement mode (MEAS).**
2. **Press SHIFT and then press BEEP.** The display will show the last setting **(Figure 17).**
3. **Each time you press SHIFT and BEEP, the meter automatically toggles to the opposite setting.** If you press the keys and the display shows **ON,** then the beep function will go off. If you press the keys and the display shows **OFF,** the beep function will go back on.
4. The display will only show for a few seconds and then return to the Measurement mode **(MEAS).**

17. Offset

The offset reading shows how much the meter has to compensate electronically for the efficiency of the pH electrode. The offset function shows the pH electrode offset value in mV.

The offset is based on the 7.00 pH buffer calibration. If you did not calibrate the 7.00 buffer, the primary display shows a ±20 mV offset from a base of 0.00 mV.

1. Press SHIFT and then OFFSET.

2. The display will then show the offset mV value for a few seconds, and then return to the Measurement mode **(Figure 18).**

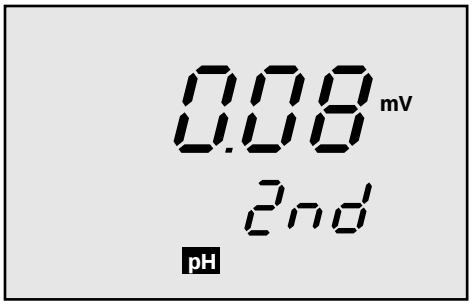
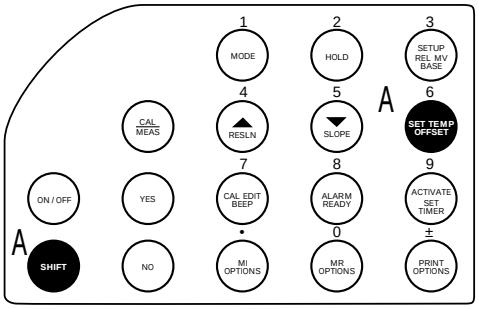


Figure 18



To display OFFSET:

A. press SHIFT key and then OFFSET key.

B. Display will show offset mV value for a few seconds and then return to Measurement mode.

18. Slope

The slope function shows the pH electrode slope as a percentage of the theoretical slope based on the Nernst equation. For ion measurements, the slope is displayed as mV per ten fold concentration increase. Slope displayed is the average slope based on the calibration data. If you have not performed any calibrations, the display will show 100.0.

1. Press SHIFT and then SLOPE.

2. The display will then show the slope percentage for a few seconds, and then return to the Measurement mode **(Figure 19).**

Electrode tip

pH electrode slope will decay over time. Check your slope regularly to know when to replace your electrode before it fails.

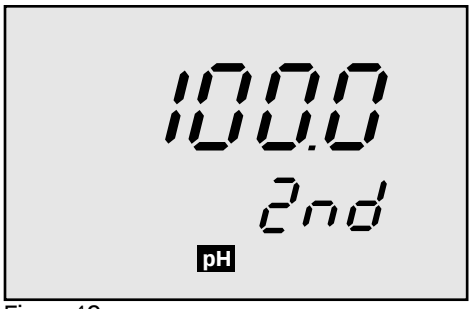
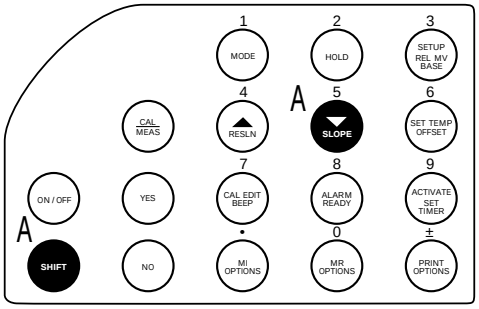


Figure 19



To display slope:

A. press SHIFT key and then SLOPE key.

B. Display will show slope percentage for a few seconds and then return to Measurement mode.

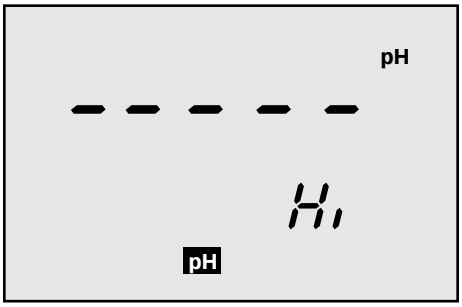
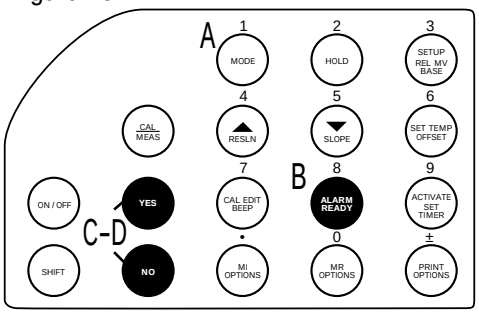


Figure 20



To set high and low setpoint alarm:

A. Select measurement MODE— pH, mV, or rel mV

B. press ALARM key.

C. use numeric keys to enter pH value for high setpoint alarm. Press YES to confirm and scroll to low setpoint alarm; NO to reenter.

D. Use numeric keys to enter pH value for low setpoint alarm. Press YES to confirm; NO to reenter.

19. Setting the high and low setpoint alarm

1. Press MODE to select the Measurement mode for the setpoint, i.e. pH, rel mV, or mV.

NOTE: Ion concentration mode does not have high and low alarms.

2. Press ALARM. If high setpoint has not been entered, the display will show **"- - - -" (Figure 20).**

3. Press the numeric keys to enter a value for the high setpoint. If you made a mistake, press **NO** and enter the value again. Press **YES** to confirm and scroll to low setpoint selection.

4. If low setpoint has not been entered, the display will show **"- - - -"**.

5. Press the numeric keys to enter a value for the low setpoint. If you made a mistake, press **NO** and enter the value again. Press **YES** to confirm and exit to Measurement mode.

To shut off the alarm...
go back into ALARM function and press ± key ***twice.*** *The display will show* ***"---"*** *and the alarm will shut off.*

20. Setting and activating the timer

The instrument provides an internal timer that counts down from 23 hours 59 minutes, and then gives an audible beep. **This function is a timer only and does not activate any other functions.**

1. **Be sure you are in the measurement function (MEAS).**
2. **Press SHIFT and SET TIMER.** If no previous time has been set, the display will show **"- - - -"**. **(Figure 21).**
3. **Set the desired time** from 23 hours 59 minutes. Use the decimal key to separate hours from minutes. For example: to set one minute, the display should show 00.01.
4. **If you make a mistake, press NO** and enter the time value again. Press **YES** to confirm and the display will return to the Measurement mode **(MEAS).**
5. **To begin the countdown,** press **ACTIVATE.** The **MEAS** indicator will flash until the timer reaches 0. The beeper will then sound continuously.
6. **To cancel the beeper sound**, press any key.
7. **To stop a countdown in progress,** press **SHIFT** and **SET TIMER,** and then press the **+/-** key. This cancels the timer setting. Press **YES** to return to the Measurement mode. Press **NO** to keep the previous timer setting while stopping a countdown in progress.

Timer tips

If you attempt to set the desired time to an amount over 23 hours 59 minutes, the meter will beep and ERROR will flash on the display.

