

User's Guide



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The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, human applications.

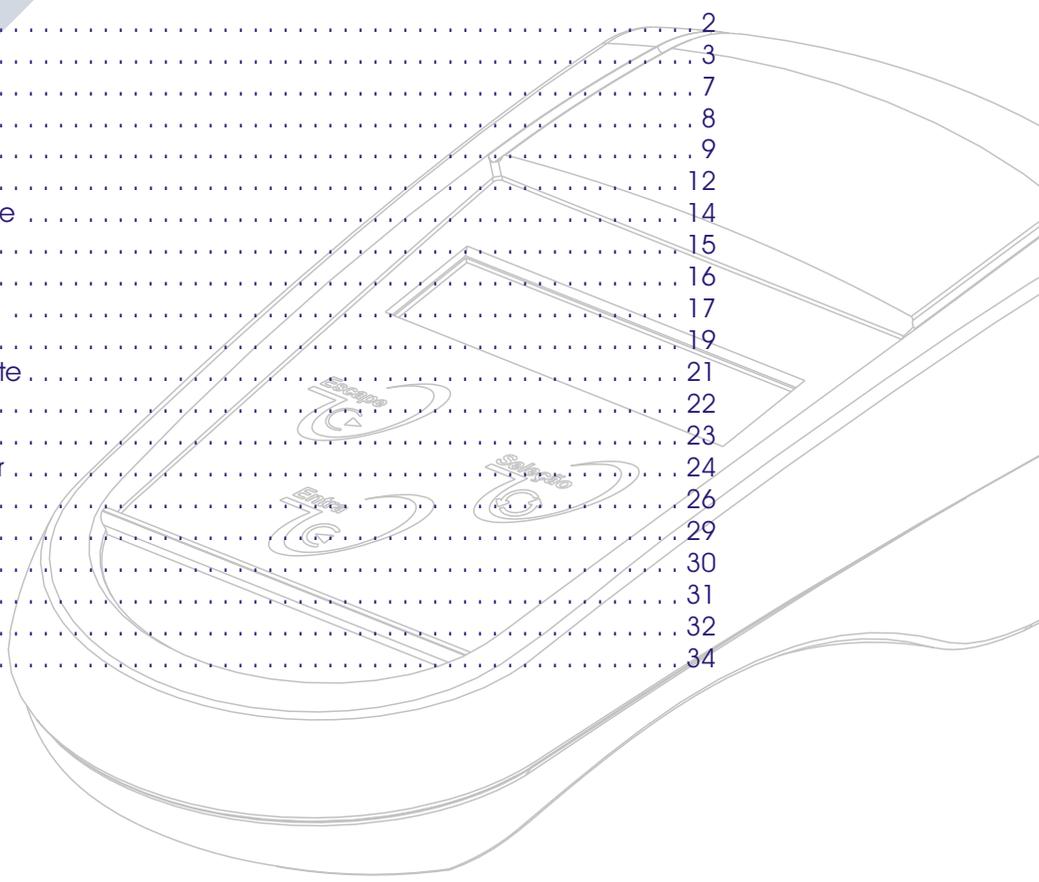
Instruction Manual

Portable pHmeter

PHB21

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2. Specifications



- pH / ORP / Temperature
- Simple 3 keys operation
- Automatic Resolution Selection
- Electrode automatic Check
- Continuous or Hold Readings
- Non-Volatile Memory, even when turned off sustains the set up programmed
- Automatic Calibration for all parameters
- Manual or Automatic Temperature Compensation
- Maximum and Minimum Sound Alarm
- Recognizes Buffer
- Battery Charge Automatic Monitored
- 99 points Datalogging
- 110/220Vac Capability (AC Adapter)
- Supplied with Glass Electrode, Buffers and Carrying Case

pH	
Range	-2,00 to 20,00 pH
Resolution	0.1 / 0.01 pH
Relative Precision	0.01 % (full scale)

mV	
Range	± 1999 mV
Resolution	1 mV
Relative Precision	0.05 % (full scale)

Temperature	
Range	20 to 120 °C
Resolution	0.1 °C
Relative Precision	0.08% (full scale)

General	
Input Impedance	1013 Ω
Isopotential Adjust	± 50%
Sensibility Adjust	80 to 120 %
Temp. Compens. Auto / Manual	-20 to 120 °C
Display	Alphanumeric 2 lines x 16 characters
Datalogging	Up to 99 Readings
Alarms	maximum and minimum
Dimensions L x H x D (mm)	100x75x180
Weight	0.45 kg
Enclosure	IP-67
Power	9Vcc Battery
Battery Life	60 hours

Accessories	
Glass pH Combined Electrode	PHE-21R
Buffer Solutions	4.01 pH and 7.00 pH
Alkaline Battery	9 V
Instruction Manual	CD

Optional	
Thermocompensator	PHE-22R
Redox Electrode	ORE-22R
Depth Probe	PHE-221
AC Adapter	CDH-30PW (110/220Vac 50/60Hz)

3. PH Measurement

Stable chemical compounds, are electrically neutral when mixed with water.

In order to form a water solution, dismember in positive or negative charged particles.

These charged particles are called "ions". When we apply differential potential in two electrodes immersed in a solution, it is possible to verify that positive ions (H⁺, Na⁺ and more) will migrate to the negative terminal, that is why we call them cations. The reverse happens with negative ions (OH⁻, Cl⁻ and more) that will migrate to the positive terminal and we call them anions. The ions freedom to migrate thru a solution is measured with the solution "**Electrical Conductivity**". Chemical compounds that produce conductive solutions are called "**Electrolytes**". Those that totally dissociate (strong acids, strong bases and salt) are called "**Strong Electrolytes**".

The others whose dissociation is not big (acids and weak bases) are called "**Weak Electrolytes**". For an hypothetical chemical compound "MA" that dissociates in cations **M⁺** and anions **A⁻**, the reaction can be written as:



The arrow indicates that exists a balance between MA not dissociated and the ions M⁺ and A⁻ dissociated.

The extension that this reaction moves to the right or left, varies from one compound to the other and with the solution Temperature.

For a specific temperature, there is a relation between the ions activity and the non dissociated molecules, that can vary between 0 up to 100%. This relation is called K Dissociation and it is expressed by the equation:

$$K = aM^+ \cdot aA^- / aMA \text{ (EQ-1)}$$

Where: K = CTE dissociation.

aM⁺ = ions activity M⁺.

aA⁻ = ions activity A⁻.

aMA =dissociated molecules activity MA.

For Chloridric acid, the "K" is practically infinity, caused by the complete dissociation for ions H⁺ and Cl⁻. So it is a strong acid:



On the other hand, Acetic acid has a low "K". Reacts as the following way:



Few hydrogen ions result at the solution, so the acetic acid is an weak acid when the most present ion is the OH⁻, the solution is alkaline.



The sodium hydroxide is totally dissociated, this is the reason for being a **STRONG BASE**. On the other hand the Ammonia Hydroxide (NH₄OH) do not dissociate too much, this the reason for being a **WEAK BASE**.



As we can see, for both acids and bases the strength of a solution depends on the H⁺ or OH⁻ ion numbers available that depends not only on the compound concentration at the water, but also on the "K" dissociation. Pure water dissociates for ions H⁺ and OH⁻, but it is very weak.



The water molecules number dissociated is low, in comparison with the non dissociated, so we can consider as an activity of HOH equal to 100%.

3. PH Measurement (cont.)

At 25°C the "K" dissociation of water has a value of 10 where we can take (EQ-1) that is the activity product (aH+) by (aOH-) is equal to ion OH-, the solution is neutral and activities of H+ and OH- must be both of 10 mols / L.

If a strong acid, such as HCl, is added to water, many ions H+ are added; this should reduce the number of ions OH-. For example: if added HCl until the OH+ activity turns 10-2 the OH- activity must turn 10-12. The hydrogen potential scale is Established by a definition merely operational, the acid degree or activity of ions H+ will be expressed by therm "pH" (Hydrogenionic potential).

The pH will be defined as:

$$pH = -\log |aH+|$$

If the activities of ion H+ is 10-x so pH is "x". For example, at pure water @ 25°C, the hydrogen ion activity is 10-7, so the pH is 7 @ 25°C. An acid solution has more ions H+ than OH-. So the ions H+ activities will be bigger than 10-7, being, 10-6, 10-5 and more. The pH of an acid solution by definition, must be lower than 7, will be 6, 5, 4...

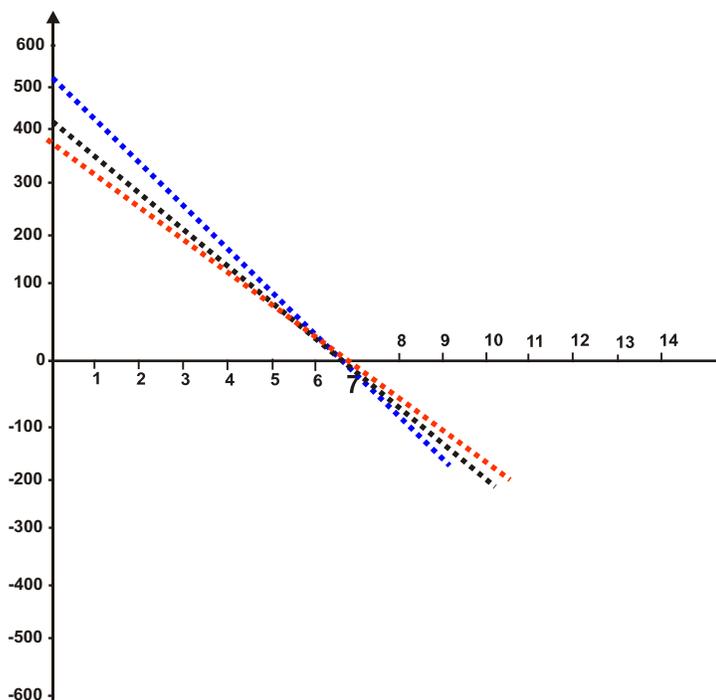
If the OH- number exceed the number of ions H+ the H+ activity must be lower than 10-7, being, 10-8, 10-9 and more... The pH will be bigger than 7, will be 8, 9, 10...

