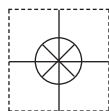


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PHB23 **Benchtop pH/mV/ Concentration Meter**



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Omega Engineering, Inc., One Omega Drive, P.O. Box 4047
Stamford, CT 06907-0047 USA
Toll Free: 1-800-826-6342 TEL: (203) 359-1660
FAX: (203) 359-7700 e-mail: info@omega.com

Canada:

976 Bergar
Laval (Quebec), H7L 5A1 Canada
Toll-Free: 1-800-826-6342 TEL: (514) 856-6928
FAX: (514) 856-6886 e-mail: info@omega.ca

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Czech Republic:

Frystatska 184
733 01 Karviná, Czech Republic
Toll-Free: 0800-1-66342 TEL: +420-59-6311899
FAX: +420-59-6311114 e-mail: info@omegashop.cz

France:

Managed by the United Kingdom Office
Toll-Free: 0800 466 342 TEL: +33 (0) 161 37 29 00
FAX: +33 (0) 130 57 54 27 e-mail: sales@omega.fr

Germany/Austria:

Daimlerstrasse 26
D-75392 Deckenpfronn, Germany
Toll-Free: 0800 6397678 TEL: +49 (0) 7056 9398-0
FAX: +49 (0) 7056 9398-29 e-mail: info@omega.de

United Kingdom:
ISO 9001 Certified

OMEGA Engineering Ltd.
One Omega Drive, River Bend Technology Centre, Northbank
Irlam, Manchester M44 5BD United Kingdom
Toll-Free: 0800-488-488 TEL: +44 (0) 161 777-6611
FAX: +44 (0) 161 777-6622 e-mail: sales@omega.co.uk

It is the policy of OMEGA Engineering, Inc. to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

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

Benchtop Meter

PHB23

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2. Characteristics

- pH / ORP / Temperature / Concentration(ISE)
- Simple 3-key operation.
- Automatic Resolution Selection.
- Automatic Electrode Check.
- Continuous, Average or Hold Readings.
- Non-volatile memory.
- Automatic Calibration for all Parameters.
- Automatic Temperature Compensation recognition.
- Sound Alarm for Minimum and Maximum.
- Recognizes up to 5 Buffer Solutions.
- RS-232 output for computer or printer connection.
- Internal Power Supply 85-240VAc 50/60Hz.
- Records last Calibration, Check and Electrode Change Date.
- Allows user to inform number of Readings before prompting for Calibration need.
- Allows Clock adjustment and display.
- Allows user to choose between English, Spanish or Portuguese language.
- User can program User Name.

MEETS GLP STANDARD



Electrode Holder w/ Articulated Arm	PHA-EH
Combined pH Electrode	PHE-1411
Solutions (250ml. Bottles)	7.00 / 4.01 pH
Instruction Manual	-
Thermo Compensator (ATC)	PHE-22R
<i>OPTIONAL</i>	
Printer	PRN-1

3. Specifications

Application	Measures pH, mV (ORP), Temperature and Concentration
pH	
Range	-2 to 20 pH
Resolution	0.1 / 0.01 / 0.001 pH
Relative Precision	0.05% (full scale)
Calibration	2 / 3 / 4 / 5
mV	
Range	± 1999 mV
Resolution	1 / 0.1 mV
Relative Precision	0.05% (full scale)
Temperature	
Range	-20 to 120 °C
Resolution	0.1 °C
Relative Precision	0.08% (full scale)
Concentration	
Range	0.01 to 99.99
Resolution	1 / 0.1 / 0.01 / 0.001
Output	RS-232
General	
Temp. Comp. Auto / Manual	-20 to 120 °C
Display	Alphanumeric 2 lines x 16 characters
Dimensions LHD	147 x 145 x 210
Weight	1.2 Kg
Power	110 - 240 V ~ (50/60 Hz)
Tension Fluctuation	± 10% of nominal tension
Overtension	Based on Category II at standard IEC 60864-4-443
Electrical Protection	Class I
Power Consumption (max.)	2.5 VA
Environmental Conditions	
Use	Indoors
Altitude	up to 2000 m
Operating Temperature	Between 5 and 40 °C
Relative Humidity (max.)	80%

3. Specifications (cont.)

For ISE the following curves are already build in at the Set-Up: Fluoride, Iodine, Nitrate, Potassium, Silver, Sodium, Sulfide, H+, Ammonia, Ammonium, Bromide, Cadmium, Calcium, Lead, Cyanide, Chloride, Copper and *four other ions that the user can program.*

Available Units: ppm, mg/L, % or mEq/L.

Ranges:	PPM	0.02 thru 9000ppm
		5 thru 8pH
		0 thru 80C
	%	0 thru 9000%
		5 thru 8pH
		0 thru 80C
	mg/L	0.01 thru 12700mg/L
		5 thru 8pH
		0 thru 80C
	mEq/L	0.01 thru 12700mEq/L

Resolution: 1, 0.1 or 0.01

Calibration Points: 2, 3, 4 or 5 - fully programable

4. 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} 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:

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

Where: K = CTE dissociation.

aM^+ = ions activity M^+ .

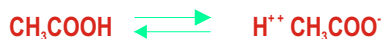
aA^- = ions activity A^- .

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:



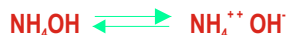
On the other hand, Acetic acid has a low " K ". Reacts as the following way:



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 (NH_4OH) 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%.

4. 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...

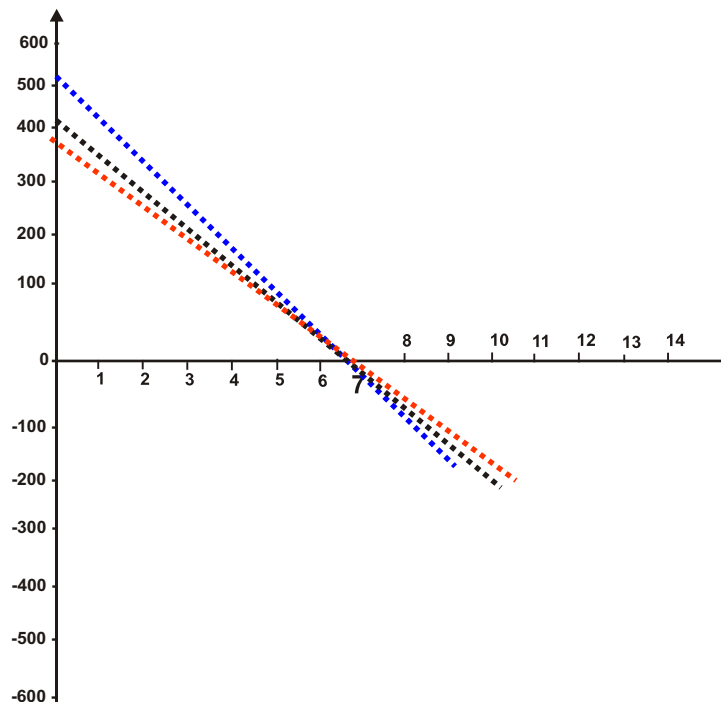
If the OH- number exceed the number of ions H+ the H+ activity must be lower than 10-7, being, 10-8, 10-9 and more... The pH will be bigger than 7, will be 8, 9, 10...