The timer will not work if meter is turned off. ***Make sure to turn off the AUTO-OFF function if you wish the alarm to go off more than 30 minutes after the meter has last been operated.***

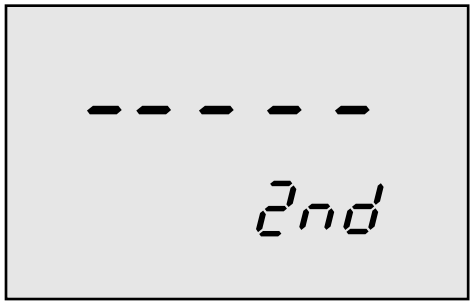
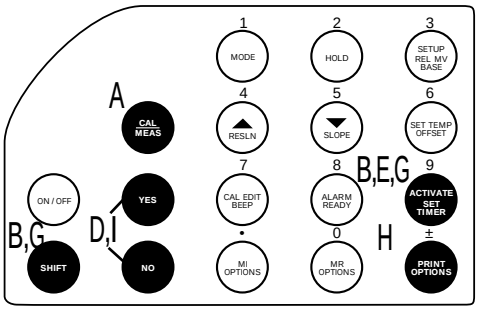


Figure 21



To Print on Time Interval:

A. Press CAL/MEAS key to enter measurement mode (if necessary).

B. Press SHIFT and SET TIMER.

C. Use numeric keys to enter time.

D. Press YES to confirm; NO to reenter.

E. Press ACTIVATE to begin countdown.

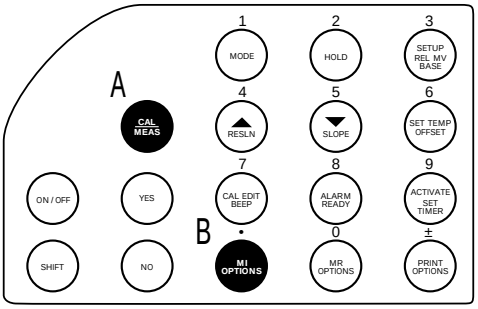
F. When beeper goes off, press any key to cancel.

To Cancel Countdown in progress:

G. Press SHIFT and SET TIMER keys.

H. Press ±key to cancel timer setting.

I. Press YES to return to measurement function; NO to keep previous timer setting while stopping countdown in progress.



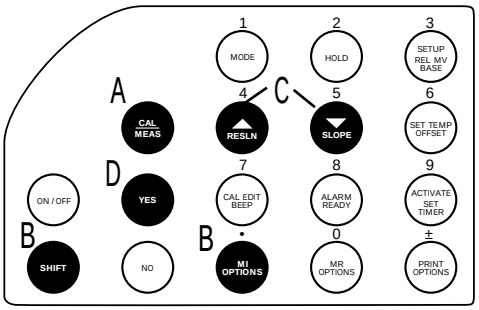
To input readings into memory.

A. press CAL/MEAS key to enter measurement mode (if necessary).

B. press MI key to input any data into memory.



Figure 22



To access memory input on READY option:

A. press CAL/MEAS key to enter measurement mode (if necessary).

B. press SHIFT key and then MI key.

C. use ▲ or ▼ arrows to turn MI READY on or off.

D. press YES to confirm.

E. press MI/OPT to access second option; press CAL/MEAS to return to measurement function.

19. Memory input function and options

Data is stored in sets:

- pH and temperature;
- mV and temperature (includes ion concentration measurements)
- relative mV and temperature.

This meter can store up to 16 sets of data in any combination of values (pH, mV, and relative mV). For example, you can store 7 pH, 5 mV, and 4 relative mV values. The meter uses the last-in-first-out **(LIFO)** method of memory management within each of the three modes, but not between the modes when used in combination.

NOTE: pH/Ion/mV/°C meters store up to 13 sets of data in any combination of values. Ion concentration measurements are stored as mV values.

1. **During any measurement function (MEAS),** press the **MI** key to input any data into the memory.
2. **MEM will flash** for a few seconds on the display. The meter stays in measurement function.
3. **If the memory is full, the first value stored will be erased to create space for the new value.**

Memory options

1st option: Memory input on Ready.

Default is **OFF (Figure 22).** When turned **ON,** the meter automatically sends reading data to memory when the **READY** indicator appears in the display.

1. To access the first **MI** option, press **SHIFT** and then **MI/OPT.**
2. Use the ▲ and ▼ keys to turn on or off the **MI READY.**
3. Press **YES** to confirm.
4. To get to the second option, press **MI/OPT** again. To leave the options and return to measurement function, press **CAL/MEAS.**

If you turn on MI READY...

but you've previously turned the ready function off on your meter (see section 15, page 27) the meter will respond with the blinking ERROR indicator. Turn your READY function ON again (see page 27) and then return to MI READY.

2nd option: Memory input on time interval.
This option allows you to input data into memory at a selected time interval; for example, if you want to maintain a record of reading every hour.

1. To access the second **MI** option, press **SHIFT,** then **MI/OPT,** then **YES.**

2. Use the numeric keys to select the time interval between automatic inputs to interval. **(Figure 23).**

3. After entering your numeric value, press **YES.** The display will return to the measurement function. If you make a mistake, press **NO** to reset the value and enter again.

To remove a previously entered time interval:

1. Press the SHIFT and then the MI key to enter Memory input options.

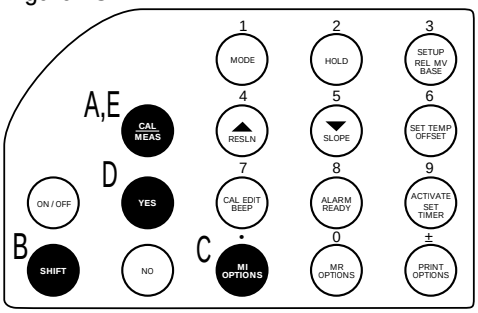
2. Press YES once to enter the Memory input on time interval mode, then **press the +/– key** to erase timer interval (**"-- - --"**).

3. Press **YES** to confirm.

When INPUT TIME INTERVAL is set…
The **MEAS** indicator at the top of the display will blink. Resetting your time interval to **– – –** (see above) will turn this function off and return your **MEAS** indicator to normal.



Figure 23



To access memory input on time interval option:

A. Press CAL/MEAS key to enter measurement function (if necessary).

B. Press SHIFT key and then MI key.

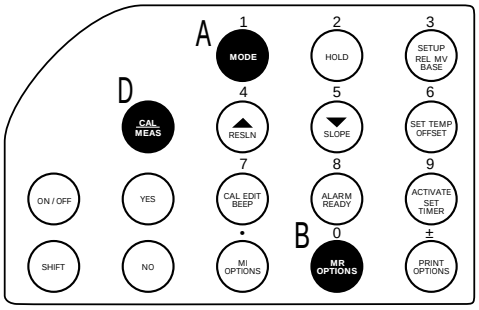
D. Press YES to scroll to second option.

E. Use the numeric keys to input the time interval you wish to print on. Press YES to confirm; No to reenter.

E. press CAL/MEAS to return to measurement function.

22. Memory recall function and options

This function recalls the previous readings stored in the memory.



To recall readings from memory:

A. Set mode to parameter you wish to recall (pH, mV, rel mV).

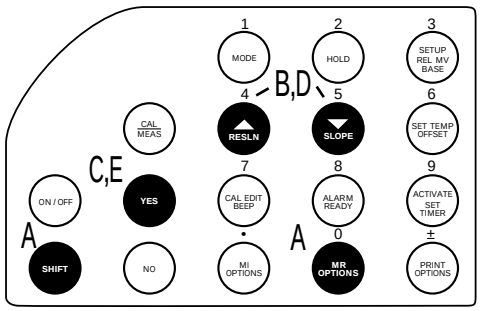
B. Press MR key to recall last reading stored.

C. Press MR key again to recall next to last reading, and so on.

D. Press CAL/MEAS to return to measurement function.

Memory Recall note:
you can only access **MR** in the Measurement mode. When in pH mode, **MR** recalls only stored pH values; mV and Ion Concentration modes recall only stored mV values; and Rel mV mode recalls only stored relative mV values.

1. **Set the mode** to the parameter that you wish to recall (pH, mV, relative mV, or Ion). Ion values are recalled in mV units.
2. **Press the MR key once** to recall the last reading stored. **MEM** will flash on the display.
3. **Press the MR key again** to recall the next to the last reading stored, and so on.
   NOTE: Memory is retained even if the unit is shut off.
4. To prevent accidental clearing of memory, see "Memory clear", memory recall option 2 below.
5. To exit Memory Recall, **press the CAL/MEAS key** to return to measurement function.