To avoid solution ionic concentration modification being measured it is necessary that the current that goes thru the circuitry composed by the galvanic cell (pH electrode) be minimum (I < 1pA), such as the voltage drop caused by the internal resistance of the same electrochemistry cell being null, not to cause measuring errors. Such condition restrict the choice to Choose the instrument to a "HIGH IMPEDANCE VOLTMETER". The instrument will have a scale graduated in pH, calibrated by glass electrode and a reference electrode based on the relation between the pH and the electromagnetic force Of the cell.

$$E = E0 - KT (pH)$$

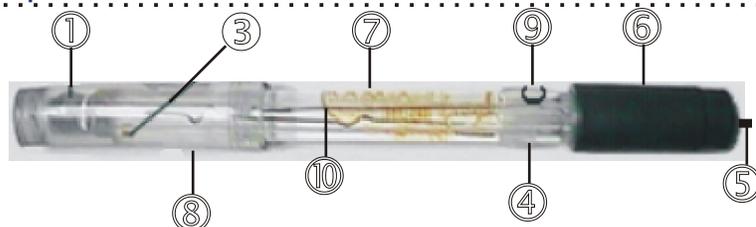
Above equation, define the equation of a line, whose decline is -KT and whose origin ordenate is E. The electrode must have a zero volts point (isopotential), that can be achieve performing a correspondence to 7 to zero volts, to any temperature, using a internal BUFFER at the glass electrode, whose pH variation with the temperature compensates to the temperature variation at the electrode.

The approximate decline of the line mV / pH involves the factor adjustment of factor KT @ 59.16 mV decade of pH, @ 25°C by controlling the equipment "SENSIBILITY" that does the decline around the isopotential. The temperature compensator is applied to correct the decline based on real sample temperature, varying the definition of the instrument, relating to a 1pHunit, from 54.20 mV @ 0°C up to 66.10 mV @ 60°C.



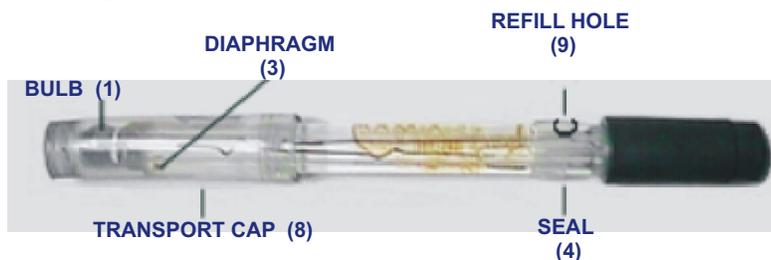
3. PH Measurement (cont.)

Electrode Description



- 1 - **pH sensing Bulb** - rugged construction, in order to avoid ease breakage.
- 2 - **Glass Body** - chemically inert.
- 3 - **Punctual Ceramic**.
- 4 - **Seal** - ease operation for electrolyte solution filling.
- 5 - **Low Noise Cable** - assuring stable readings..
- 6 - **Polypropylene Cap** - chemically aggressively resistant.
- 7 - **Ionic Barrier** - avoid contamination with solutions that contain Silver, Mercury, Sulfite, etc.
Avoid AgCl precipitations. Provides quick readings on temperature variations.
- 8 - **Transportation Cap** - contains reference electrolyte solution for transportation or storage.
- 9 - **Electrolyte Fill Hole** (on refillable electrodes only).
- 10 - **Argent Reference**.

Electrode Usage Instruction



- 1 - Before using the electrode, verify it's body for possible mechanical defects or cracks and in case it occur, replace it immediately.
- 2 - Take off the transportation cap and rinse the electrode with distilled water, remove eventual crystallization at the diaphragm (3). The transportation cap must always be used when transporting the electrode, avoiding dehydration of the bulb (1).
- 3 - Remove the seal (4) in order to establish Atmospheric Pressure (only applicable for refillable electrodes) and close it again.
- 4 - Eliminate possible air bubbles that may occur internally at the bulb (1), by shacking the electrode vertically.
- 5 - On Refillable electrodes, the electrolyte level must be at a maximum of 10 mm below the hole (9).
- 6 - Always refill, when necessary, the electrolyte level with 3 MKCl thru the hole (9). On Bridge Electrolytic Electrodes, with the proper bridge (see table 1) thru the hole (9).
- 7 - When the Electrode is not in use, always immerse into electrolyte reference.
- 8 - To measure, just immerse the electrode into the sample, covering the diaphragm (3).
- 9 - Switching from one solution to other, always wash electrode with distilled water.

3. PH Measurement (cont.)

Buffer Solutions

.....
These are solutions that resist the pH variations, by effect of adding acids or bases and/or by dilution, all happening like if they had an acid reserve and/or alkaline. Selected solutions are used as standard for calibration of pH meters based on operational definition. They are fixed points that define the pH scale. Composed, usually, by a weak acid mixed with its own strong base salt. The KCl is a neutral salt, so does not interfere at the pH value. It can be used to raise the conductivity at the sample, in case we are measuring a weak electrolyte.

Supplied in 475ml Bottles (other volumes upon request)

OMEGA offers the following Buffer Solutions:

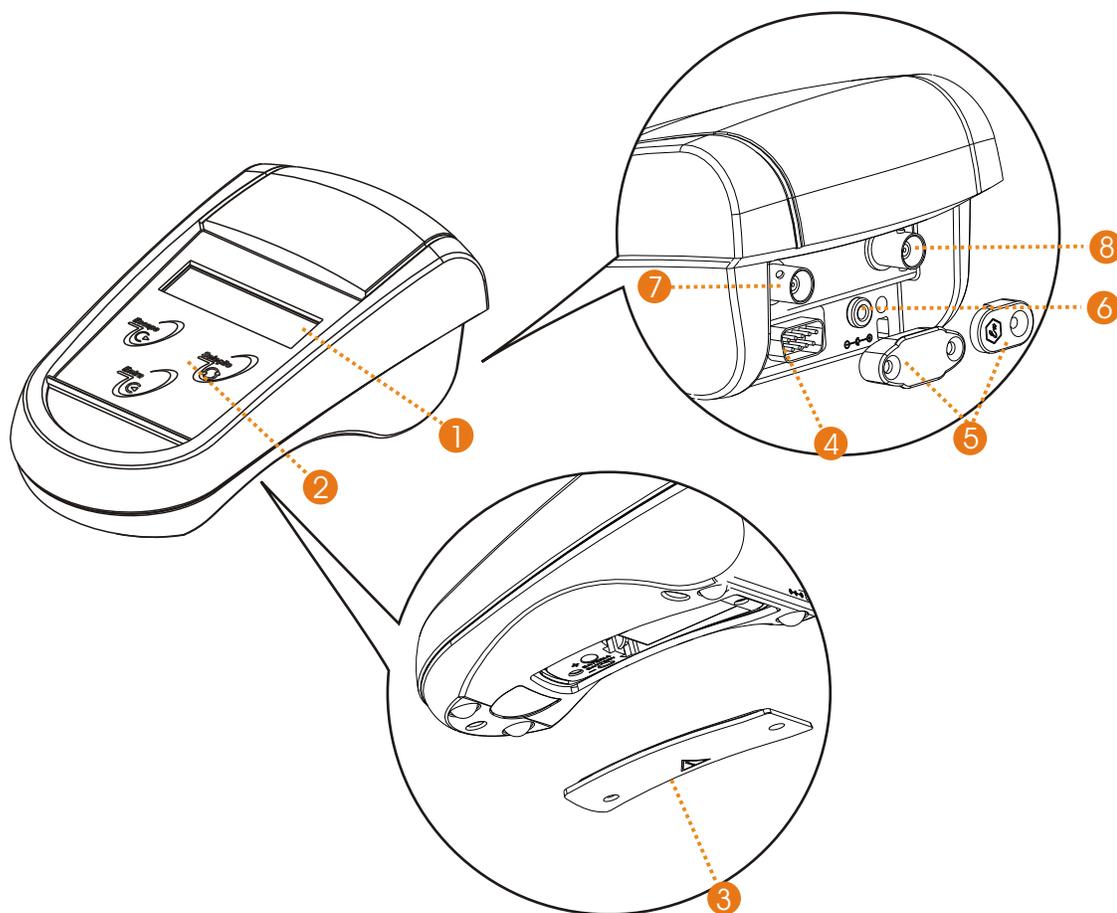
PHA-4	4.01pH
PHA-7	7.00pH
PHA-10	10.01pH

4. MV Measurement

Oxide Redox Potential Measurement

In order to measure potential redox it is used metallic electrodes, generally Platinum or Silver. This type of electrode refers to chemical reactions in solutions that operate only by electrons transference. Such reactions occur with composed elements presenting two or more oxidizing stages. Ex.: $\text{Fe}^{2+} / \text{Fe}^{3+}$. The redox measurement applications in a determined process, complies with previous knowledge of certain factors: presence of infectants capable of competing with the main redox reaction, approximate values of the ions activity coefficients entering the final equation of the potential differential, approximate speed of the reaction to be controlled, necessary or not to control the pH. At Oxide reduction systems where the ions H^+ take part at the reaction, the redox potential depends on the pH. In order to obtain a complete description of such systems it is necessary to indicate, besides the reference electrode, the pH value. The temperature has two effects over the redox potential. First it enters as a factor over the logarithm of **NERNST** equation. This means that a determined reason of the ionic activity, the electrode will develop a different potential. Second, the temperature influence the ionic activity on each ion of the solution.