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.

$$E = E_0 - KT (pH)$$

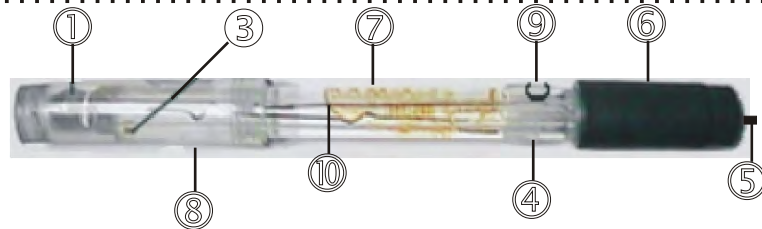
Above equation, define the equation of a line, whose decline is **-KT** and whose origin ordenate is **E**. The electrode must have a zero volts point (isopotential), that can be achieve performing a correspondence to 7 to zero volts, to any temperature, using a internal BUFFER at the glass electrode,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



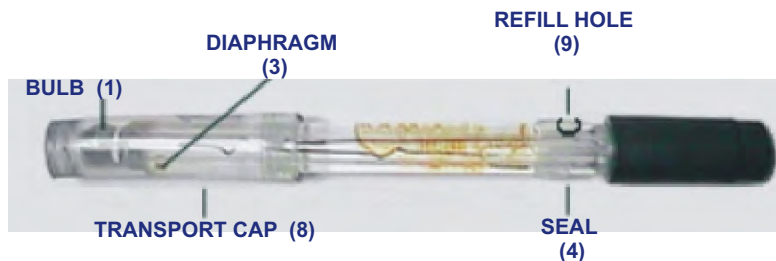
4. pH Measurement (cont.)

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 reillable electrodes only).
- 10 - **Argential 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.

4. 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*

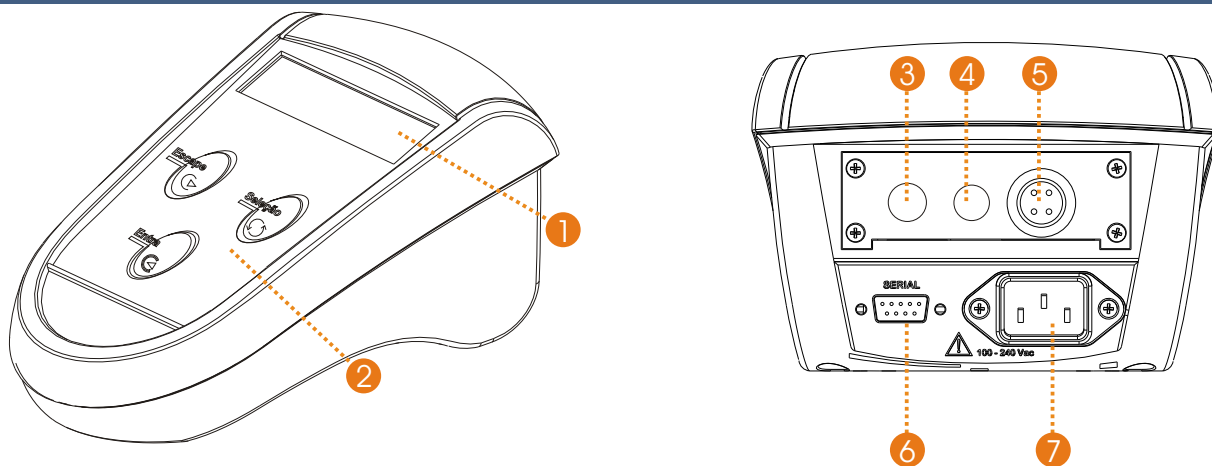
PHA-10 *10.01pH*

5. 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.

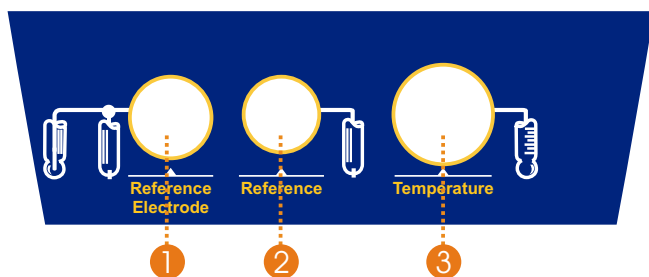
6. Product Description



Items Description

- 1 - Alphanumeric Display 2 lines x 16 characters
- 2 - Keyboard: with 3 tactile membranes
- 3 - Connector **BNC**: pH Electrode / reference inlet.
- 4 - Connector **Banana** 4mm: Reference electrode inlet.
- 5 - Connector **BNC**: Thermocompensator inlet (DMF-P1X).
- 6 - **Serial Output**: for printer or computer connection.
- 7 - Connector **Male 3 poles** (AC Power)

Symbols

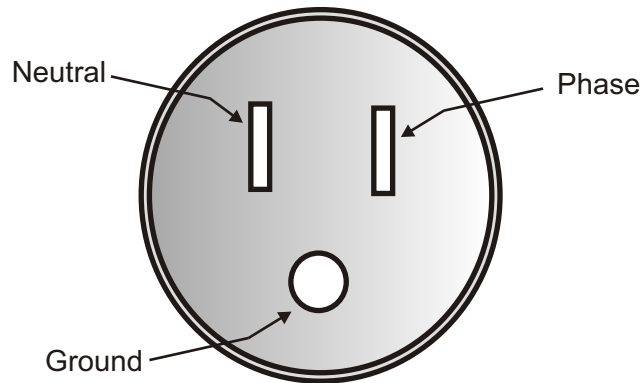


- 1 pH Combined Electrode Symbol
- 2 Reference Electrode Symbol
- 3 Thermocompensator Symbol

7. Equipment Installation

For a better performance of the equipment, user must follow below steps:

- 1 - Position the equipment in such a way to avoid power cord disconnection;
 - 2 - Install the equipment leaving lateral space for its correct operation and for easy maintenance;
 - 3 - Disconnect the equipment from power before any maintenance.
- In case of maintenance, please contact OMEGA by phone 800 872.9436;
- 4 - A circuit breaker should be installed for the equipment(s) power, compatible with the instrument power;
 - 5 - This breaker should be installed close to the equipment(s) for the operator easy access;
 - 6 - This breaker must be identified as a protection device to the instrument(s) and must be in accordance with standards IEC 60947-1 and IEC 60947-3 (item 6.11.3.1 from general standard). The breaker cannot interrupt the ground conductor.
 - 7 - Use a proper outlet, as shown below:



8. Equipment Operation

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.