To access Memory Recall options:

A. press SHIFT and then MR/OPT key to access options.

B. use arrow keys (▲ and ▼) to turn on or off. ON will sort all memorized data by mode and download to RS-232 output.

C. press YES to confirm and scroll to next option.

D. Use arrow keys (▲and ▼) to turn on or off. ON will clear all memorized values.

E. Press YES to confirm and return to measurement function.

Memory recall options

1st option: Memory download to printer
for RS-232 models only.

Default is **OFF.** Select **ON** to sort all memorized data by mode and download to RS-232 output.

1. To access the first **MR** option, press **SHIFT** and then **MR/OPT.**
2. Use the ▲ and ▼ keys to turn on or off downloading data in memory to RS-232 output.
3. Press **YES** to confirm.
4. To get to the second option, press **MI/OPT** again. To leave the options and return to measurement function, press **CAL/MEAS.**

Option 2: Memory clear.

Select **ON** to clear all values in memory. Default is **OFF.**

1. To access the second **MR** option, press **SHIFT,** then **MR/OPT,** then **YES.**
2. **Use the ▲ and ▼ keys** to clear (**ON**) or leave (**OFF**) all values in memory.
3. After making your selection, press **YES.** The display will return to the measurement function. Press **NO** to reset the value and enter again.

23. Setting up the optional printer and RS-232 output

RS-232 provides an output for transmitting displayed readings to a printer or computer. The data is supplied in ASCII format. ASCII format lets you import data to most popular software programs, and to most printers.

Using the meter with a printer

Minimum printer requirements to print data:

1. A 9 pin RS-232 serial port on printer.

2. Printer should have the option to receive 8 data bits; even (2), odd (1) or none (0) parity bits; and 1 or 2 stop bits.

NOTE: To print data, connect the meter directly to the printer. You do not additionally need to connect the meter to a computer.

Connecting the cable to the meter

1. The RS-232 connector is accessible from the back of the meter **(Figure 24).**

2. Noting the orientation of the RS-232 connector, plug the male connector into the RS-232 port on the meter.

3. Tighten the two screws on the sides of the male RS-232 connector.

Connecting the cable to the printer

1. Locate the cable port on the printer. If the printer has a 9 pin connector, attach the cable as described above in steps 2-3.

2. If the printer has a 25 pin connector, you must use a 25 pin to 9 pin converter. Attach the cable (with converter) as described in steps 2-3 above.

NOTE: For the meter and printer to properly communicate and transfer data, the pin configurations on both units must match. To determine this, compare the pin configuration of your printer (see the printer manual) with the pin configuration of this meter **(see tables at right)**. Since there is no industry standard for the pin configuration on printers, you might need to configure the pins. This can require soldering. Also, jumper boxes and cable-making products are available from most computer stores.

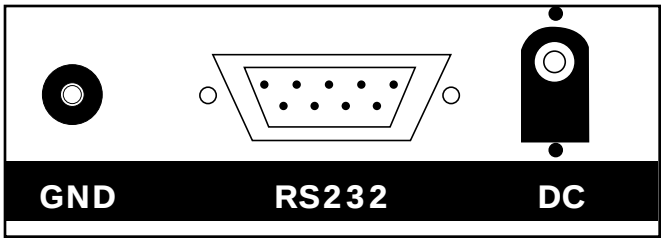


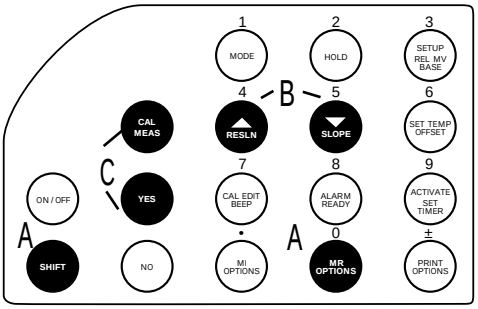
Figure 24

The meter has a 9 pin female RS-232 connector with this configuration:

Pin number	Description
1	—
2	Transmit Data
3	Receive data
4	DSR (Data Send Ready)
5	GND (Ground)
6	—
7	
8	RTS (Request to send)
9	—

If the printer has a 25 pin connector, a 25 pin to 9 pin connector will have to be used. Use the following configuration:

pin number of meter	pin number of printer
2 (TXD)	3 (RXD)
4 (DSR)	20 (DTR)
5 (GND)	7 (GND)



To print stored memory:

A. press SHIFT and then MR/OPT key to access options.

B. use arrow keys (▲ and ▼) to select ON to sort all memorized data by mode and download to printer.

C. press YES and then CAL/MEAS to confirm return to measurement function.

Using the meter with a printer to download stored memory

Use the first MR key option to download all memory to a printer.

1. To access the first **MR** option, press **SHIFT** and then **MR/OPT.**
2. Use the ▲ and ▼ keys to select **ON** to sort all memorized data by mode and download to RS-232 output.
3. Press **YES** to confirm. All data will download to the printer.
4. To get to the second option (lets you clear all values stored in meter memory), press **MI/OPT** again. To leave the options and return to measurement function, press **CAL/MEAS.**

Print function and options

1. **Press PRINT** to send currently displayed data to printer or computer. The PRINT icon will appear **(Figure 25).**
2. **"Error" symbol blinks** if cable is incorrectly attached or setup does not match the PC requirements.
3. **Press CAL/MEAS** to exit error situation. **ON/OFF** will also exit error situation, but also turns off the meter.

Print function options

Option 1: Ready to print.

This option lets you set up the meter to send data to your PC or printer when the **READY** indicator is displayed. Default is **OFF.**

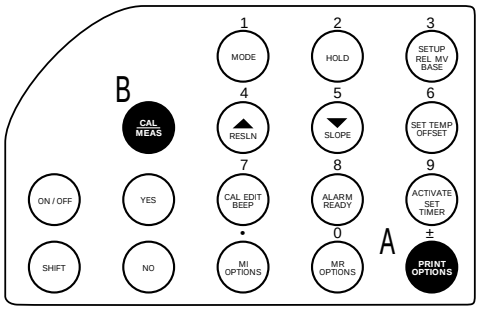
1. To access Option 1, press the **SHIFT** key and then the **PRINT OPT** key.
2. Use ▲ or ▼ to turn this option on or off.
3. Press **YES** to confirm and scroll to next option.

Option 2: Set print time interval.

This option lets you set up the meter to send data to your PC or printer on a set time interval. If no interval is set, the display will show **"- - - -".**

1. To access Option 2, press the **SHIFT** key, then the **PRINT OPT** key, then YES.
2. Use numeric keys to set a time interval up to 23.59. Figure 24 shows a setting with a ten minute interval.
3. Press **YES** to confirm and automatically start the printing countdown.
4. Press **CAL/MEAS** to return to measurement function.

NOTE: To cancel the print time interval, go back into option 2 again, press +/-, and then press YES.



To Print currently displayed data

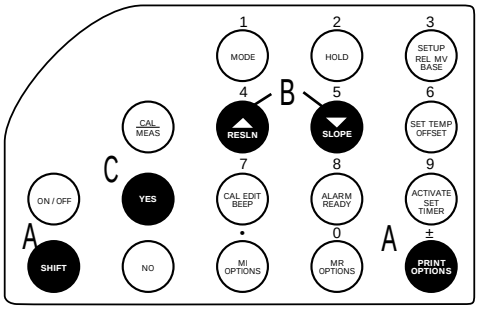
A. press PRINT key.

B. "Error" symbol will blink if cable in incorrectly attached or setup does not match PC/printer requirements.

C. press CAL/MEAS to exit error situation.



Figure 25



To Print on READY or on time interval:

A. Press SHIFT key, then PRINT OPT key.

B. First option—print on READY—appears. Use ▲ or ▼ keys to turn on or off.

C. Press YES to confirm and scroll to print on time interval option.

D. Use numeric keys to set time. Press YES to confirm and start printing countdown.

Using the meter with a computer and the Oakton DAS for Windows®

Minimum computer requirements to run OAKTON DAS for Windows®

- ✔ 386 and above that can run Microsoft Windows® 95 or higher, a CD-ROM drive, and a hard disk with approximately 500 MB free disk space.
- ✔ EGA Monitor and above.
- ✔ Mouse and Mouse Driver Software.
- ✔ 9 pin PC Serial Port Connecting Cable (OAKTON 35615-09 or other).