5. Parts Description



Items Description

- 1 -Display: Alphanumeric 2 Lines x 16 characters
- 2 -Membrane Keyboard
- 3 - Battery Lid cover
- 4 - Serial Output RS-232
- 5 - Protection lids for field protection usage
- 6 - ACAdapter output
- 7 - BNC Connector: pH Electrode Inlet
- 8 -BNC Connector: Thermocompensator Inlet

6. Equipment Operation

To turn ON the equipment, press and hold **<ENTER>** key. Make sure the power cord is plugged correctly! The menus are self-explanation with it's respective options, selected by pressing the **<SELECT>** key. After making your selection (flashing option), using **<SELECT>** key, press the **<ENTER>** key to confirm Your selection. This manual will represent the Flashing Option always in **Blue Color**. In case of any error or if you decide to change your selection, press the **<ESCAPE>** key to move the screen one step back so you can make the necessary changes, or hold this key for about 5seconds in order to turn OFF the equipment, until the message "SWITCH OFF? YES / NO" shows off on screen.

SETUP OPERATION

This equipment is supplied with a non-volatile memory (E2PROM), to store it's operational set up (resolution, reading mode, calibration, etc).

Even if **disconnected** from it's power supply, it **will not** loose the information saved for work!

Before you start to work with this equipment, please review the setup, so you can program the equipment based on your application!

After powering the equipment on, by pressing and holding **<ENTER>** key, the equipment will perform an Auto Check and will then stop at Main Menu (Select Function) with options for the user to Select the desired Function. pH function will be flashing as a default. Press **<SELECT>** key to move around until you reach the desired selection (flashing option) then press **<ENTER>** key to access the sub-menu were you will find the SETUP FUNCTION (SET.). Press the **<SELECT>** key until SET is flashing, then press **<ENTER>** key to confirm it. The equipment will prompt for a password, press the following keys in sequence **<SELECT><ENTER><ESCAPE>** and follow the instructions on the display.

Always use **<SELECT>** key to move around the options and press **<ENTER>** key to confirm this option.

Refer to page 12 for description of Set Up Screens.

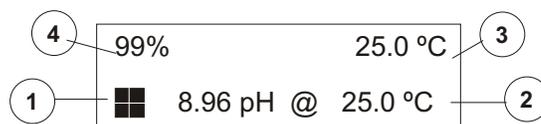
CHECK OPERATION

The Check Sensor option is very useful, it gives the user the conditions to check the sensibility of the sensor. The operation is self-explanatory! From main menu press the **<SELECT>** key to choose the desired function, then press **<ENTER>** key to confirm. Select option Check, then press **<ENTER>** key to confirm option. The display will guide you thru the process.

READING OPERATION

Under this operation, you'll find CALIBRATION and READING options. If you want to calibrate the sensor, press the **<SELECT>** key to select the Calibration option (flashing option - CAL), then press **<ENTER>** key to confirm. The program will guide you step by step on how to calibrate the sensor. If you need to use the READING option, press the **<SELECT>** key to select READ (flashing option), then press **<ENTER>** key and the display will show the following format:

- 1 - The Prompt signal will flick at each reading.
- 2 - The Measured Value and Reference Temperature (chosen at setup).
- 3 - Sample Temperature.
- 4 - Electrode's Sensibility.



6. Equipment Operation (cont.)

IMPORTANT INFORMATION

1 - In case you want to quit Reading operation, press and hold **<ESCAPE>** key for about 5 seconds in order to be recognized by the equipment. This time is necessary to certify the user desires to quit this mode.

2 - When the equipment is turned on again, the set up will follow initial conditions including the changes prior to when it was turned off.

To turn off the equipment, press and hold **<ESCAPE>** key until the message to Switch Off shows on screen, then by pressing **<SELECT>** key, choose YES to turn if off or NO to continue working and press **<ENTER>** key to confirm the option chosen.

BASIC OPERATION

The menus are self-explanatory for easy operation. To input new information or change the pre-seted information, the menu offers flashing options, selected by **<SELECT>** key and confirmed by **<ENTER>**.

The **<ESCAPE>** key is used to change options or to correct data (every time the user press **<ESCAPE>** The screen will move back one step or one option).

This manual will represent the Flashing Option always in **BLUE Color**.

6. Equipment Operation (cont.)

Basic Operations

1 - The software offers self explanatory menus for easy interaction with the user. The menu shows the selected option as Flashing. Use the **<SELECT>** key to modify the flashing option and select a different one, then press **<ENTER>** to confirm it.

2 - In case of a mistake, or data modification or to return to a prior menu, press **<ESCAPE>** key. While at Reading Mode, press and hold **<ESCAPE>** key for about 5 seconds in order to exit this mode. This is necessary in order for the instrument understand that the user really desires to exit the Reading Mode.

3 - The equipment stores the configuration on a non volatile memory (E²PROM). Even when turned off, the last set up Configuration will be stored.

Turning On the equipment

1 - Turn on the equipment by pressing **<ENTER>**. The display will show the following menus until reached the Main Menu.

Press **<ENTER>** key to turn if on

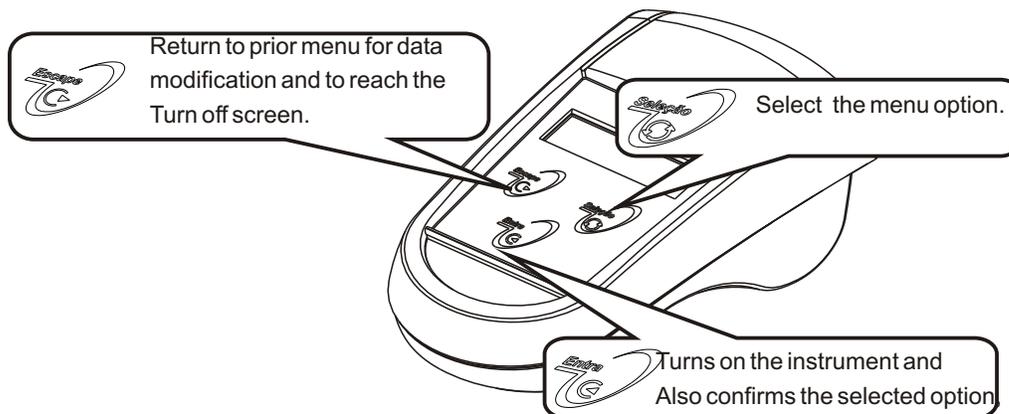
OMEGA
PHB21 - V1.0

Program performs electronic check

=====
===

Main Menu

SELECT FUNCTION
pH mV °C



Every time you see the symbols ">" or "<", that means that the user can adjust the displayed value up or down.

To increase the value press **<SEL>** key until ">" flashes, then press **<ENT>** to confirm, then press **<SEL>** key and at every touch the value will increase by one unit.

To decrease the value press **<SEL>** key until "<" flashes, then press **<ENT>** to confirm, then press **<SEL>** key and at every touch the value will decrease by one unit.

If a mistake is made, press **<ESC>** key to return and correct the value!

If user press and holds **<SEL>** key, the units will move faster, but be careful when gets closer to the desired number, as you can miss it and if that happens, press **<ESC>** key to move back and Correct the mistake.

6.1. Equipment Operation pH - Set Up

Press **<SELECT>** key until option pH flashes, then press **<ENTER>** key to confirm the option chosen.

SELECT FUNCTION
pH mV °C

Press **<SELECT>** key until option Set Up flashes, then press **<ENTER>** key to confirm the option chosen.

pH: READ /
SET UP/CHECK

A password is required to access the Set Up mode. Press in sequence <SELECT>, <ENTER>, <ESCAPE>.

PASSWORD
- - -

Program will display the battery life left.

BATTERY
=====

User has the option to choose the desired language. Press **<SELECT>** key until the desired option flashes, then press **<ENTER>** key to confirm the option chosen.

LANGUAGE:PORTUG.
ENGLISH/SPANISH

This Screen is default and cannot be changed.

RANGE
-2 TO 20 pH

Select the Resolution by pressing **<SELECT>** key. Option chosen will flash. Then press **<ENTER>** key to confirm option chosen.

RESOLUTION
0.1 0.01

Option to choose how many calibration points you need. Press **<SELECT>** key until desired option flashes, then press **<ENTER>** key to confirm chosen option.

CALIBRATION
POINTS: 2/3/4/5

User can fully adjust the Buffer values. In order to get to know how to change the values, please refer to page 12.

ISO = 7.00pH <>
SENS. = 4.01pH <>

User can instruct the instrument to inform that calibration is needed.

INFORM CALIBR.?
Yes / No

User can program the number of readings, before instrument prompts for calibration. Refer to page 12 on how to adjust the number.

INFORM AFTER:
200 READINGS <>

User can choose Reference Temperature as of 20C or 25C.

REF. TEMPERATURE
20°C / 25°C

User can choose between the following Reading Modes:
Continuous - Read continuously after time is set
Average - Reads the average after time is set
Hold - user must press **<ENTER>** key to Read

READING MODE
CONT/AVER./HOLD

User can program the time between Readings. Refer to Page 12 for instructions on how to adjust this time.

TIME BETWEEN READ
5s <>

A
Go to Page 14

6.1. Equipment Operation pH - Set Up (cont.)

User can program the display to show information like Barr graph, Keyboard Beep, Stability Beep and more.

User can choose if desire to have Barr graph shown above the Reading screen. When Bar Graph is displayed, the information about Sensibility and Sample Temperature will not be displayed!

User can now adjust the Minimum and Maximum values for the Bar Graph. Refer to Page 12.

User can choose if instrument would Beep when Stability is reached during Read Mode or Not.