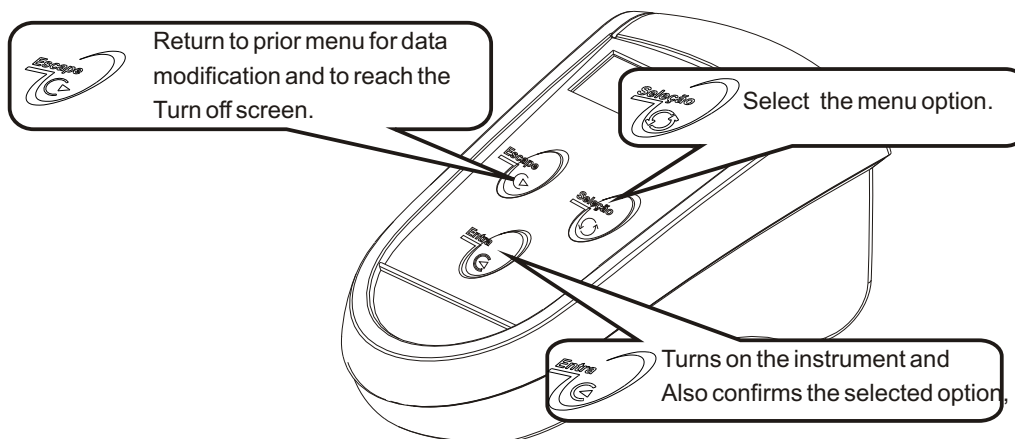
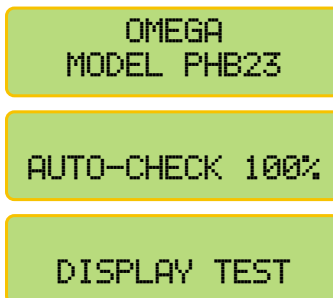
2 - In case of a mistake, or data modification or to return to a prior menu, press **<ESCAPE>** key. While at Reading Mode, press and hold **<ESCAPE>** key for about 5 seconds in order to exit this mode. This is necessary in order for the instrument understand that the user really desires to exit the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



8. Equipment Operation (cont.)

To turn ON the equipment, press and hold **<ENTER>** key. Make sure the power cord is plugged correctly! The menus are self-explanation with its 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 **RED 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 its operational set up (resolution, reading mode, calibration, etc).

Even if **disconnected** from its power supply, it **will not** lose 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 where 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 16 for description of Set Up Screens.

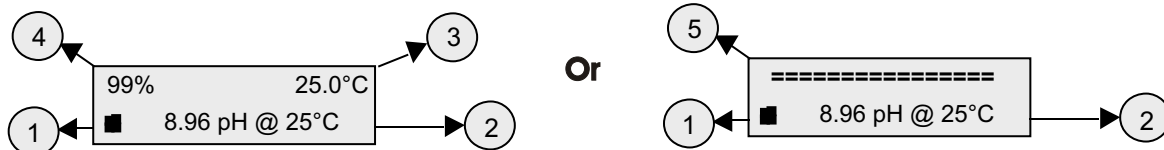
CHECK OPERATION

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 as per setup. Don't forget that this setting is made when you setup the readings in the SETUP menu (Reading Mode).
- 2 - The Measured Value and Reference Temperature (chosen at setup).
- 3 - Sample Temperature
- 4 - Electrode's Sensibility
- 5 - Barr Graph will show, if chosen this option during Set Up Operation.



8. 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**.

The Calendar/Clock will be displayed, when the unit is turned off, if user chooses this option during Set Up Operation.

The program will automatically records the last Calibration and Check Dates.

The program also offers the user, capability to store the last electrode Change date, but this is NOT done Automatically, the user needs to access the Set Up operation in order to store this date.

8.1 Equipment Operation pH - Set Up

Press **<ENTER>** key in order to turn on the instrument.

OMEGA
MODEL PHB23

AUTO-CHECK 100%

DISPLAY TEST

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

SELECT FUNCTION
pH mV °C CONC.

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
_ _ _

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** / 0.001

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 below
instructions.

Iso = 7.00pH <>
Sens. = 4.01pH <>

B

Go to Page 17

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

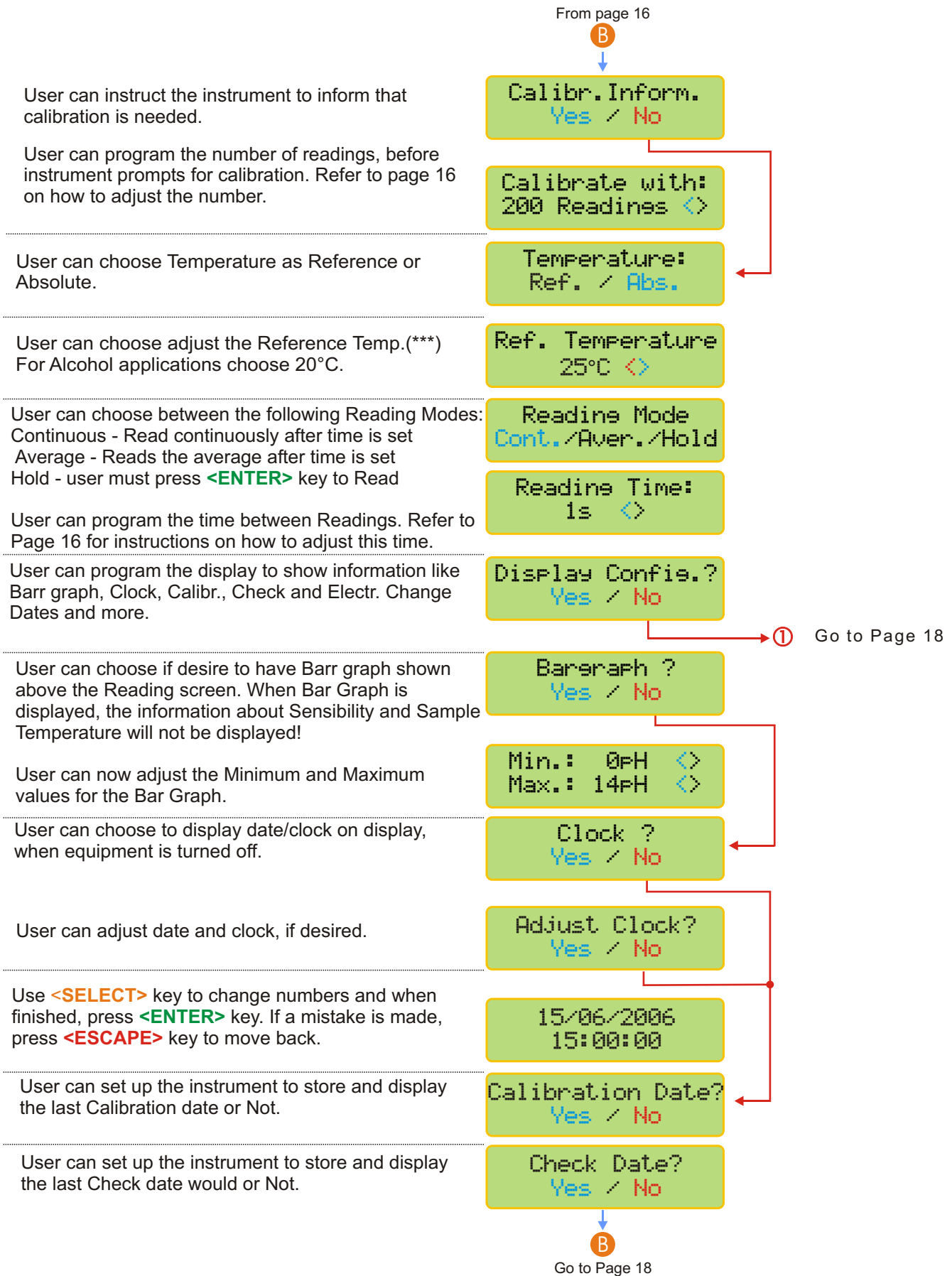
To increase the value press **<SEL>** key until ">" flashes, then press **<ENT>** to confirm, then press **<SEL>** key and at every touch the value will increase by one unit.