Introduction

The OAKTON DAS is the NEXT GENERATION in easy to use Data Acquisition Software. The features offered are:

- **Bi-directional communications** so you can monitor, control, and operate virtually all the meter functions and the data acquisition operations directly from your PC—even while you operate other programs!
- **Faster data sampling times** for more frequent sampling when values change rapidly.
- **Easily sets up and configures your meter from your PC** to ensure the meter and PC are using the same communications parameters.
- **View measured values directly on the screen** with automatic updating.
- **Displays alarm and timer status at the PC**.
- Filing options for **importing your data file to virtually any spread sheet or word processing application**.

NOTE: Make sure the meter and mouse are connected BEFORE you start. It is also preferable to turn off the meter's Auto Off function in the Set-up program P 2.1 (see page 24 for instructions). This lets you avoid error messages indicating the meter is in STAND BY mode when the auto off is activated from a period of no activity (30 min.)

Loading the OAKTON Data Acquisition Software

To run the DAS software from the CD-ROM:

1. Use the Windows File Manager or Explorer. Select "File Run" and then type "A:\OAKDAS".

To run the DAS software from your hard drive:

1. Use File Manager or Explorer to create a new directory and copy the contents of the disk to this new directory.
2. Switch to your new directory and double click the "OAKDAS" file or icon to run the application.

MAIN MENU OPTIONS

Six items are displayed at the top of the screen just below the header. these are the MAIN MENU OPTIONS **(Figure 26).** From LEFT to RIGHT these are:



Figure 26

1. **FILE**- Selecting this reveals a window with the options labeled SETTINGS, RUN... , OPEN, CLOSE, and EXIT. OPEN and CLOSE are not active until there are data files available to open or close (OPEN and CLOSE will appear in grey scale to indicate this).
2. **METER PARAM**- Selecting this opens a read only dialog box that indicates all the current settings. These settings will be downloaded to the meter when the program begins running (once 'RUN.....' is selected in the FILE options).
3. **CAL PARAM**- Selecting this lets the meter communicate calibration information to the PC. This option cannot be opened until 'RUN' is selected.
4. **ABOUT**- Selecting this and double clicking Enter opens a read only dialog box that identifies the DAS software, and copy right and trade mark information.
5. ▼ - Select this to minimize the DAS to an on screen ICON labeled 'OAKTON D.A.S.' 'DAS SOFTWARE'. Use this feature when you want to go to another application software and still keep the OAKTON DAS ready for use. Single Clicking on the ICON lets you edit the name under the ICON. Hold the click on the ICON to move the ICON to new positions on the screen.
6. ▲▼ - This symbol identifies the button that lets you quickly resize the DAS window between full size and a smaller prespecified size. When the window is full size this symbol appears as: ▲. This is useful to quickly resize the window when running DAS at the same time as other applications.

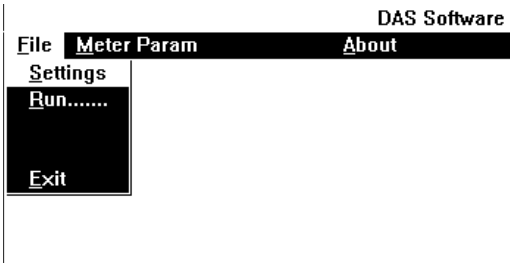


Figure 27

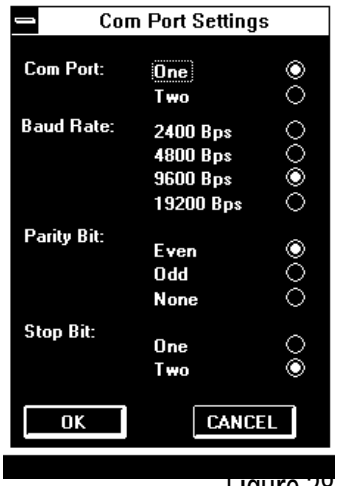


Figure 28

Options under "FILE" menu

A. Settings:

1. Click on FILE and select SETTINGS **(Figure 27).** A window labeled COM PORT SETTINGS will appear **(Figure 28).** This lets you select the RS-232 communications port number (1 or 2), communications baud rate, parity and stop bit.
2. Check the label where the cable connects the meter to the PC to confirm the COM PORT settings are correct.
3. Select the other settings in the COM PORT SETTINGS window to match the printer output configuration on your meter. See Section 13, "setup functions, SELECTING RS 232 parameters, Programs P 4.0 to P4.3" on page 24 to view or change meter parameters.

NOTE: If the COM PORT window settings do not match the meter's RS-232 parameters, the DAS will give you an error message (ERROR STOP NO RESPONSE, and an OK button). To match the settings, press the OK button, and then either change the selections in the meter's set-up program or change the selections in the COM PORT SETTINGS window.

NOTE: The RS-232 settings for meters with Ion Concentration mode are permanently set a baud rate of 9600, parity of 2 and stop bit of 1.

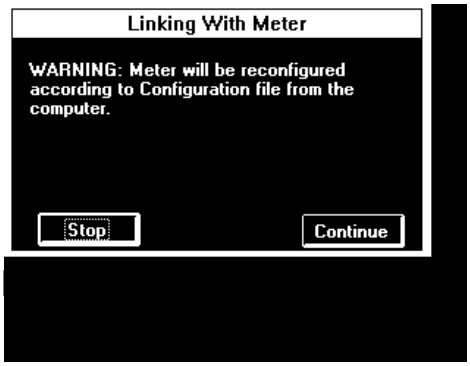
B . EXIT:

1. If you select EXIT, DAS closes and you will return to your main Windows screen.

C. RUN:

This opens the actual DAS operating mode.

1. You will first see a LINKING WITH METER window that warns you that the meter will be reconfigured according to the Configuration file **(Figure 29).** The configuration file combines the COM PORT SETTINGS and the Meter PARAM files.
2. Select the STOP button to cancel the DAS operating mode. If you select STOP you return to the main DAS screen.
3. Or, select the continue button to load the configuration settings and open the DAS operating mode. If you select continue, the DAS will either:
   - show a window that displays each parameter that is loading into the meter.
   - give you a warning ERROR STOP NO RESPONSE with an OK button to press.



If the see a window that displays the meter parameters loading into the meter, wait until the DISPLAY window with "UPDATING DATA" appears. This window will flash to indicate the readings are current and updating constantly. **(Figure 30).** Two rows of function buttons will appear at the bottom of the screen. The CAL PARAM option in the header will also darken, indicating it is available as a selection. DAS is now running.

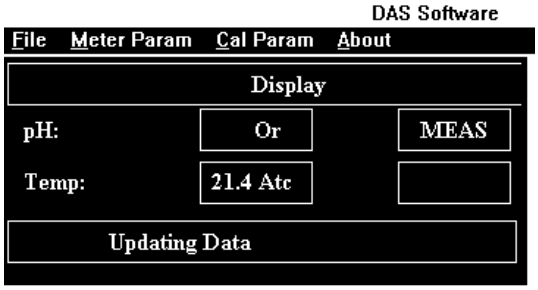


Figure 30

If you see a warning, "ERROR STOP NO RESPONSE," clicking the OK button in the ERROR window will give a message: "linking error check cable and communications parameters" and cause the DAS to go back to the main screen.

To correct the error message, select SETTINGS under the FILE options above and reset the COM PORT SETTINGS. Or, reset the meter's RS 232 parameters to match the selections in the COM PORT SETTINGS window. Select RUN under the FILE options and continue. If you still have error messages, call your OAKTON Distributor for advice.