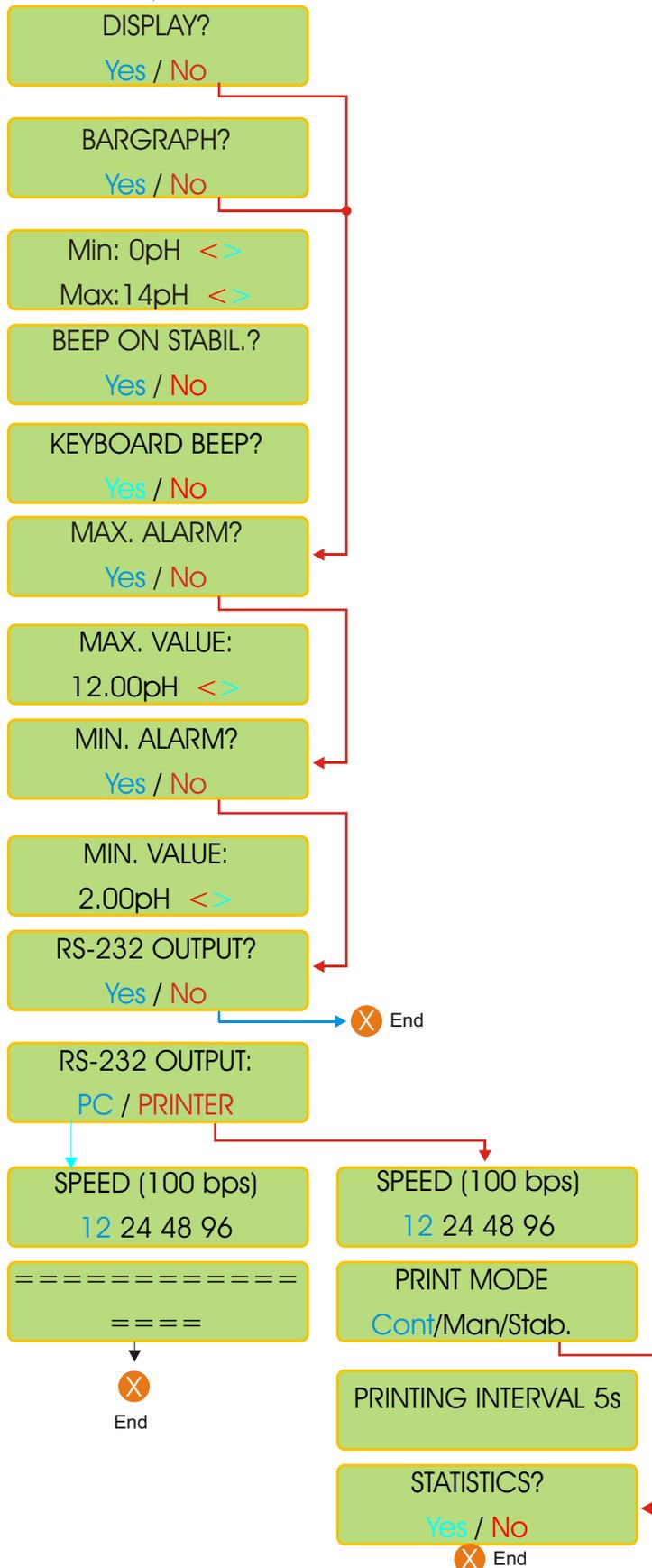
User can choose if instrument would Beep on Keyboard touch or Not.

During this sequence, user will be able to choose alarms and also adjust it's values. Will be able to choose if RS 232 is needed and if connected to a PC or a Printer.

Press **<SELECT>** key until desired option flashes, then press **<ENTER>** key to confirm the option chosen.

In order to adjust the values, refer to page 12.

A From page 12



Printing Mode
CONT.: Print continuously (based on the printing interval chosen)
MAN.: Prints the Read value just after pressing **<ENTER>** key. But only after the read value is stabilized (an arrow is displayed).
STAB.: Prints only one time, after the reading is stabilized (an arrow is displayed).

6.2. Equipment Operation pH - Calibrate

Press **<SELECT>** key until option pH flashes, then press **<ENTER>** key to confirm the option chosen.

SELECT FUNCTION
pH mV °C

Press **<SELECT>** key until option Read flashes, then press **<ENTER>** key to confirm the option chosen.

pH: READ /
SET UP/CHECK

Press **<SELECT>** key until option Calibrate flashes, then press **<ENTER>** key to confirm the option

pH: READ /
CALIBRATE/REG

If a thermo is attached to the instrument, Manual will be displayed and user will have the option to adjust the Temperature Compensation. Refer to page 12.

TEMP. COMP.: Man
25°C <>

Dip electrode into 7.00pH Buffer. This buffer value was chosen at Set Up Operation.

PLACE ELECTRODE
BUFFER 7.00 pH

Then press **<ENTER>** key to confirm the option chosen.

READY?

Wait.

=====

Remove the electrode from 7.00pH Buffer and wash it using deionized water.

WASH ELECTRODE
READY?

Dip electrode into 4.01pH Buffer. This buffer value was chosen at Set Up Operation.

PLACE ELECTRODE
BUFFER 4.01 pH

Then press **<ENTER>** key to confirm the option chosen.

READY?

Wait.

=====

The Sensibility of the electrode will be displayed

=====

Wash the electrode using deionized water, then press **<ENTER>** key to continue.

WASH ELECTRODE
READY?

Use is prompted to go to sample, if desired, press **<ENTER>** key, if not, press **<ESCAPE>** key.

GO TO SAMPLE!
READY?

If the user had chosen Minimum or Maximum Alarm during the Set Up Mode, the values will be displayed.

MIN. ALARM:
->3.60pH @ 25°C

The reading will be displayed.

100% 25°C
->3.60pH @ 25°C

Reading display, when the bargraph function was chosen Durign Set Up Mode.

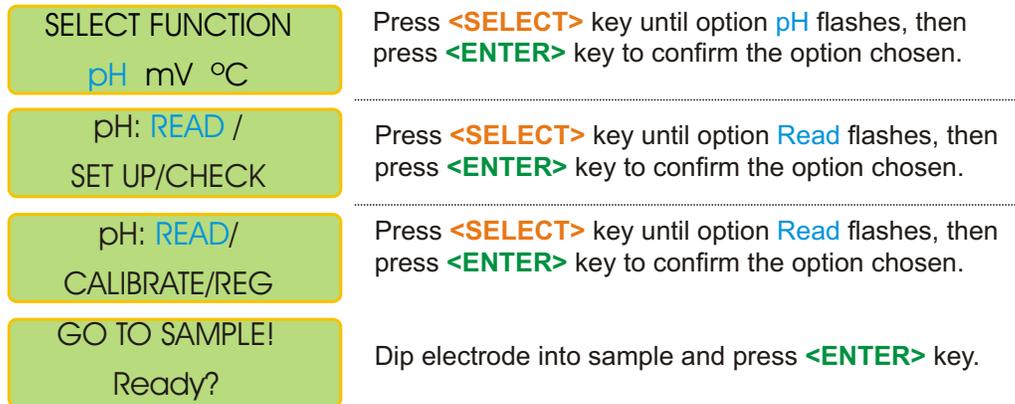
=====

If user press and hold **<ESCAPE>** key in order to exit the reading Mode, program will confirm if can end the report and print the final results thru RS 232.

END REPORT?
Yes / No

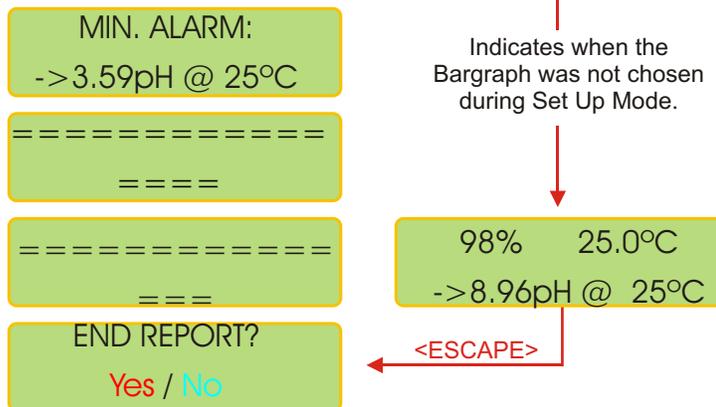
<ESCAPE>

6.3. Equipment Operation pH - Read



If the user had chosen Minimum or Maximum Alarm during the Set Up Mode, the values will be displayed.

Example for Reading, when the bargraph was chosen during Set Up Mode



The End Report screen will only be displayed if user had chosen to use RS 232 during Set Up Mode. If user press and hold <ESCAPE> key in order to exit the reading Mode, program will confirm if can end the report and print the final results thru RS 232.

6.4. Equipment Operation pH - Check

Press **<SELECT>** key until option pH flashes, then press **<ENTER>** key to confirm the option chosen.

SELECT FUNCTION
pH mV °C

Press **<SELECT>** key until option Check flashes, then press **<ENTER>** key to confirm the option chosen.

pH: READ /
SET UP/CHECK

ELECTRODE
CHECK

Dip electrode into 7.00pH Buffer. This buffer value was chosen at Set Up Operation.

PLACE ELECTRODE
BUFFER 7.00pH

When ready, press **<ENTER>** key.

READY?

Wait.

=====

=====

Remove the electrode from 7.00pH Buffer and wash it using deionized water. When finished, press **<ENTER>** key.

WASH ELECTRODE
READY?

Dip electrode into 4.01pH Buffer. This buffer value was chosen at Set Up Operation.

PLACE ELECTRODE
BUFFER 4.01pH

When ready press **<ENTER>** key.

READY?

Wait.

The Sensitivity of the electrode will be displayed.

=====

Good Electrode

Electrode with problem

The analysis program will then display the electrode sensibility and its condition or any problem that might occur with it.

ELECT.:VERY GOOD
<ENTER>

ATTENTION:CHECK
ELECTRODE

WASH ELECTRODE
READY?

CHEK SOLUTION
<ENTER>

ELECTRODE
HIGH ISO<ENTER>

WASH ELECTRODE
w/THIOUREA

& PEP SIN
PERSISTING BAD

CONTACT OMEGA
CUSTOMER SERVICE

(800) 872-9436
<ENTER>

Sensitivity above 90% - Very Good
Sensitivity below 90% and above 80% - Good
Sensitivity below 80% - Bad

6.5. Equipment Operation pH - Register

Perform this function if user desires to store the results while Reading

Press <SELECT> key until option pH flashes, then press <ENTER> key to confirm the option chosen.

SELECT FUNCTION
pH mV °C

Press <SELECT> key until option Read flashes, then press <ENTER> key to confirm the option chosen.

pH: READ /
SET UP/CHECK

Press <SELECT> key until option Register flashes, then press <ENTER> key to confirm the option

pH: READ /
CALIBRATE/REG

Press <SELECT> key until option Read flashes, then press <ENTER> key to confirm the option chosen.