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.

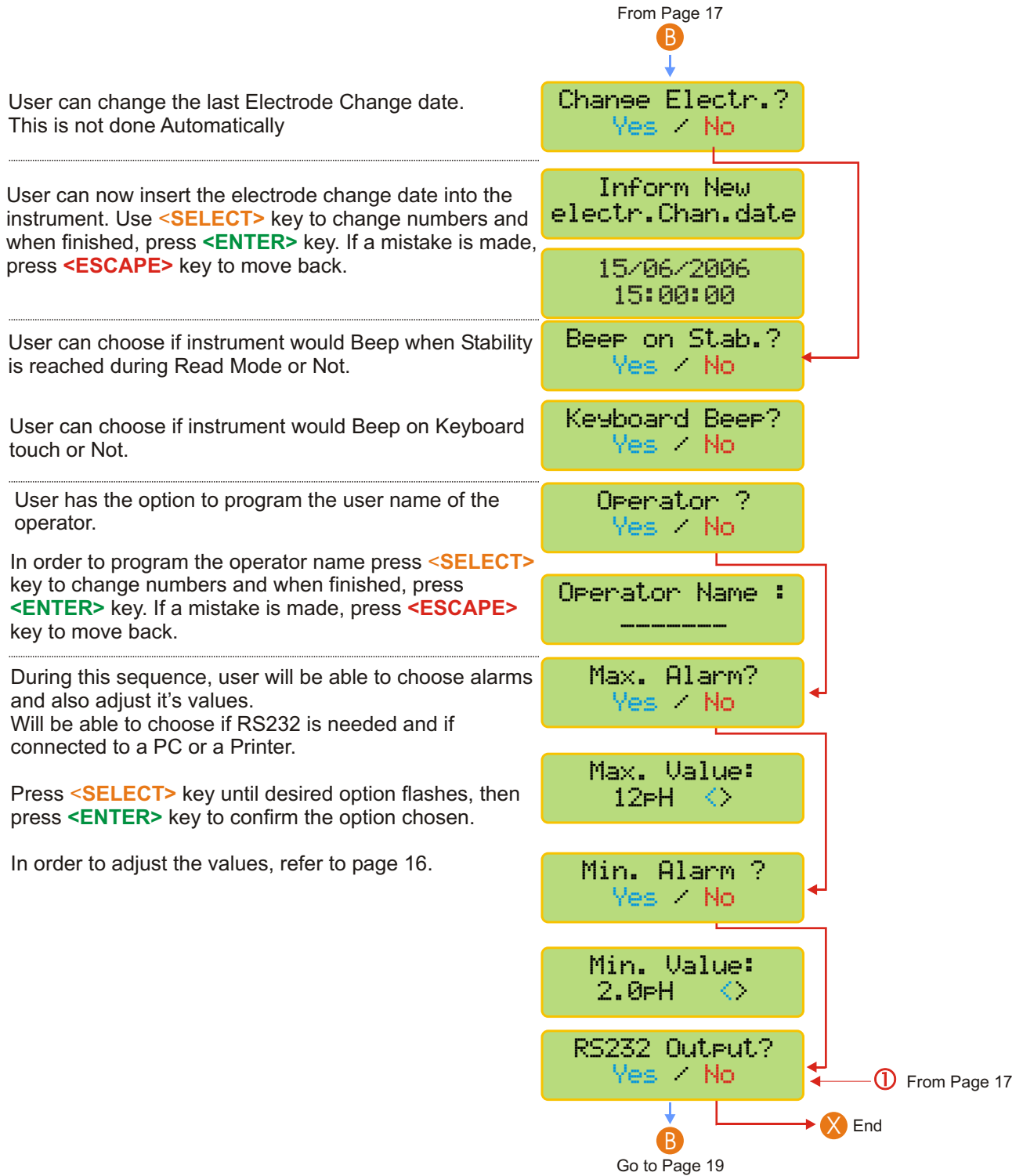
If a mistake is made, press **<ESC>** key to return and correct the value!

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.