DATA FILE MANAGEMENT

The OAKTON DAS software lets you log data directly to your computer or to download readings that have been stored in your meter's memory. Logging data directly to your computer allows faster logging rates and unlimited file sizes—-see "Storing Directly to Computer File" below.

Logging data to your meter's memory allows you to store readings even when you don't have immediate access to a computer; however, you are limited to 16 readings (13 with the pH/Ion/°C meter)—see "Downloading Memory from Meter" on page 44).

Storing directly to computer file

OPEN Window (under the FILE menu)

While the DAS is in the RUN mode (see page 41), the OPEN and CLOSE operations under the FILE options are available. The OPEN option lets you store data for retrieval and use in other application software programs.

When you select the OPEN option under the FILE menu, a DATA window opens that displays the current readings, date and time. OPEN file, CLOSE file and LOG TIME buttons also appear **(Figure 31).**

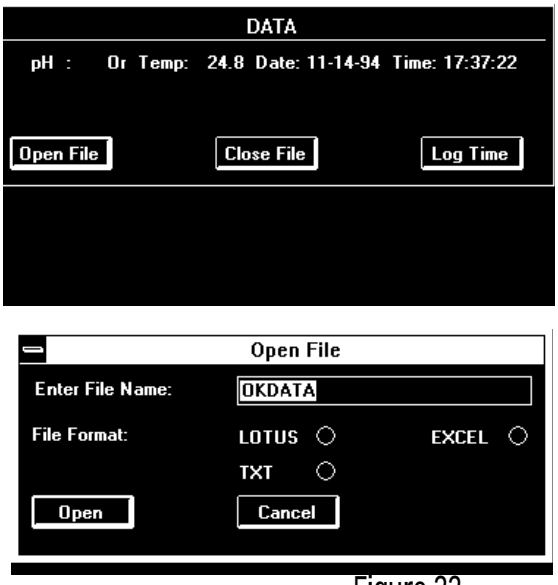


Figure 32

OPEN FILE button

Selecting OPEN FILE opens a window with a text area for you to name a file, and three optional file formats to select **(Figure 32).**

1. Type a file name in the "Enter File Name" area. Type a new name for a new data file. Type an existing name to append an existing data file.
2. Use the file format selection feature to quickly format your files so they can more easily be imported to your application software. If you are using Lotus or Excel, select the correct format. Select TXT file format for general purpose use in other word processing applications.
3. After selecting a file name and file format, click OPEN.
   - If you used an existing file name, when you click OPEN you will see a message that asks it you want to append the existing file. Click yes to add the data you are collecting to the existing file in chronological order. Click no to start a separate data file; you then need to name a new file in the"Enter File Name" area.

- If you used an existing file name or a new file name, you will see a window that reads, "For continuous logging, set auto shut off option off." This is a reminder to disable the automatic shutoff feature that shuts meter down after 30 minutes. Use the A-O/Reset button to disable Auto-off.

4. You now have opened a data file where readings can be stored either automatically or manually.
   - To manually store readings, press the PRINT key on the meter.
   - If you want to set the meter to download on a time interval to the PC, click the LOG TIME button (see below for directions).
   - As long as you want to download readings from the meter memory, leave the data file window open. Directions for downloading memory from the meter are in the "MEMORY OPTION button: PRINT ALL MEMORY" section on page 44. You can also set data-logging on a time interval from the "MEMORY OPTION button: METER DATALOG ON TIME INTERVAL" section—see page 45 for directions.

CLOSE FILE button

Selecting CLOSE FILE in the DATA window shuts down the data file. You will no longer be able to automatically or manually download data to the data file.

LOG TIME button

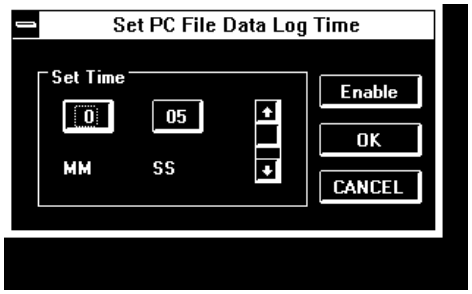
This button lets you set the approximate time interval for datalogging from your PC.

1. Click the LOG TIME button in the DATA window. This opens the SET PC FILE DATA LOG TIME window **(Figure 33).**
2. Highlight the ENABLE button to activate the datalog on time function.
3. Use the mouse to select the Minutes (MM) or Seconds (SS) time interval buttons.

NOTE: Logging intervals are approximate and will vary by a few seconds per reading as the communication between the computer and the meter is not instantaneous.

4. Use the ▲ and ▼ arrows to adjust these values to an appropriate time interval to store your data in your newly named PC data file.
5. Press OK to confirm the setting or Cancel to cancel the setting. Either button will close the SET PC FILE DATA LOG TIME window.

Once you have opened a data file, you MUST leave the DATA window open as long as you want to automatically or manually download readings to your data file!



Downloading memory from meter

To download readings stored in the meter's memory, click the MEMORY OPTIONS button on the bottom of the computer screen.

NOTE: You can store readings to memory either through the MEM IN button located on the meter keypad, or from the MEM IN button located at the bottom of the computer screen.

The MEMORY OPTIONS button also lets you clear all memory in the meter, select Datalog on Ready indicator, or select Datalog on time interval from the meter.

MEMORY OPTIONS button.

Selecting this button will open a series of four windows with options for you to select. These are:

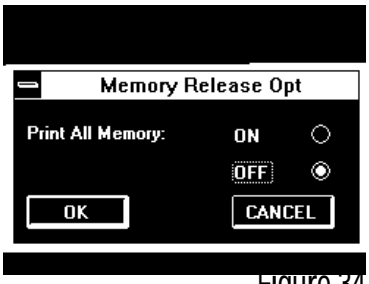


Figure 34

A. Memory release opt: PRINT ALL MEMORY
This window lets you download all memory in the meter.

1. Select ON or OFF for the PRINT ALL MEMORY operation to download all readings in the meter's memory to the PC **(Figure 34).**
2. If you press ON and then press OK, the computer displays the Meter Memory Data Window. This window displays all readings stored in the meter. It has a SAVE button that lets you save the stored data to an existing file, and a CANCEL button to exit this window.
   - If you have set up an existing file, when you press SAVE the data will download into that file.
   - If you have not set up an existing file, when you press SAVE you will see a window stating, "No file is opened" with an OK button. See the "OPEN FILE" section on page 42 for directions on how to create and open a file for data storage from the meter.

NOTE: if no memory is stored in the meter, the Meter Memory Data Window will display, "All memories are empty."

3. Press OK or CANCEL to exit the PRINT ALL MEMORY window and move on to the next window.

B. Memory Release Opt: CLEAR ALL MEMORY

This window lets you select ON or OFF to clear all memory and erase the readings stored in the meter's memory **(Figure 35).**

1. Select ON or OFF to select whether to clear all memory data from the meter .
2. Press OK to enter this setting into the system. Press the CANCEL button to cancel this change to the setting.

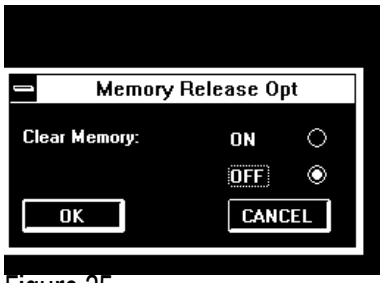


Figure 35

C. Memory In Opt: DATALOG ON READY

This window lets you select DATALOG ON READY function ON or OFF. If this function is turned on, the meter stores readings in the meter's memory each time the READY indicator displays (indicates a stable reading) **(Figure 36).**

1. Select ON or OFF to select whether to turn on DATALOG ON READY.

NOTE: If you select ON while the READY indicator is turned off, you will see a window that says to turn the READY indicator on. See page 49 for directions.