REG: READ /
CONSULT/ERASE

Dip electrode into sample, then press <ENTER> key to continue reading operation.

GO TO SAMPLE!
Ready?

Example for Reading, when the bargraph was chosen during Set Up Mode.

=====

Register 01 was stored, press <ENTER> key to move to next reading and store them.

REGISTER: 01
WAIT

Indicates when the Bargraph was not chosen during Set Up Mode.
99% 25.0°C
16.53pH @ 25°C

Perform this function if user desires to consult the results stored

Press <SELECT> key until option pH flashes, then press <ENTER> key to confirm the option chosen.

SELECT FUNCTION
pH mV °C

Press <SELECT> key until option pH flashes, then press <ENTER> key to confirm the option chosen.

pH: READ /
SET UP/CHECK

Press <SELECT> key until option Register flashes, then press <ENTER> key to confirm the option

pH: READ /
CALIBRATE/REG

Press <SELECT> key until option Consult flashes, then press <ENTER> key to confirm the option

REG: READ /
CONSULT/ERASE

Press <SELECT> key until chosen option flashes, then press <ENTER> key to confirm the option chosen.

CONSULT
DISPLAY/PRINTER

Press <ENTER> key to consult the next registered reading.

REG:01 25.0°C
->3.58pH @ 25°C

User can display the results thru the display or printer.

6.5. Equipment Operation pH - Register (cont.)

Perform this function if user desires to erase all data stored

Press **<SELECT>** key until option **pH** flashes, then press **<ENTER>** key to confirm the option chosen.

SELECT FUNCTION
pH mV °C

Press **<SELECT>** key until option **Read** flashes, then press **<ENTER>** key to confirm the option chosen.

pH: READ /
SET UP/CHECK

Press **<SELECT>** key until option **Register** flashes, then press **<ENTER>** key to confirm the option

pH: READ /
CALIBRATE/REG

Press **<SELECT>** key until option **Erase** flashes, then press **<ENTER>** key to confirm the option chosen.

REG: READ /
CONSULT/ERASE

Re-confirm option chosen. This is the last chance not to erase ALL data stored. After this point, if chosen to erase, **ALL data will be lost!**

CONFIRM?
Yes / No

6.6. Equipment Operation mV - Set Up

Press **<SELECT>** key until option **mV** flashes, then press **<ENTER>** key to confirm the option chosen.

SELECT FUNCTION
pH mV °C

Press **<SELECT>** key until option **Set Up** flashes, then press **<ENTER>** key to confirm the option chosen.

mV: READ /
SET UP/CHECK

A password is required to access the Set Up mode. Press in sequence <SELECT>, <ENTER>, <ESCAPE>.

PASSWORD
—

Program will display the battery life left.

BATTERY
=====

User has the option to choose the desired language. Press **<SELECT>** key until the desired option flashes, then press **<ENTER>** key to confirm the option chosen.

LANGU.: PORTUG./
ENGLISH/SPANISH

This Screen is default and cannot be changed.

RANGE
-1999 to +1999mV

Select the Resolution by pressing **<SELECT>** key. Option chosen will flash. Then press **<ENTER>** key to confirm option chosen.

RESOLUTION
0.1 0.01

Option to choose the Calibration Standard value. Refer to page 12 on how to adjust this value.

CALIBRATION
228mV @ 25°C <>

User can instruct the instrument to inform that calibration is needed.

CAL.INFORMATION?
Yes / No

User can program the number of readings, before instrument prompts for calibration. Refer to page 12 on how to adjust the number.

INFORM WITH:
200 READINGS <>

User can choose between the following Reading Modes:
Continuous - Read continuously after time is set
Average - Reads the average after time is set
Hold - user must press **<ENTER>** key to Read

READ MODE
CONT/AVER./HOLD

User can program the time between Readings. Refer to Page 12 for instructions on how to adjust this time.

TIME BETWEEN
READINGS 5s <>



Go to Page 21

6.6. Equipment Operation mV - Set Up (cont.)

A From Page 20

User can program the display to show information like Barr graph, Keyboard Beep Stability Beep and more.

User can choose if desire to have Barr graph shown above the Reading screen. When Bar Graph is displayed, the information about Sensibility and Sample Temperature will not be displayed!

User can now adjust the Minimum and Maximum values for the Bar Graph. Refer to Page 12.

User can choose if instrument would Beep when Stability is reached during Read Mode or Not.

User can choose if instrument would Beep on Keyboard touch or Not.

During this sequence, user will be able to choose alarms and also adjust it's values.
Will be able to choose if RS 232 is needed and if connected to a PC or a Printer.

Press **<SELECT>** key until desired option flashes, then press **<ENTER>** key to confirm the option chosen.

In order to adjust the values, refer to page 12.

DISPLAY?
Yes / No

BARGRAPH?
Yes / No

Min: -500mV <>
Max: 500mV <>

BEEP ON STABIL.?
Yes / No

KEYBOARD BEEP?
Yes / No

MAX. ALARM?
Yes / No

MAX. VALUE:
500.0mV <>

MIN. ALARM?
Yes / No

MIN. VALUE:
-500.0mV <>

RS-232 OUTPUT?
Yes / No

RS-232 OUTPUT:
PC / PRINTER

SPEED (100 bps)
12 24 48 96

=====
=====

A Go to Page 22

SPEED (100 bps)
12 24 48 96

PRINTING MODE
Cont/Man/Stab

PRINTING INTERVAL 5s
<>

STATISTICS?
Yes / No

A Go to Page 22

Printing Mode

CONT.: Print continuously (based on the printing interval chosen)

MAN.: Prints the Read value just after pressing **<ENTER>** key. But only after the read value is stabilized (an arrow is displayed).

STAB.: Prints only one time, after the reading is stabilized (an arrow is displayed).

6.7. Equipment Operation mV - Calibration

Press **<SELECT>** key until option **mV** flashes, then press **<ENTER>** key to confirm the option chosen.

SELECT FUNCTION
pH **mV** °C

Press **<SELECT>** key until option **Read** flashes, then press **<ENTER>** key to confirm the option chosen.

mV: **READ** /
SET UP/CHECK

Press **<SELECT>** key until option **Calibrate** flashes, then press **<ENTER>** key to confirm the option

mV: READ /
CALIBRATE/REG

If a thermo is attached to the instrument, Manual will be displayed and user will have the option to adjust the Temperature Compensation. Refer to page 12.

TEMP. COMP.:Man
25°C <>

Dip electrode into 228mV Standard. This buffer value was chosen at Set Up Operation.

PLACE ELECTRODE
SOL.228mV @ 25°C

Wait.

=====

The sensibility of the electrode will be displayed.

SENS. = 100.0%

Wash the electrode using deionized water, then press **<ENTER>** key.

WASH ELECTRODE
READY?

User will now be able to choose the reading in Absolute or Relative.

READ
ABS /REL.

Dip the electrode into the relative sample, to tare, then press **<ENTER>** key.

GO TO SAMPLE!
READY?

LET ZERO!
READY?

-> 202.0mV ABS

-> 228 mV ABS

END REPORT?
Yes / No

<ENTER>
228 mV ABS

GO TO SAMPLE!
READY?

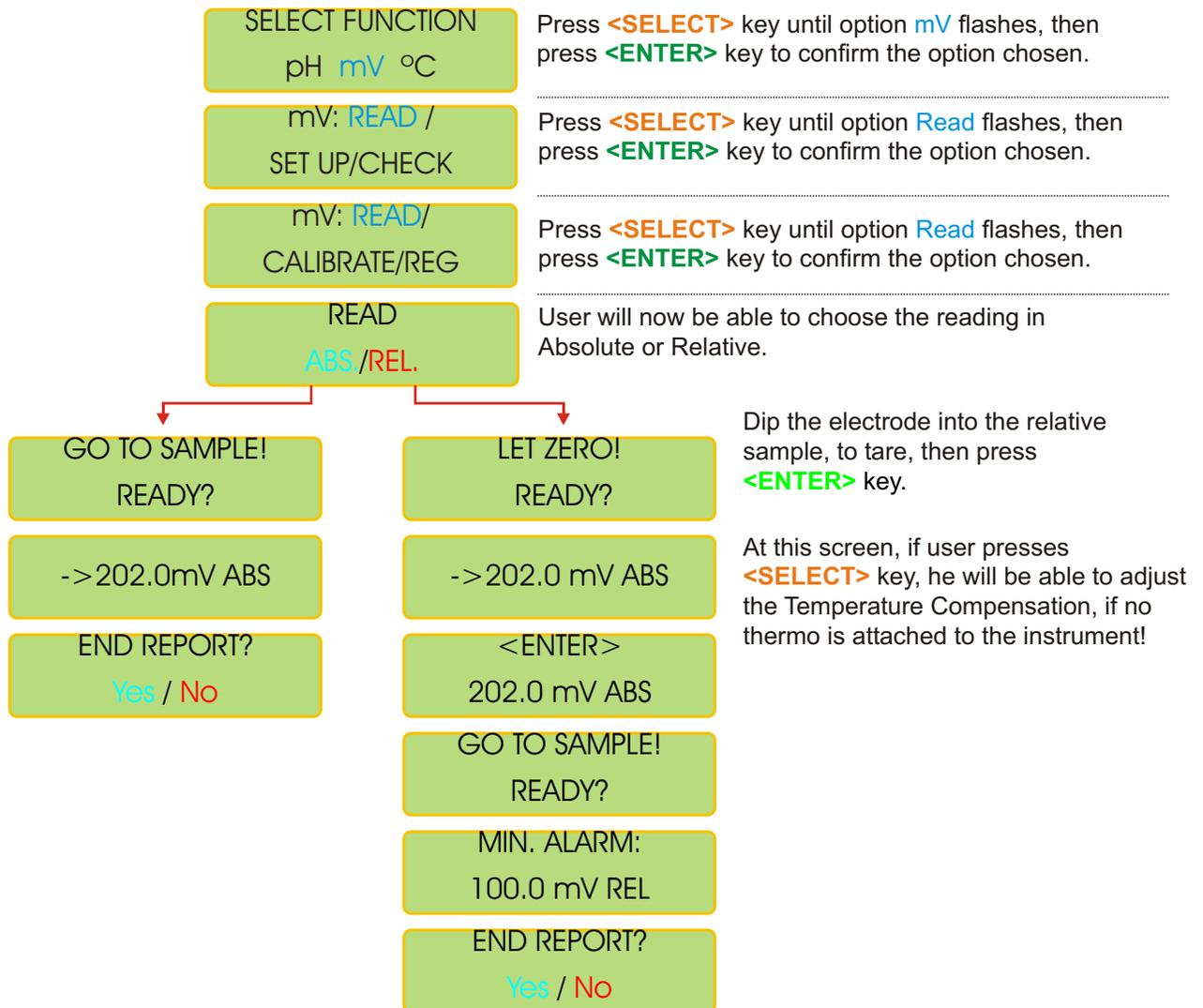
-> 0.0 mV ABS

END REPORT?
Yes / No

The reading will be displayed.