8.1 Equipment Operation pH - Set Up

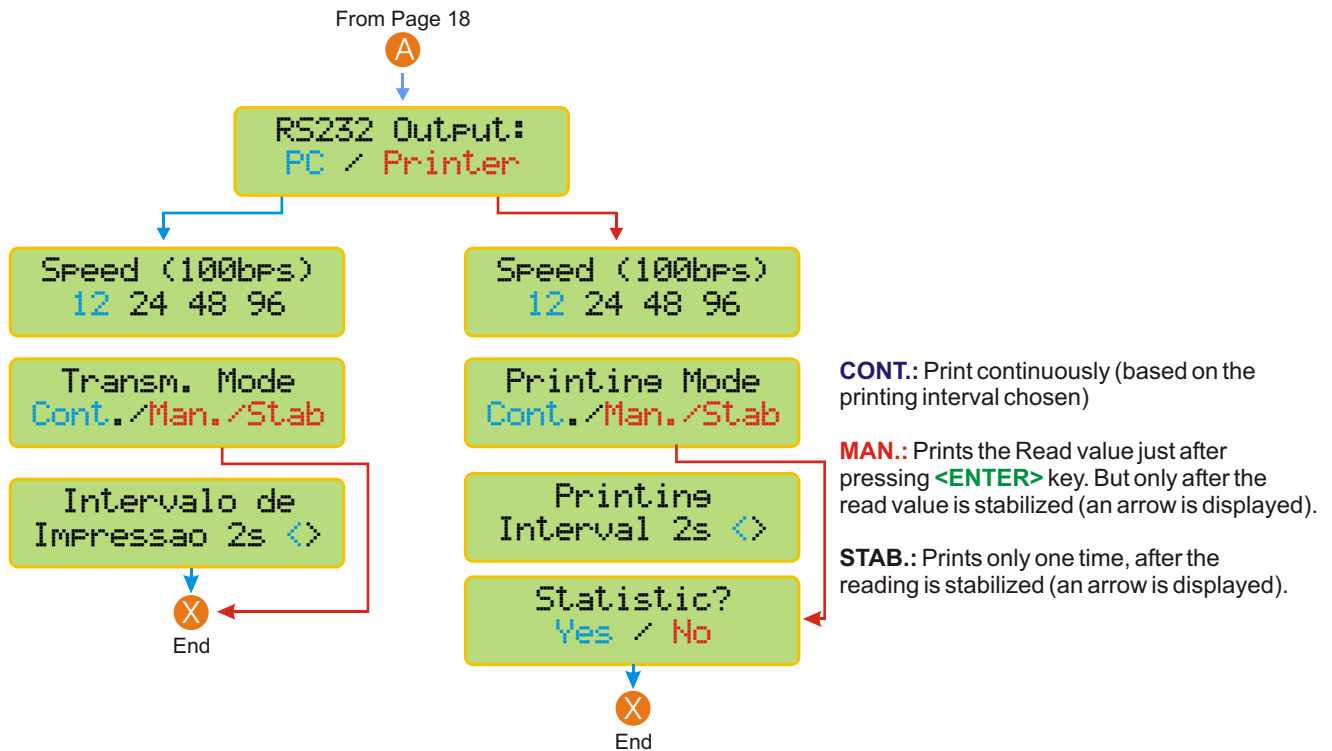


8.1 Equipment Operation pH - Set Up (cont.)



8.1 Equipment Operation pH - Set Up (cont.)

User can program the PC or the Printer to be used at the RS 232 output, Speed Transmission and Printing modes, intervals and Statistics.



8.2 Equipment Operation pH - Calibration

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

```
Select Function:
pH mV °C CONC.
```

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
```

The last Electrode Change date and time will be displayed. This date/time is changed manually during Set Up operation.

```
PH Elect.Change:
00/00/00 08:00
```

The last Calibration date/time will be displayed!

```
Last Calib.Date:
00/00/00 08:00
```

Dip electrode into 7.00pH Buffer. This buffer value was chosen at Set Up Operation.
If no Temperature Probe is attached to the instrument, User will be prompted to adjust the Compensation Temperature.

```
Place Electrode
@ Buffer: 7.00pH
```

```
Man. Comp. Temp.
25°C <>
```

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

```
READY ?
```

Wait.

```
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: 4.01pH
```

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

```
Ready ?
```

Wait.

```
WAIT
```

The Sensibility of the electrode will be displayed

```
Sens.= 100%
```

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

```
Wash Electrode
Ready ?
```

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

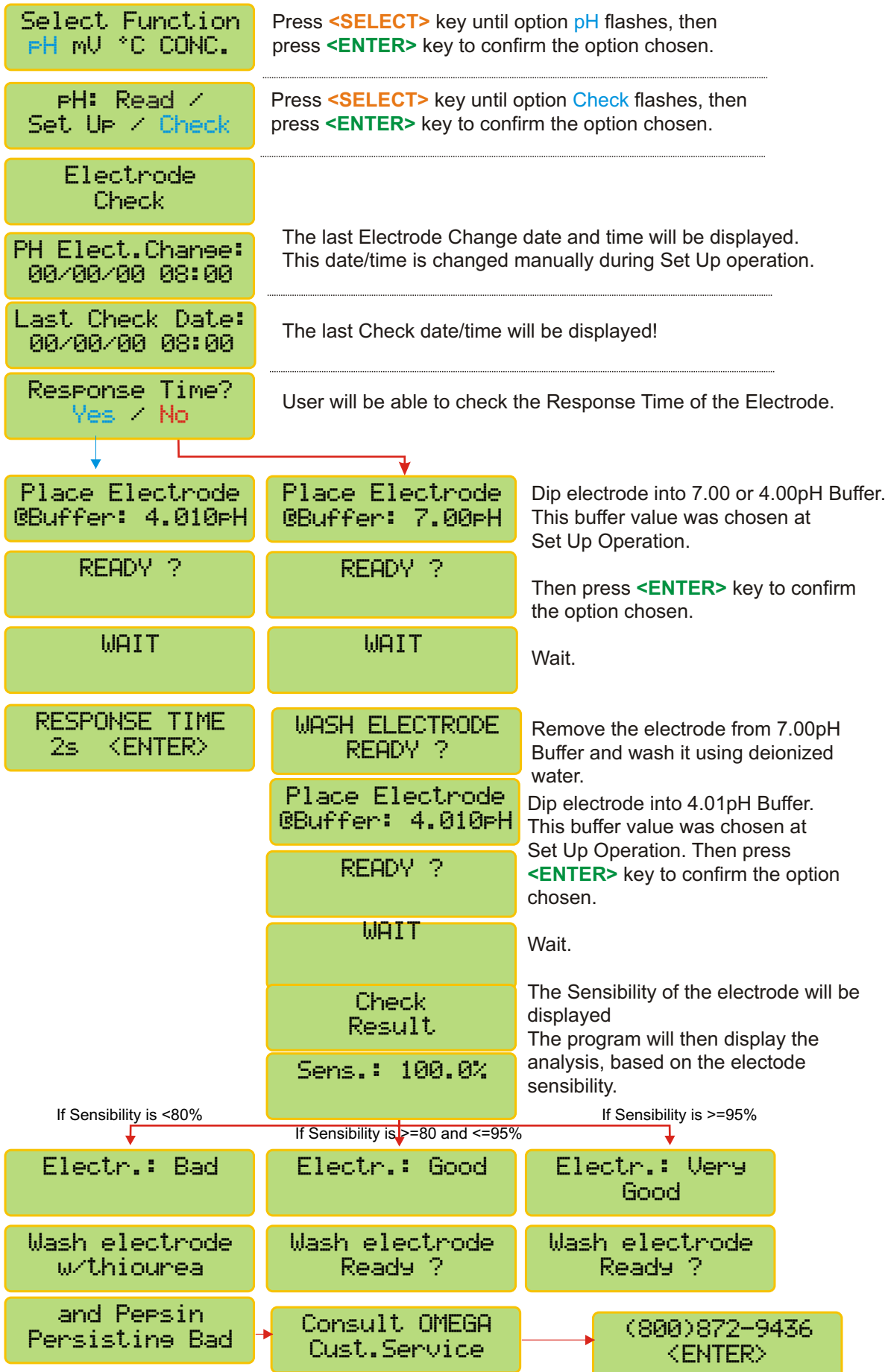
```
Go to Sample!
Ready ?
```

After pressing **<ENTER>** key user will be able to adjust the Compensation Temperature. Dip electrode at sample, then press **<ENTER>** key to proceed with Sample Reading.

```
Man. Temp.Comp.:
23.4°C <>
```

```
100.0 % 25.5°C
8.00pH @ 23.4°C
```

8.3 Equipment Operation pH - Check



8.4 Equipment Operation pH - Read

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

```
SELECT FUNCTION
pH mV °C CONC.
```

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

```
pH: Read /
Calibrate
```

Dip electrode into sample and when Ready, press **<ENTER>** key to confirm.

```
Go to Sample!
Ready?
```

The display will show the electrode sensibility, the sample temperature (if Temperature Probe is attached), the pH Value and the Reference Temperature.