2. Press OK to enter this setting into the system. Press the CANCEL button to cancel this change to the setting.



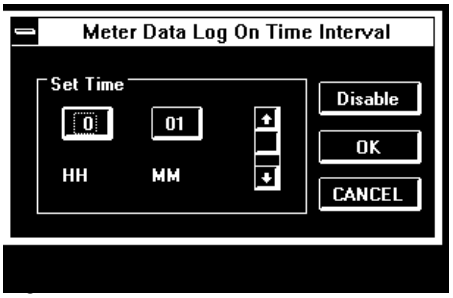
D. METER DATALOG ON TIME INTERVAL

This button lets you set up the DAS and meter to automatically datalog to the PC on a time interval **(Figure 37).** This lets you accumulate large data files for manipulation later.

1. Click the ENABLE/DISABLE button to toggle it between ENABLE and DISABLE. ENABLE indicates that the meter will datalog on a time interval; DISABLE indicates that the meter will not datalog on a time interval.
2. When ENABLE is displayed, use the mouse to select hours (HH) or minutes (MM), and then use the ▲ and ▼ arrow keys to enter the datalog time interval.

NOTE: Logging intervals are approximate and will vary by a few seconds per reading as the communication between the computer and the meter is not instantaneous.

3. Press the OK button to confirm all selections. To return to previous settings, press the CANCEL button.
4. To stop datalogging, open the Meter Data Log On Time Interval window again, then select DISABLE and OK.



CAL PARAM

Select CAL PARAM at the top of the screen to view a window that shows all the calibration data **(Figure 38).**

NOTE: Although you can view calibration data from the screen, you need to perform calibration functions from your benchtop meter.

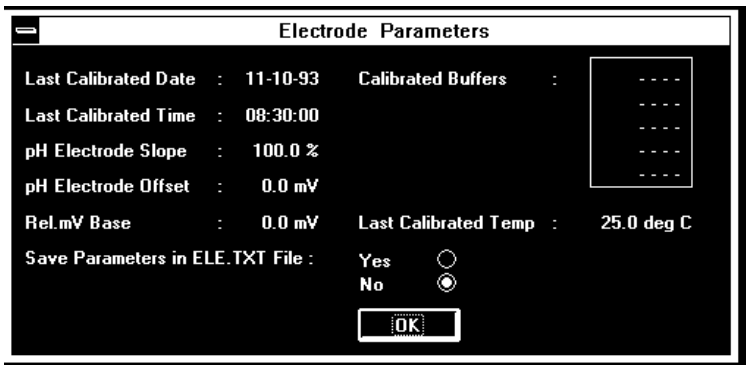


Figure 38

The "Electrode Parameters" window shows all the calibration data: Last Calibration date, Last Calibration Time, pH Electrode Slope, pH Electrode Offset, relative mV base, a list of the calibration buffers used in calibration, and Last Calibration Temperature.

NOTE: You may save this file as ELE.TXT, a text file that you can import to your other application software for a record of the calibration. Click YES or NO to select the save function. Click OK to close this window. The file will save to the directory where the DAS is located.

introduction
keypad functions
starting up
calibration
measurement
temperature
setup functions
resolution/ READY/offset/ slope
alarm/ timer
memory input/recall
printing/ RS-232
electrode care and maintenance
trouble shooting/error messages
pH buffer temperature tables
specifications/ accessories
warranty/ return items

DAS CONTROL BUTTONS

The DAS control buttons are located along the bottom of the screen.

OFF button:
Careful: this causes the DAS to stop running and return to the main screen of the DAS. To return to the DAS running mode, select RUN under the FILE menu.

MEAS button:
Use this to exit calibration functions and return to measurement mode from the PC.

MODE button:
Use this to select measurement mode from the PC: either pH, mV, Rel mV or Concentration. A window noting the mode change will appear for an instant.

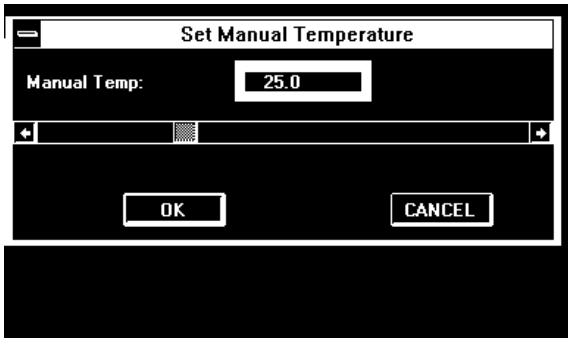
HOLD button:
Freezes the readings from the PC. Press it again and it returns the meter and DAS displays to updated readings.

MEM IN button:
Memory Input. Use this to manually store a reading in memory from the PC.

MEM OPT button:

SEE "DATA FILE MANAGEMENT" on page 44.

SET TEMP button
This opens a window for setting the temperature value for manual pH temperature compensation **(Figure 39)**.



1. Click and hold the mouse and drag the slider to the temperature position you want. Use the arrow keys on the sides of the slider for finer incrementation. Watch the numeric display of the selected value to choose the appropriate manual temperature setting.
2. Press OK to enter this setting into the system. Or, press the CANCEL button to cancel this change.

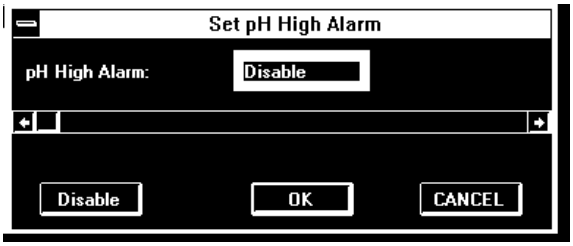


Figure 40

ALARM button

This button opens a series of two windows that let you select the high and low alarm set points. **(Figure 40).** The measurement mode that the meter and DAS system are in determines the alarm type shown in the window.

For example: the pH measurement mode lets you set pH alarms, the mV measurement mode lets you set the mV alarms, etc.

NOTE: There are no alarm settings in Ion concentration mode.

The following description uses the SET high pH Alarms as an example, but all modes follow the same principles.

A. SET pH HIGH ALARM window has a slider to control the selection of the alarm value.

1. Press the DISABLE/ENABLE button at the BOTTOM of the window until ENABLE is displayed.
2. Place the arrow over the shaded slider button and position it at the value for the pH High alarm Observe the numerical display at the top of the window to verify this value. Use the arrow keys at the sides of the slider for finer incrementation.
3. Press OK to enter this setting into the system Press the CANCEL button to cancel this change. When you press the OK or Cancel button, the window will close and the SET pH LOW ALARM window will appear.

B. SET pH LOW ALARM window operates exactly the same as the SET pH HIGH ALARM window.

NOTE: You cannot set the High pH Alarm setpoint lower than the Low pH Alarm setpoint.

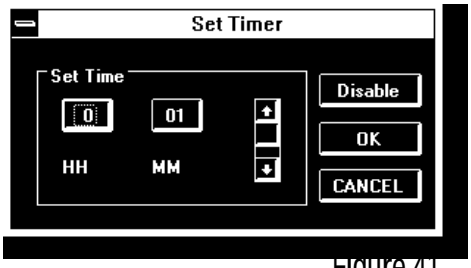


Figure 41

SET TIMER button

Clicking this button causes the SET TIMER window to appear **(Figure 41).** To set the timer:

1. Press the DISABLE/ENABLE button until ENABLE is displayed .
2. Click on the hours (HH) or Minutes (MM) buttons to select the intervals you want to adjust.Use the mouse arrow on the ▲ and ▼ arrows on the display to set the time for the timer.
3. Press OK to enter this setting into the system. Press the CANCEL button to cancel this change to the setting. Whether you press the OK or Cancel button, the window will close.

ACTIVATE button

Starts the timer countdown.

NOTE: If there is no time interval set for the timer, an error message "METER TIMER NOT SET. GO SET TIMER' is displayed with an OK button. Press the OK button to close the message window.

When a time interval is set, you will see a brief message, "please wait meter is enabling the timer". After this message disappears, the timer is running. A continuous beep will signal when the time is up. A message window stating, "timer status timer is activated" and an OK button will appear. Click the OK button or press the activate button on the meter to deactivate the beep.