If user press and hold **<ESCAPE>** key in order to exit the reading Mode, program will confirm if can end the report and print the final results thru RS 232.

6.8. Equipment Operation mV - Read



The reading will be displayed.

If user press and hold **<ESCAPE>** key in order to exit the reading Mode, program will confirm if can end the report and print the final results thru RS 232.

6.9. Equipment Operation mV - Check

Press **<SELECT>** key until option **Check** flashes, then press **<ENTER>** key to confirm the option chosen.

mV: READ /
SET UP/CHECK

Dip electrode at the Standard. This standard value was chosen at Set Up Operation.

ELECTRODE
CHECK

When ready, press **<ENTER>** key.

PLACE ELECTRODE
SOL.228mV @ 25°C

Wait.

READY?

=====
=====

The Sensibility of the electrode will be displayed.

CHECK
RESULT

Good Electrode

Electrode with problem

The analysis program will then display the electrode sensibility and its condition or any problem that might occur with it.

ELECTR.:VERY GOOD
<ENTER>

PLACE ELECTRODE
SOL.228mV @ 25°C

WASH ELECTRODE
READY?

=====
=====

WASH ELECTRODE
READY?

Sensibility above 90% - Very Good
Sensibility below 90% and above 80% - Good
Sensibility below 80% - Bad

PLACE ELECTRODE
SOL.228mV @ 25°C

=====
=====

CHECK
RESULT

BAD ELECTRODE
<ENTER>

PLACE ELECTRODE IN
30% HCl

FOR 30s
PERSISTING BAD

CONTACT OMEGA
CUSTOMER SERVICE

(800)872-9436
<ENTER>

6.10. Equipment Operation mV - Register

Perform this function if user desires to store the results while Reading

Press **<SELECT>** key until option **mV** flashes, then press **<ENTER>** key to confirm the option chosen.

SELECT FUNCTION
pH mV °C

Press **<SELECT>** key until option **Read** flashes, then press **<ENTER>** key to confirm the option chosen.

mV: READ /
SET UP/CHECK

Press **<SELECT>** key until option **Register** flashes, then press **<ENTER>** key to confirm the option

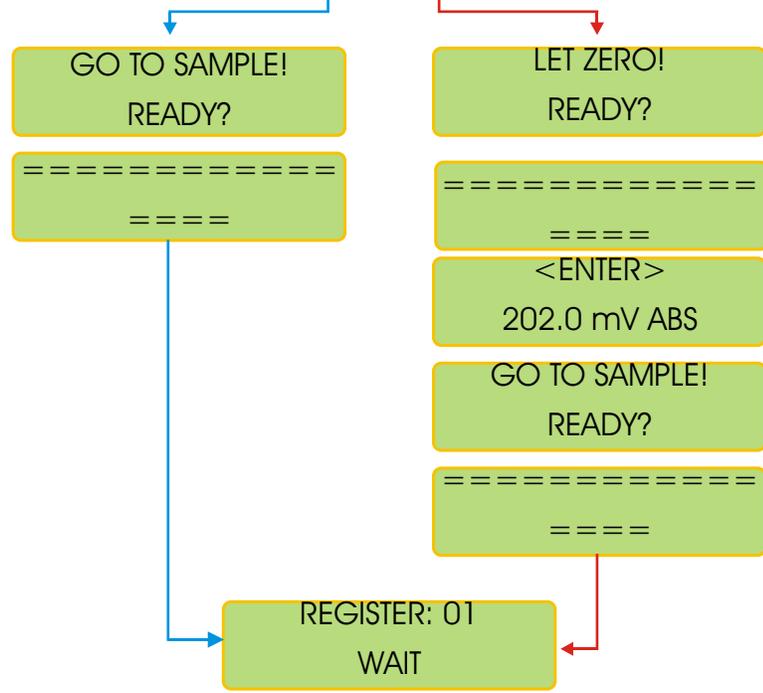
mV: READ /
CALIBRATE/REG

Press **<SELECT>** key until option **Read** flashes, then press **<ENTER>** key to confirm the option chosen.

REG: READ /
CONSULT/ERASE

User will now be able to choose the reading in Absolute or Relative.

READ
ABS./REL.



Dip the electrode into the relative sample, to tare, Then press **<ENTER>** key.

6.10. Equipment Operation mV - Register (cont.)

Perform this function if user desires to consult the results stored

Press <SELECT> key until option mV flashes, then press <ENTER> key to confirm the option chosen.

SELECT FUNCTION
pH mV °C

Press <SELECT> key until option Read flashes, then press <ENTER> key to confirm the option chosen.

mV: READ /
SET UP/CHECK

Press <SELECT> key until option Register flashes, then press <ENTER> key to confirm the option

mV: READ /
CALIBRATE/REG

Press <SELECT> key until option Consult flashes, then press <ENTER> key to confirm the option

REG: READ /
CONSULT/ERASE

Press <SELECT> key until chosen option flashes, then press <ENTER> key to confirm the option chosen.

CONSULT
DISPLAY/PRINTER

Press <ENTER> key to consult the next registered reading.

REG:01 25.0°C
->202.0mV REL

REG:n 25.0°C
->210.0mV REL

Perform this function if user desires to erase all data stored

Press <SELECT> key until option pH flashes, then press <ENTER> key to confirm the option chosen.

SELECT FUNCTION
pH mV °C

Press <SELECT> key until option Read flashes, then press <ENTER> key to confirm the option chosen.

mV: READ /
SET UP/CHECK

Press <SELECT> key until option Register flashes, then press <ENTER> key to confirm the option

mV: READ /
CALIBRATE/REG

Press <SELECT> key until option Erase flashes, then press <ENTER> key to confirm the option chosen.

REG: READ /
CONSULT/ERASE

Re-confirm option chosen. This is the last chance not to erase ALL data stored. After this point, if chosen to erase, **ALL data will be lost!**

CONFIRM?
Yes / No

6.11. Equipment Operation °C - Set Up

Press **<SELECT>** key until option °C flashes, then press **<ENTER>** key to confirm the option chosen.

SELECT FUNCTION
pH mV °C

Press **<SELECT>** key until option Set Up flashes, then press **<ENTER>** key to confirm the option chosen.

°C: READ /
SET UP

A password is required to access the Set Up mode. Press in sequence <SELECT>, <ENTER>, <ESCAPE>.

PASSWORD
—

Program will display the battery life left.

BATTERY
=====

User has the option to choose the desired language. Press **<SELECT>** key until the desired option flashes, then press **<ENTER>** key to confirm the option chosen.

LANGUA: PORTUG./
ENGLISH/SPANISH

This Screen is default and cannot be changed.

RANGE
-20 to 130°C

Select the Resolution by pressing **<SELECT>** key. Option chosen will flash. Then press **<ENTER>** key to confirm option chosen.

RESOLUTION
1 / 0,1

User can choose between the following Reading Modes:
Continuous - Read continuously after time is set
Average - Reads the average after time is set
Hold - user must press **<ENTER>** key to Read

READING MODE
CONT/AVER./HOLD

User can program the time between Readings. Refer to Page 12 for instructions on how to adjust this time.

TIME BETWEEN
READINGS 5s <>



6.11. Equipment Operation °C - Set Up (cont.)

A From Page 27

User can program the display to show information like Barr graph, Keyboard Beep Stability Beep and more.

User can choose if desire to have Barr graph shown above the Reading screen. When Bar Graph is displayed, the information about Sensibility and Sample Temperature will not be displayed!

User can now adjust the Minimum and Maximum values for the Bar Graph. Refer to Page 12.