```
100.0 % 25.5°C
3.59pH @ 25°C
```

Press **<SELECT>** key and user will be able to adjust the Compensation Temperature. Refer to page 16 for instructions on how to adjust this value.

```
Man. Comp.Temp.:
25.5°C <>
```

Press and hold **<ESCAPE>** key for about 5seconds, if user desires to exit Reading Mode. If so, the message End Report will be displayed for the user to inform if this would be the end of the Application and the final data would then be sent to the PC or printer, finalizing the Report.

```
End Report?
Yes / No
```

8.5 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 CONC.
```

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:
- - -
```

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
-1999 to +1999mV
```

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

```
Resolution
1 / 0.1
```

Option to choose the calibration standard. Refer to page 16 on how to adjust the value, then press **<ENTER>** key to confirm chosen option.

```
Calibration
228mV @ 25°C <>
```

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

```
Calibrat. Info.?
Yes / No
```

User can program the number of readings, before instrument prompts for calibration. Refer to page 16 on how to adjust the number.

```
Inform after:
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

```
Reading Mode
Cont./Aver./Hold
```

User can program the time between Readings. Refer to Page 16 for instructions on how to adjust this time.

```
Reading Time:
1s <>
```

User can program the display to show information like Barr graph, Clock, Calibr., Check and Electr. Change Dates and more.

```
Config. Display?
Yes / No
```

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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!

```
Bareraph ?
Yes / No
```

User can now adjust the Minimum and Maximum values for the Bar Graph.

```
Min.: 0pH <>
Max.: 14pH <>
```

User can choose to display date/clock on display, when equipment is turned off.