NOTE: To disable timer, click the SET TIMER button and click the DISABLE/ENABLE button to DISABLE.

READY button

Opens a window that lets you select whether the Ready indicator is on or off **(Figure 42).**

1. Use the mouse to select Ready ON or OFF.
2. Press OK to enter this setting into the system. Press the CANCEL button to cancel this change to the setting. Whether you press the OK or Cancel button, the window will close.

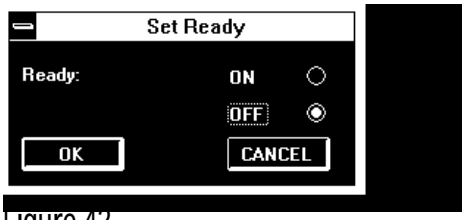


Figure 42

RESLN button

Opens a window that lets you select the pH resolution as 0.1 or 0.01pH **(Figure 43).**

1. Use the mouse to select 0.1 or 0.01pH.
2. Press OK to enter this setting into the system. Press the CANCEL button to cancel this change to the setting. Whether you press the OK or Cancel button, the window will close.

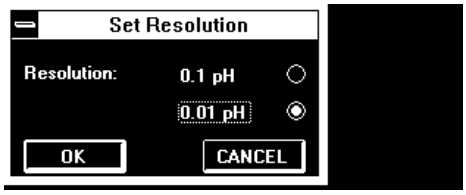
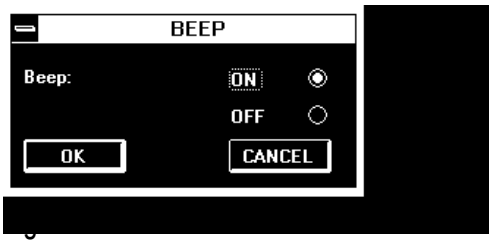


Figure 43

BEEP button

Opens a window that lets you turn on or off the meter's audible beep that confirms function activation **(Figure 44).** This does not affect the alarm or timer beep; these will still audibly beep at the appropriate times.

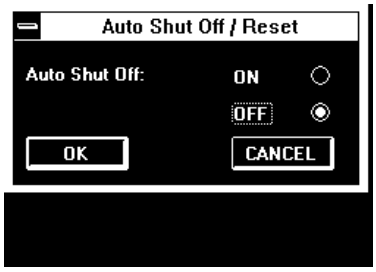
1. Use the mouse to select beep ON or OFF.
2. Press OK to enter this setting into the system. Press the CANCEL button to cancel this change to the setting. Whether you press the OK or Cancel button, the window will close.





DRIFT/MIN button

Opens a window that displays the electrode's drift per minute. This is a view only window. This window displays the electrode drift in the current measurement mode. For example: if the meter is set for the pH mode electrode drift is displayed in pH/min; if it is set for mV, rel mV or ion modes, electrode drift is displayed in mV/min. Press OK to close the window **(Figure 45).**

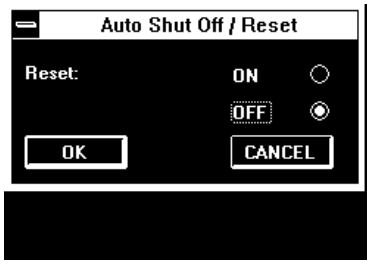


AUTO OFF AND RESET button

Opens a series of two windows:

A. The first Window lets you select whether the Auto Shut Off function is ON or OFF **(Figure 46)**.

1. Use the mouse to select auto off ON or OFF.
2. Press OK to enter this setting into the system. Press the CANCEL button to cancel this change to the setting. Whether you press the OK or Cancel button, the window will close.



B. The Second Window lets you select whether the RESET is ON or OFF **(Figure 47).** Resetting the meter is a quick way to reconfigure meter for a new electrode.

NOTE: Selecting ON and pressing the OK button will erase ALL memory and calibrations, and reset the meter to all default parameters! The meter will shut off and go to standby mode. A message window will appear indicating the meter is in standby mode. If you press the OK button, you will return to the main DAS screen. Select RUN under FILE options and Continue in the next window to return to DAS in the running mode.

1. Use the mouse to select Reset ON or OFF.
2. Press OK to enter this setting into the system. Press the CANCEL button to cancel this change to the setting. Whether you press the OK or Cancel button, the window will close.

DATE/TIME button

Opens a series of two windows that let you set the date and time shown on the DAS. The first Window is the SET DATE window **(Figure 48).**

1. Use the mouse to select year (YY) , month (MM) or day (DD) for adjustment.
2. Select the ▲ and ▼ arrows to change the values displayed.
3. Press OK to enter this setting into the system Press the CANCEL button to cancel this change to the setting. Whether you press the OK or Cancel button, the window will close.and the second window will display.

The second window is the SET TIME window.

1. Use the mouse to select Hours (HH) minutes (MM) or seconds (SS) for adjustment.
2. Use the mouse to operate the ▲ and ▼ arrows to change the values displayed.
3. Press OK to enter this setting into the system Press the CANCEL button to cancel this change to the setting. Whether you press the OK or Cancel button, the window will close.

DATE and TIME DISPLAY buttons

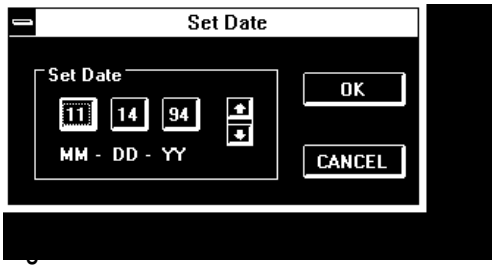
The last two buttons in the lower right hand corner are read only displays of the date and time.

EXITING OAKTON DAS

CLOSE (under FILE options)

Select CLOSE in FILE options. The display window and buttons will close. Then select EXIT under FILE OPTIONS.

Excel, Microsoft—Reg TM Microsoft Corp.
Lotus 123—Reg TM Lotus Development Co.



24. pH Electrode care and maintenance

Because your pH electrode is susceptible to dirt and contamination, clean it every one to three months depending on the extent and condition of use.

NOTE: for Ion Selective Electrode care, consult the instruction manual included with your electrode.

pH electrode storage

For best results, always keep the pH bulb wet. Use the protective rubber cap filled with electrode storage solution to store your electrode. Also, you can store in a pH 4 buffer with 1/100 part of saturated KCl. *Other pH buffers are OK for storage, but NEVER use distilled water for storage.*

After measuring

1. Rinse the pH electrode and reference junction in de-ionized water.
2. Store the electrode as recommended above in "Storage," or as recommended by the manufacturer.

To reuse the pH electrode:

Rinse the liquid junction with de-ionized water and tap dry—**never wipe electrode dry.**

NOTE: If this does not restore electrode to normal response, see "*Reactivating the electrode" below*.

pH electrode cleaning

Salt deposits: dissolve the deposits by immersing the electrode in tap water for ten to fifteen minutes. Then thoroughly rinse with distilled water.

Oil/grease film: wash electrode pH bulb gently in some detergent and water. Rinse electrode tip with distilled water, or use a general purpose electrode cleaner.

Clogged reference junction: heat a diluted KCl solution to 60 to 80°C. Place the sensing part of the electrode into the heated solution for about 10 minutes. Allow the electrode to cool in some unheated KCl solution.

Protein deposits: prepare a 1% pepsin solution in 0.1M of HCl. Set the electrode in the solution for five to ten minutes. Rinse the electrode with distilled water.

Reactivating the pH electrode

If stored and cleaned properly, your pH electrode should be ready for immediate use. However, a dehydrated bulb may cause sluggish response. To rehydrate the bulb, immerse the electrode in a pH 4 buffer solution for 10 to 30 minutes. If this fails, the electrode requires reactivation. ***Never touch or rub glass bulb. Contact builds up an electrostatic charge.***

WARNING:
Only qualified persons proficient with the safe handling of dangerous chemicals should perform the procedure below. Provide proper containers, fume hoods, ventilation, and waste disposal. Safety goggles and protective clothing must be worn while performing this procedure. If possible, replace with another electrode instead of performing this reactivation procedure.