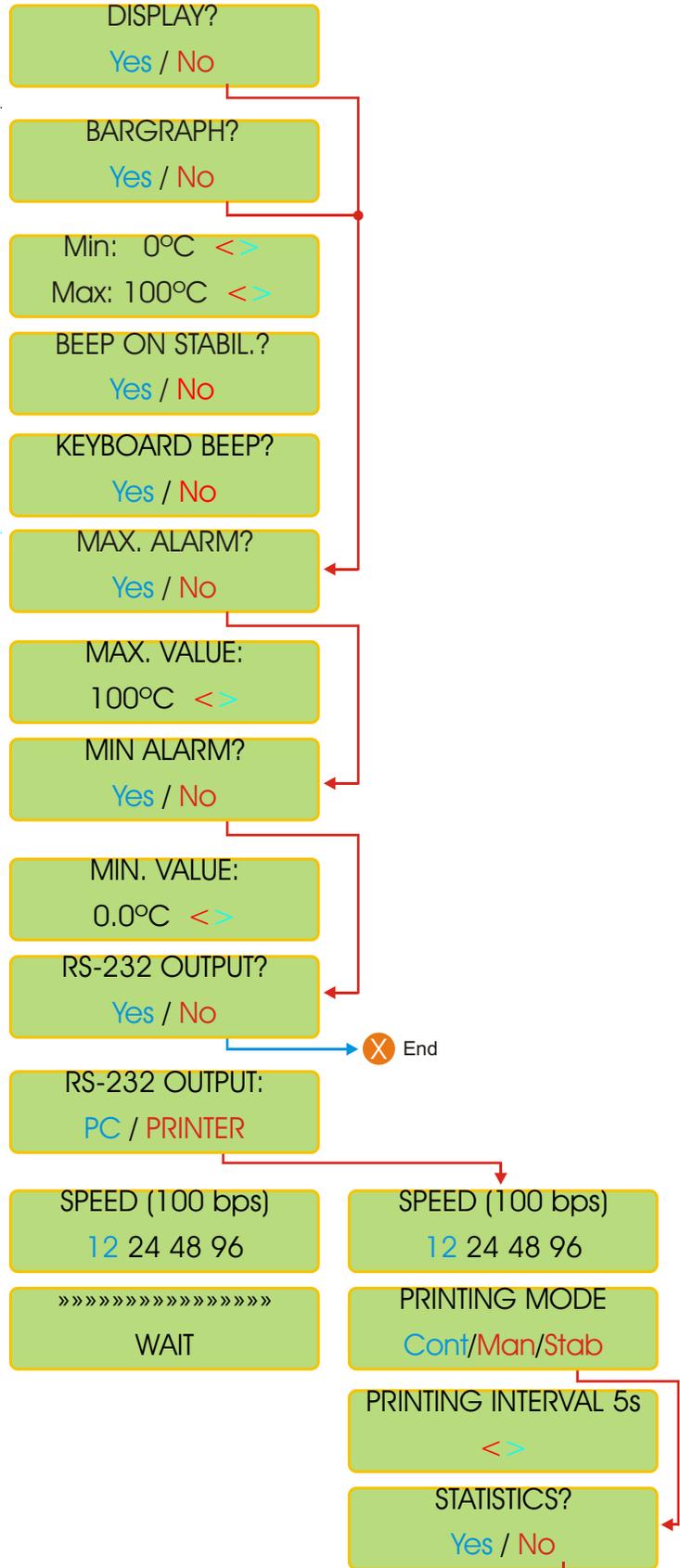
User can choose if instrument would Beep when Stability is reached during Read Mode or Not.

User can choose if instrument would Beep on Keyboard touch or Not.

During this sequence, user will be able to choose alarms and also adjust it's values.
Will be able to choose if RS232 is needed and if connected to a PC or a Printer.

Press **<SELECT>** key until desired option flashes, then press **<ENTER>** key to confirm the option chosen.

In order to adjust the values, refer to page 12.



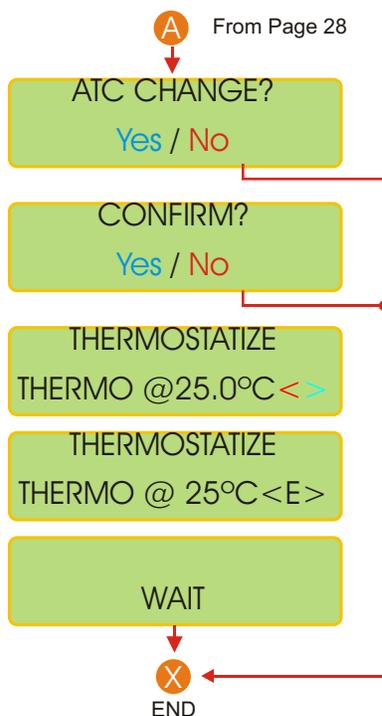
Printing Mode
CONT.: Print continuously (based on the printing interval chosen)
MAN.: Prints the Read value just after pressing **<ENTER>** key. But only after the read value is stabilized (an arrow is displayed).
STAB.: Prints only one time, after the reading is stabilized (an arrow is displayed).

A
Go to Page 29

6.11. Equipment Operation °C - Set Up (cont.)

If user is changing or adding a Thermo to the instrument, it is necessary to adjust the temperature of the probe with the instrument. If changing or adding a Themo, choose Yes, then choose Yes again to confirm.

First find out the any sample temperature. Then adjust the temperature at the screen, to match the sample temperature being used. Refer to page 12 for instruction on how to modify this value. Dip the thermo into the used sample, then press <ENTER> key.



6.12. Equipment Operation °C - Read

Press **<SELECT>** key until option °C flashes, then press **<ENTER>** key to confirm the option chosen.

SELECT FUNCTION
pH mV °C

Press **<SELECT>** key until option Read flashes, then press **<ENTER>** key to confirm the option chosen.

°C: READ / SET UP

Dip the electrode into the sample, then press **<ENTER>** key.

GO TO SAMPLE!
Ready?

The reading will be displayed.

> 25°C

If user press and hold **<ESCAPE>** key in order to exit the reading Mode, program will confirm if can end the report and print the final results thru RS 232.

END REPORT?
Yes / No

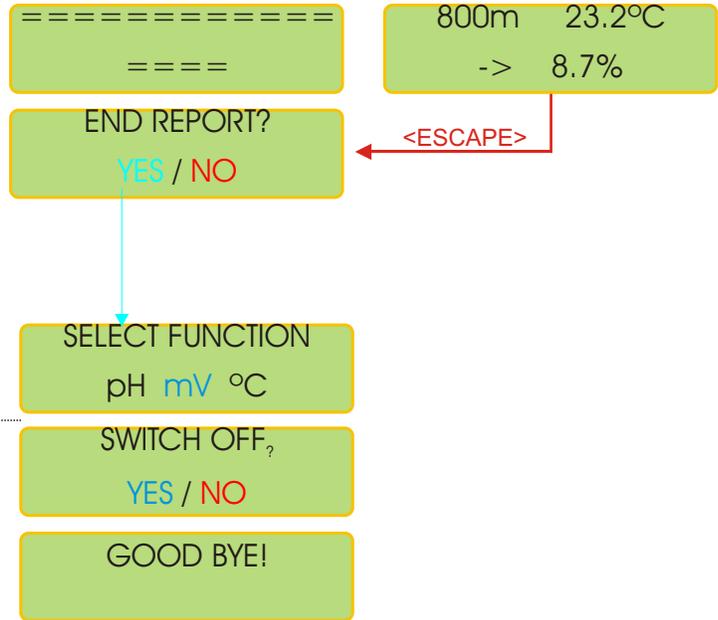
6.13. Equipment Operation - Turning Off

While during Read Mode, user must press and hold **<ESCAPE>** key and the Select Function Menu will be displayed.

Press **<ESCAPE>** key and user will be guided to the Switching Off Screen.

Reading display, when the bargraph function was not chosen during Set Up Mode.

Example for Reading, when the bargraph was chosen during Set Up Mode.



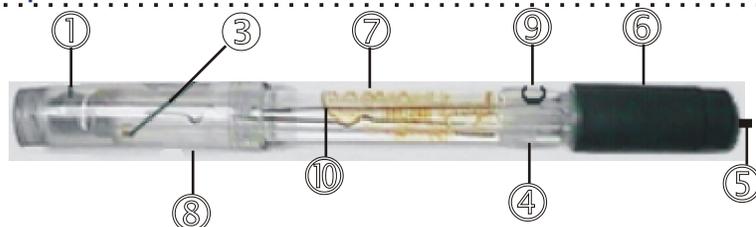
The End Report screen will only be displayed if user had chosen to use RS 232 during Set Up Mode. If user press and hold **<ESCAPE>** key in order to exit the reading Mode, program will confirm if can end the report and print the final results thru RS 232.

Press **<ESCAPE>** key.

Press **<SELECT>** key until option **Yes** flashes, then press **<ENTER>** key to confirm the option chosen.

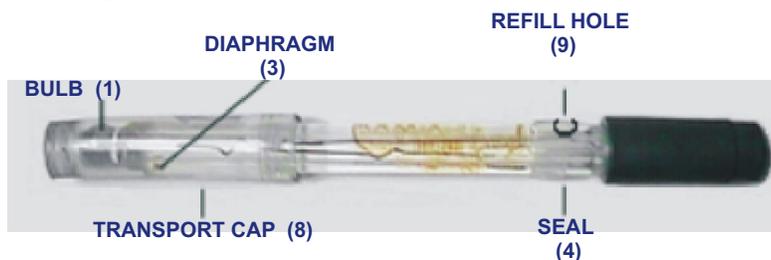
7. PH Electrode Type

Electrode Description



- 1 - **pH sensing Bulb** - rugged construction, in order to avoid ease breakage.
- 2 - **Glass Body** - chemically inert.
- 3 - **Punctual Ceramic**.
- 4 - **Seal** - ease operation for electrolyte solution filling.
- 5 - **Low Noise Cable** - assuring stable readings..
- 6 - **Polypropylene Cap** - chemically aggressively resistant.
- 7 - **Ionic Barrier** - avoid contamination with solutions that contain Silver, Mercury, Sulfite, etc.
Avoid AgCl precipitations. Provides quick readings on temperature variations.
- 8 - **Transportation Cap** - contains reference electrolyte solution for transportation or storage.
- 9 - **Electrolyte Fill Hole** (on refillable electrodes only).
- 10 - **Argent Reference**.

Electrode Usage Instruction



- 1 - Before using the electrode, verify it's body for possible mechanical defects or cracks and in case it occur, replace it immediately.
- 2 - Take off the transportation cap and rinse the electrode with distilled water, remove eventual crystallization at the diaphragm (3). The transportation cap must always be used when transporting the electrode, avoiding dehydration of the bulb (1).
- 3 - Remove the seal (4) in order to establish Atmospheric Pressure (only applicable for refillable electrodes) and close it again.
- 4 - Eliminate possible air bubbles that may occur internally at the bulb (1), by shacking the electrode vertically.
- 5 - On Refillable electrodes, the electrolyte level must be at a maximum of 10 mm below the hole (9).
- 6 - Always refill, when necessary, the electrolyte level with 3 MKCl thru the hole (9). On Bridge Electrolytic Electrodes, with the proper bridge (see table 1) thru the hole (9).
- 7 - When the Electrode is not in use, always immerse into electrolyte reference.
- 8 - To measure, just immerse the electrode into the sample, covering the diaphragm (3).
- 9 - Switching from one solution to other, always wash electrode with distilled water.

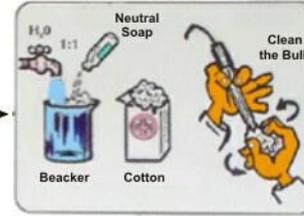
8. Maintenance

CLEANING:



QUICK CLEANING

- TO AVOID INFECTION
- TO CLEAN LIGHT DIRT



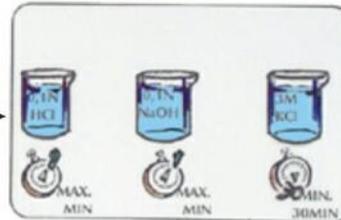
PERIODICAL CLEANING

- WHEN NOTICED MEASURE DEVIATION
- AFTER THIS, CALIBRATE



PERIODICAL CLEANING

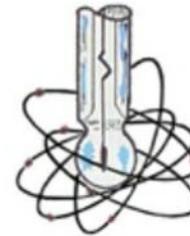
- 15 MIN. IN THIOUREA
- RINSE WITH H_2O
- 15 MIN. IN PEPSIN
- RINSE WITH H_2O



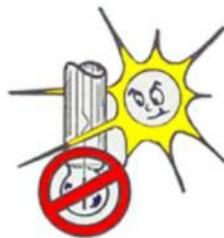
CONSIDERATIONS:



REST IN 3M KCl



AFTER FIRST CONTACT WITH ANY SOLUTION, STARTS ACTIVITY



NEVER DRY

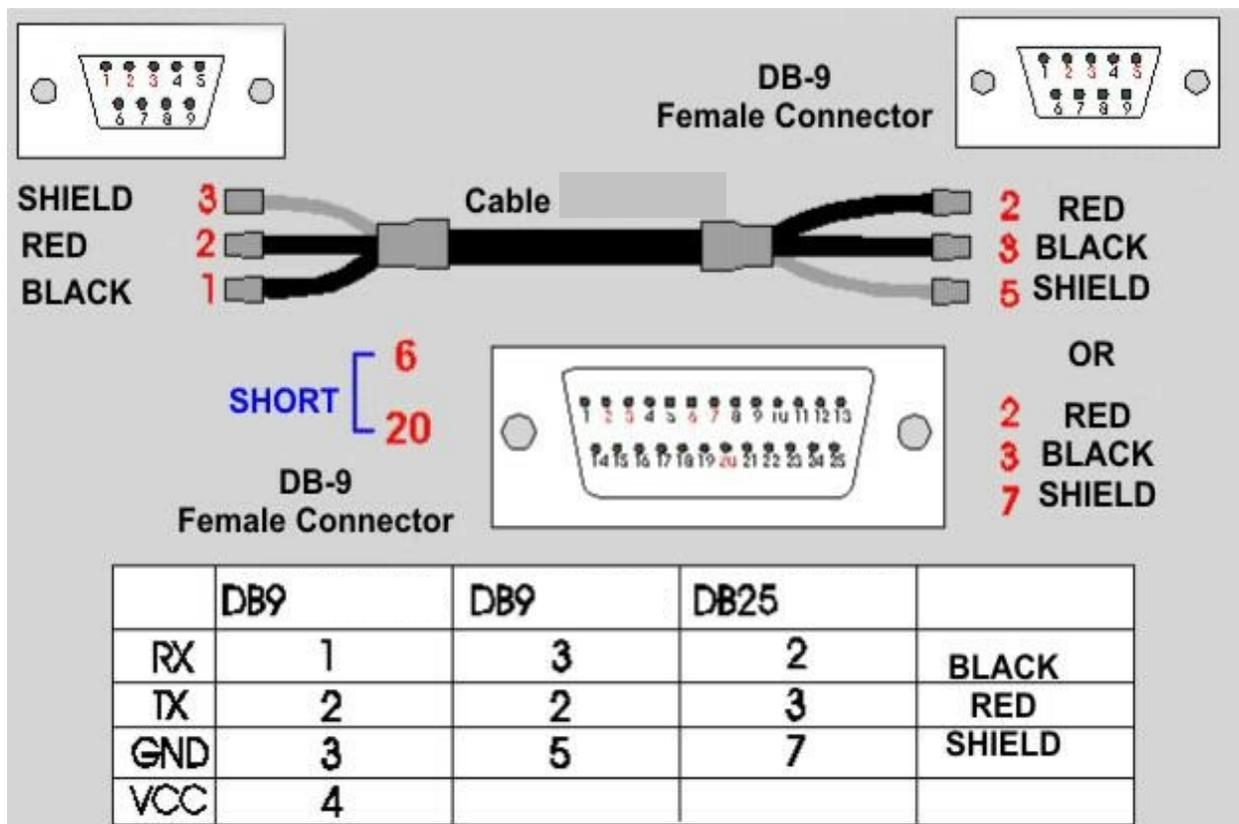
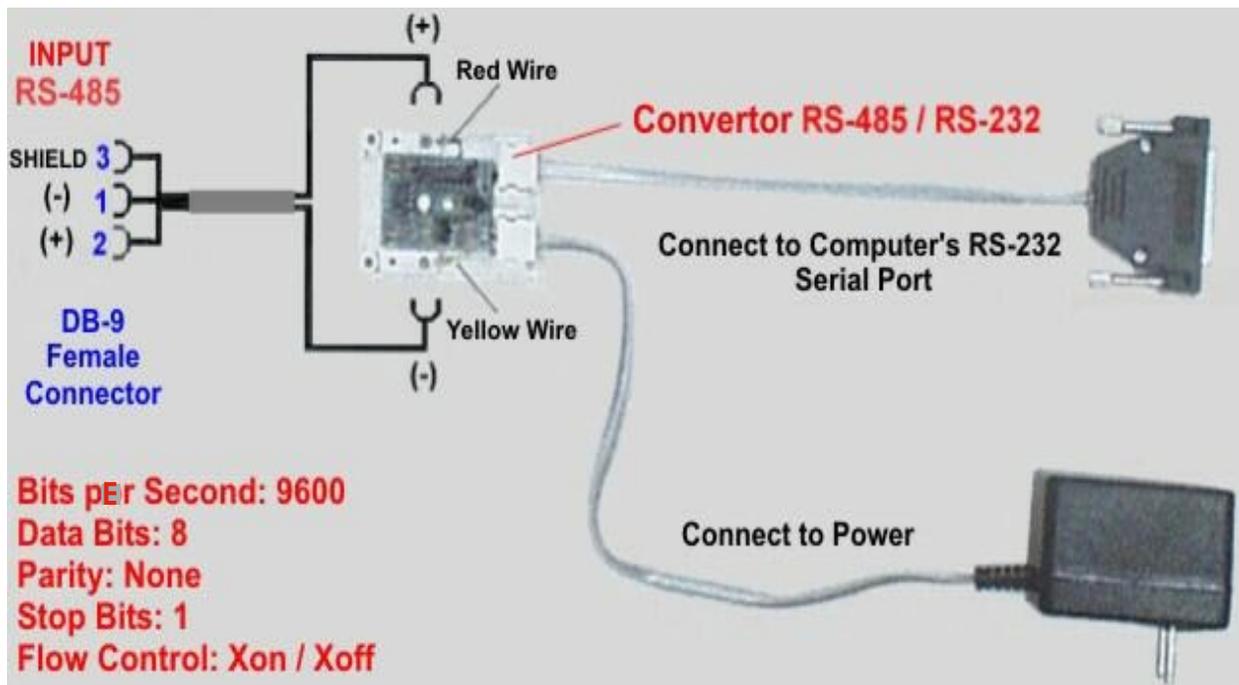


TRANSPORT IN KCl

8. Maintenance (cont.)

- 1 - For storage purpose, electrodes must be immersed at the same electrolyte's reference, with hole(9) closed.
- 2 - In order to avoid mistakes during readings, the membrane (1) and the diaphragm (3), must be always clean.
- 3 -For cleaning, wash the electrode with commercial detergent using your fingers to clean the bulb, rinse it with distilled water. Rest the electrode for 15 minutes into Thiourea Solution and for 15 minutes in PEPSIN..
- 4 - If necessary, dip the electrode for 5 minutes in HCl 0.1N and 5 minutes in NaOH 0.1N. Repeat this operation and just after it rest the electrode for 30 minutes in 3 MKCl.
- 5 - In case you noticed that the internal electrolyte reference is hazel or is contaminated, proceed with a internal clean up! Take off the internal reference by the hole(9), using a syringe and wash it internally with distilled water, by shaking the electrode vertically. Repeat this operation for 3 times. Then refill the electrode with 3m KCL.
- 6 - The membrane (1) must be manually cleaned with absorbent paper or cotton, any grease can be eliminated with benzine or any solvent.
- 7 -For tougher dirt, use chloride acid 0,1N and or sulfamic solution. Then leave it dipped for 12 hours in 3 MKCl Solution.
- 8 - Dried membranes, must be immersed for 30 seconds in HF (1-2%) solution, for Gel renewal. Then dip it for 12 hours in 3 MKCl solution.

9. Communication Cable



WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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- Infrared Pyrometers

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- Transducers & Strain Gages
- Load Cells & Pressure Gages
- Displacement Transducers
- Instrumentation & Accessories

FLOW/LEVEL

- Rotameters, Gas Mass Flowmeters & Flow Computers
- Air Velocity Indicators
- Turbine/Paddlewheel Systems
- Totalizers & Batch Controllers

pH/CONDUCTIVITY

- pH Electrodes, Testers & Accessories
- Benchtop/Laboratory Meters
- Controllers, Calibrators, Simulators & Pumps
- Industrial pH & Conductivity Equipment

DATA ACQUISITION

- Data Acquisition & Engineering Software
- Communications-Based Acquisition Systems
- Plug-in Cards for Apple, IBM & Compatibles
- Datalogging Systems
- Recorders, Printers & Plotters

HEATERS

- Heating Cable
- Cartridge & Strip Heaters
- Immersion & Band Heaters
- Flexible Heaters
- Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL

- Metering & Control Instrumentation
- Refractometers
- Pumps & Tubing
- Air, Soil & Water Monitors
- Industrial Water & Wastewater Treatment
- pH, Conductivity & Dissolved Oxygen Instruments

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