1. **Dip or stir the pH electrode** in alcohol for 5 minutes.
2. **Leave the electrode in tap water** for 15 minutes.
3. **Dip and stir the electrode** in concentrate acid (such as HCl or H_2S0_4) for five minutes.
4. **Repeat step 2.**
5. **Dip and stir in strong base** (NaOH) for five minutes.
6. **Leave for 15 minutes** in distilled or deionized water.
7. **Now test with standard calibration buffer solutions** to see if the electrode yields acceptable results. You may repeat step 3 through 6 up to three times for better response. If the response does not improve, then your electrode is no longer functioning—replace with a new electrode. Call your OAKTON Distributor.

25. Error messages

LCD display	Indicates	Cause	Solution
Err. 1 **(on primary display) + 2 short beeps.**	Memory write error.	Unit too old (> 10 years) or hardware failure.	Turn meter off and then on. Return if needed.
Err. 2 **(on primary display) + 2 short beeps.**	Memory checksum error.	Hardware failure.	Turn meter off and then on. Return if needed.
Err.3 **(on primary display) + 2 short beeps.**	ADC error.	Hardware fault.	Turn meter off and then on. Return if needed.
Err. 4 **(on primary display) + 2 short beeps.**	Keypad error.	One or more keys on the keypad are stuck.	Turn meter off and then on. Return if needed.
Err. 5 **(on primary display) + 2 short beeps.**	Real time clock failure.	Hardware failure or unit > 10 years old.	Turn meter off and then on. Return if needed.
No display + 2 short beeps.	ADC error.	Hardware fault.	Turn meter off and then on. Return if needed.
Err. **annunciator + 2 short beeps.**	Wrong keypad.	You pressed the wrong keypad.	Release key. Select correct function.
Electrode icon & buffer icon blink. Err annunciator on. + 2 short beeps.	Calibration error.	Wrong buffer used during calibration.	Check if right buffer selected OR input correct buffer value OR use fresh buffer solution.
Printer icon & Err annunciator blink + 2 short beeps	Not able to print.	Printer is off or cable is faulty.	Check cable connections and printer settings.

If it is necessary to return a meter, please see “Return of Items,” page 58.

26. Troubleshooting

Problem	Cause	Solution
Power on but no display.	A. AC adapter is not connected properly.	A. Connect AC adapter properly.
	B. AC adapter supply voltage is not enough.	B. Replace AC adapter with new one.
Unstable reading.	A. Electrode not deep enough in sample.	A. Place electrode deeper in sample.
	B. Broken electrode.	B. Replace electrode.
	C. External noise or induction caused by nearby electric motor.	C. Remove or switch off interfering motor.
	D. Dirty electrode.	D. Clean electrode. Reactivate, if needed.
Slow response.	Dirty electrode.	Clean electrode. Reactivate, if needed.

27. pH buffer/temperature table.

Temperature		pH buffer values		
°C	**°F**	**4.01**	**7.00**	**10.00**
0	**32**	4.01	7.12	10.33
5	**41**	4.01	7.09	10.25
10	**50**	4.00	7.06	10.18
15	**59**	4.00	7.04	10.11
20	**68**	4.00	7.02	10.05
25	**77**	4.01	7.00	10.00
30	**86**	4.01	6.99	9.95
35	**95**	4.02	6.98	9.92
40	**104**	4.03	6.98	9.88
45	**113**	4.04	6.97	9.85
50	**122**	4.06	6.97	9.82
55	**131**	4.07	6.98	9.80
60	**140**	4.09	6.98	9.77
70	**158**	4.12	6.99	9.73
80	**176**	4.16	7.00	9.69
90	**194**	4.20	7.02	9.66

When to use the pH buffer/temperature table:
Refer to this table when using manual temperature compensation (see section 12, page 20). Use CAL/EDIT function (see section 4, page 11) to adjust the buffer calibration to the value corresponding to your temperature.

28. Specifications

Mode	pH	Temperature	mV	Ion
Range	-2.00 to 15.99	0.0 to 100.0°C	–1999 to 1999 mV (same for rel mV)	0 to 9999 concentration units
Resolution	0.01 or 0.1 pH	0.1°C	0.1mV up to ±399.9mV 1mV beyond ±399.9mV	±1 least significant digit
Accuracy	±0.01 pH	±0.5°C	±0.2mV up to ±399.9mV ±2mV beyond ±399.9mV	±0.5% of reading
Calibration	Up to 5 buffers	Offset 0.1°C	Offset up to ±1999 mV	Up to 5 points
Temperature Compensation	ATC or manual 0.0 to 100.0°C	—	—	—

pH slope adj. range: 80 to 120%

Calibration: Up to 5 customizable pH points or concentration values (all push button calibration). pH calibration also features auto buffer recognition at 5 common pH buffer values. Meter also features push button adjustment for temperature

Rel. mV offset range: ±1999 mV

Recorder output: ±1999 mV (directly proportional to input)

RS-232: 9 pin female, selectable baud rates 2.4, 4.8, 9.6 kbps (2400, 4800, 9600, 19200 bps); selectable stop bit (1 or 2); selectable parity (odd/1, even/2, or none/0). Ion selective benchtop meters have a fixed baud rate of 9600, stop bit of 2, and parity of 1

Printer requirements: Accepts serial output as per RS-232 specifications above

Computer requirements: 386 and above that can run Microsoft Windows® 95 or higher, a 3.5" (1.44 MB) or 5.25" (1.2 MB) disk drive, hard disk with approx. 500 KB free disk space, EGA monitor or above, 9-pin serial port connecting cable, mouse.

Input impedance: $>10^{12}\ \Omega$

Display: Dual display (measurement plus temp and mode annunciators)

Connectors: pH/mV use BNC connector; temperature uses mini-phono plug; RS-232 uses 9 pin female; recorder uses mini-pin (submini phono plug)

Operating temperature: 0 to 50°C (32 to 122°F)

Power: 9 V, 500 mA AC adapter (110 or 220 VAC)

Dimensions: Meter only: 9" x 7" x 2⅜" (229 x 178 x 61 mm);
Boxed: 15½" x 3½" x 10" (394 x 89 x 254 mm)

Weight: 1.25 lbs/0.6 kg (meter only); 3 lbs/1.4 kg (boxed)

29. Accessories

Call your OAKTON® Distributor for ordering information.

35615-05 ATC probe.
35615-09 Printer cable for RS-232 printer output, 9 pin
35615-07 Replacement 110 VAC power adapter.
35615-08 220 VAC power adapter.
35801-00 OAKTON® replacement general purpose pH electrode.
35801-71 OAKTON® replacement "All-in-one", sealed general purpose pH electrode, with built-in temperature element.
35801-70 OAKTON® "All-in-one" refillable general purpose pH electrode with temperature element.
35801-72 OAKTON® "All-in-one", sealed double junction pH electrode with built-in temperature element.
00654-01 pH 1.68 calibration buffer
00654-00 pH 4.00 calibration buffer.
00654-04 pH 7.01 calibration buffer.
00654-08 pH 10.01 calibration buffer.
00654-12 pH 12.45 calibration buffer.
35622-00 Printer, 110 VAC
35622-05 Printer, 220 VAC

Consult your OAKTON® Distributor for a complete selection of pH and ORP electrodes, solutions, holders, and accessories.

NOTE: Remember to check the temperature calibration when replacing the ATC probe or when using with an OAKTON® "All-in-One" combined pH and temperature probe. See section 12, page 20, "Automatic Temperature Compensation (ATC) and Manual Temperature Compensation."

30. Warranty

We warrant this product to be free from significant deviations in material and workmanship for a period of one year from date of purchase. If repair or adjustment is necessary and has not been the result of abuse or misuse within the one year period, please return, freight prepaid, and correction will be made without charge. Out of warranty products will be repaired on a charge basis.

31. 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.
NOTE: We reserve the right to make improvements in design, construction, and appearance of products without notice.