```
Clock?
Yes / No
```

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User can adjust date and clock, if desired.

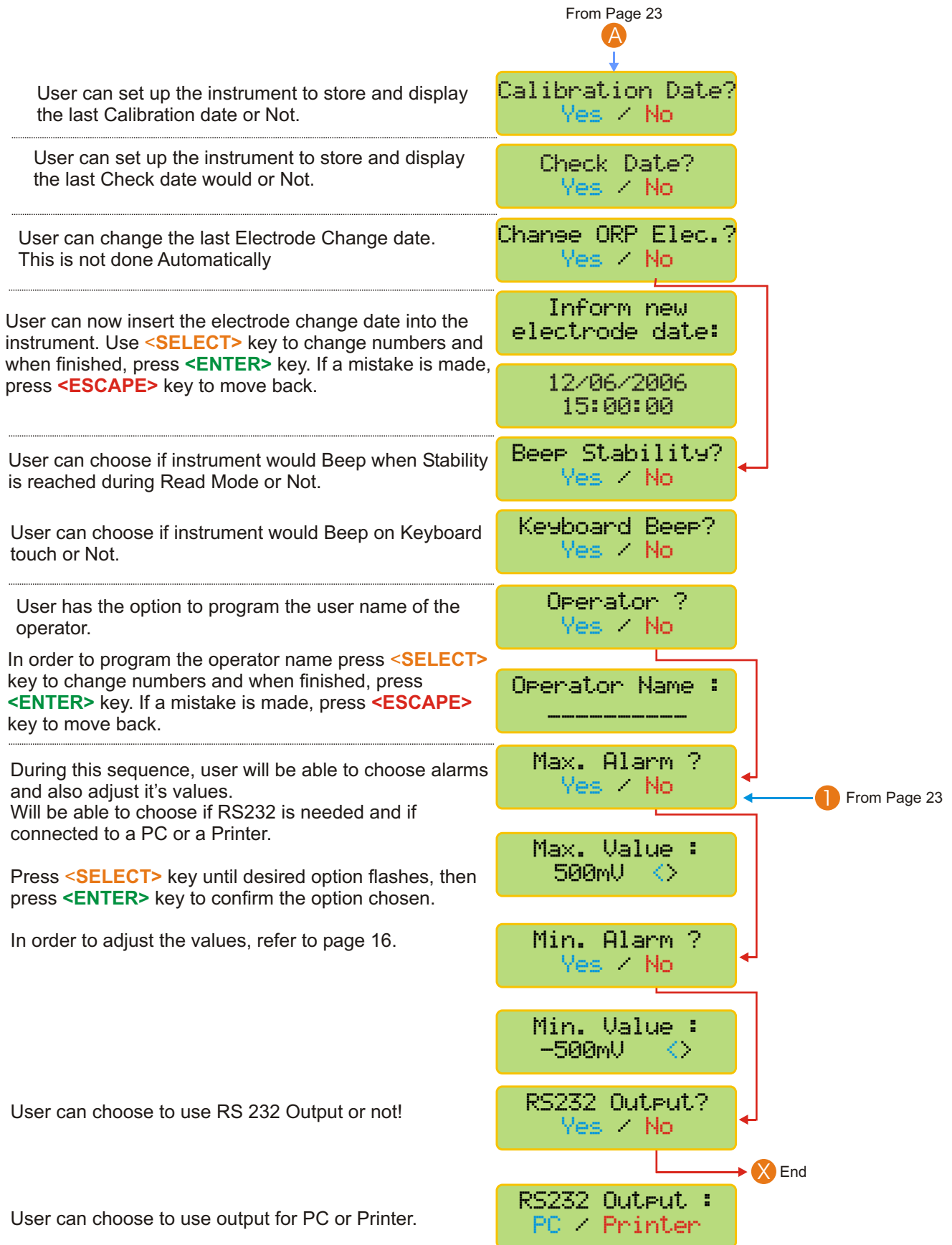
```
ADJUST CLOCK ?
Yes / No
```

A Go to Page 24

Use **<SELECT>** key to change numbers and when finished, press **<ENTER>** key. If a mistake is made, press **<ESCAPE>** key to move back.

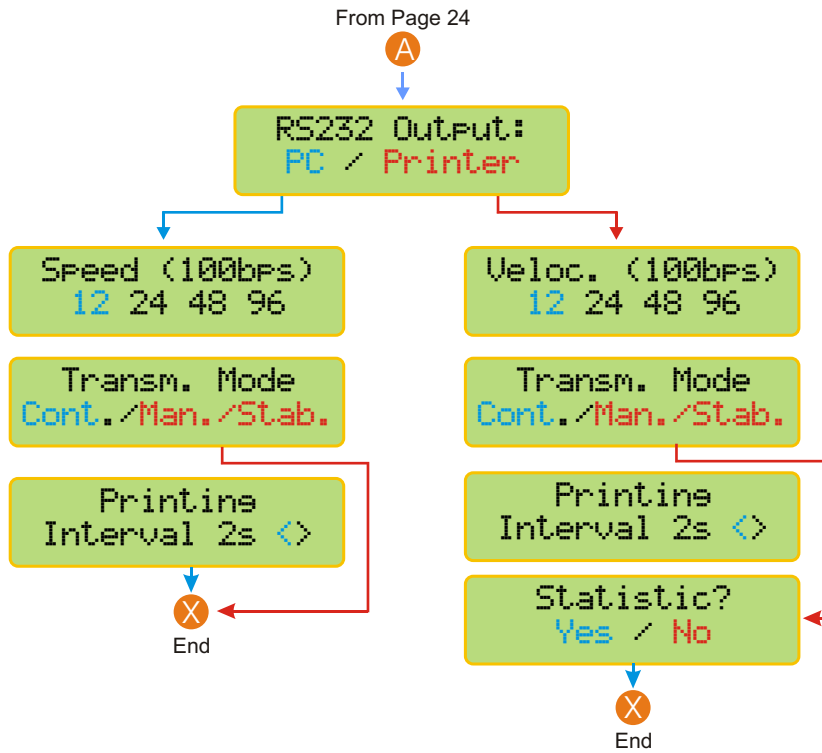
```
15/06/2006
15:00:00
```


8.5 Equipment Operation mV - Set Up (cont.)



8.5 Equipment Operation mV - Set Up (cont.)

User can program the PC or the Printer to be used at the RS 232 output, Speed Transmission and Printing modes, intervals and Statistics.

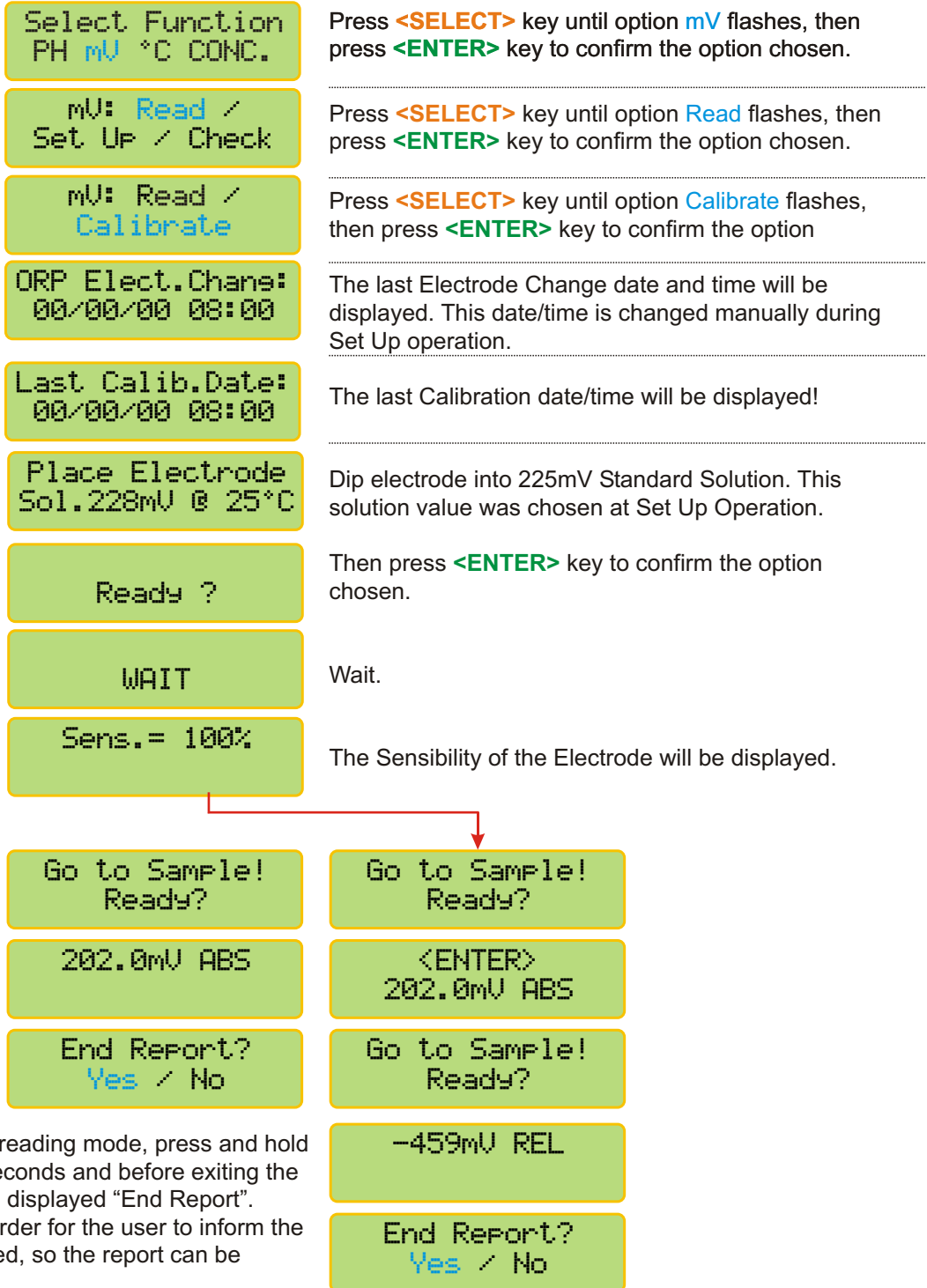


CONT.: Print continuously (based on the printing interval chosen)

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

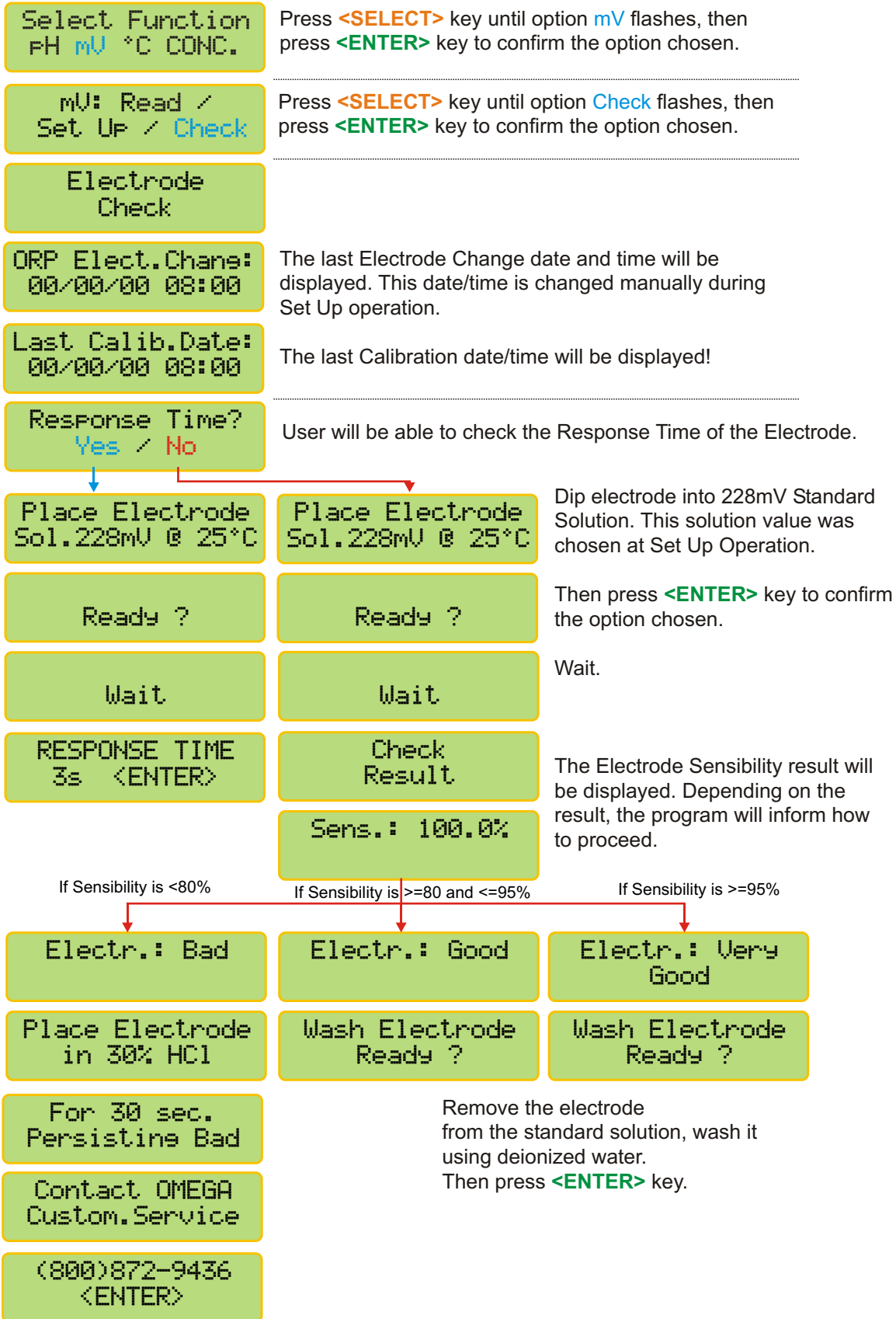
STAB.: Prints only one time, after the reading is stabilized (an arrow is displayed).

8.6 Equipment Operation mV - Calibration

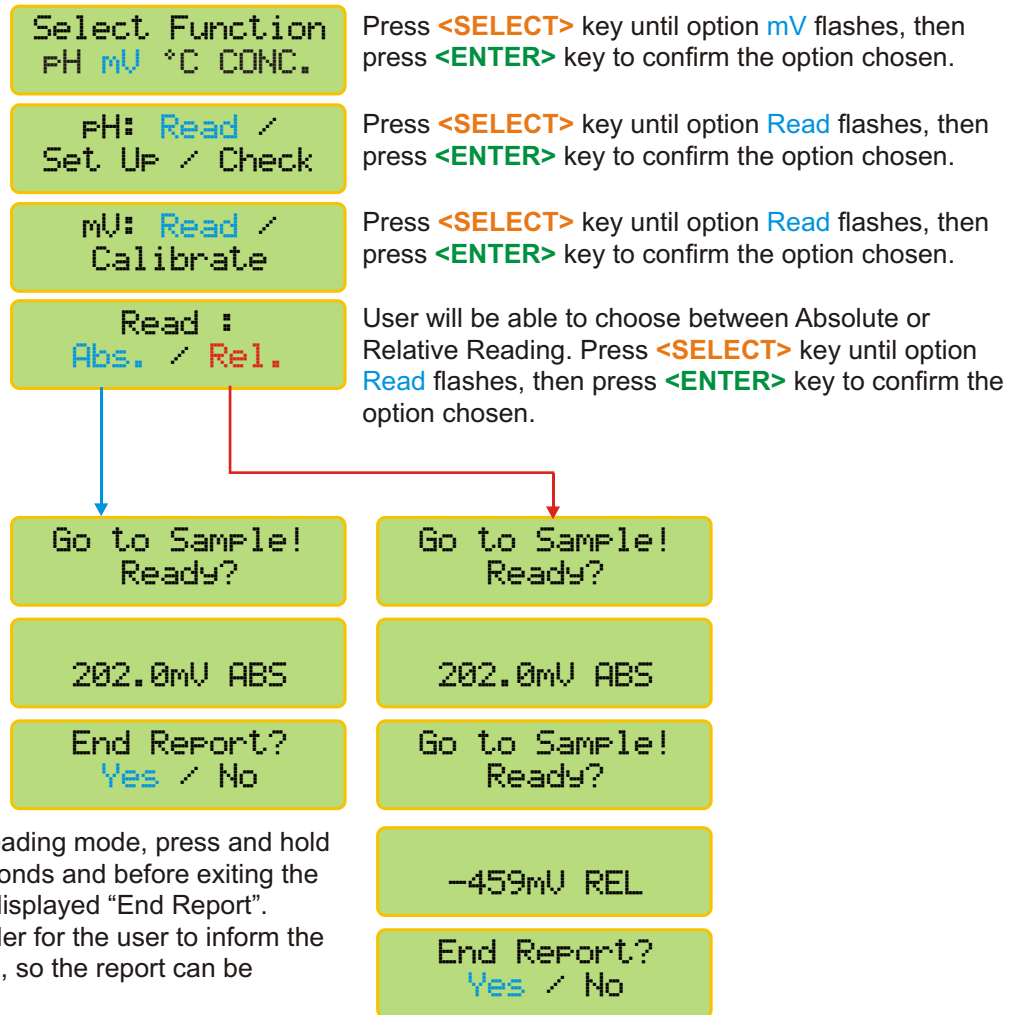


If user desires to exit the reading mode, press and hold **<ESCAPE>** for about 6seconds and before exiting the following message will be displayed "End Report". This message shows in order for the user to inform the software that the job ended, so the report can be finalized.

8.7 Equipment Operation mV - Check



8.8 Equipment Operation mV - Read



If user desires to exit the reading mode, press and hold **<ESCAPE>** for about 6seconds and before exiting the following message will be displayed "End Report". This message shows in order for the user to inform the software that the job ended, so the report can be finalized.

8.9 Equipment Operation °C - Set Up

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

```
Select Function
FH mV °C CONC.
```

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
- - -
```

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: Port./
English/Spanish
```

This Screen is default and cannot be changed.

```
Range
-2 to 12 °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 16 for instructions on how to adjust this time.

```
Reading Time:
1s <>
```

User can program the display to show information like Barr graph, Clock, Calibr., Check and Electr. Change Dates and more.

```
Config. Display?
Yes / No
```

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!

```
Barograph ?
Yes / No
```

User can now adjust the Minimum and Maximum values for the Bar Graph.

```
Min.: 0FH <>
Max.: 14FH <>
```

User can choose to display date/clock on display, when equipment is turned off.

```
Clock ?
Yes / No
```

User can adjust date and clock, if desired.

```
Adjust Clock?
Yes / No
```

Use **<SELECT>** key to change numbers and when finished, press **<ENTER>** key. If a mistake is made, press **<ESCAPE>** key to move back.

```
12/06/2006
15:00:00
```

User can set up the instrument to store and display the last Calibration date or Not.

```
Calibration Date
Yes / No
```

User can set up the instrument to store and display the last Check date would or Not.

```
Check Date
Yes / No
```

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B

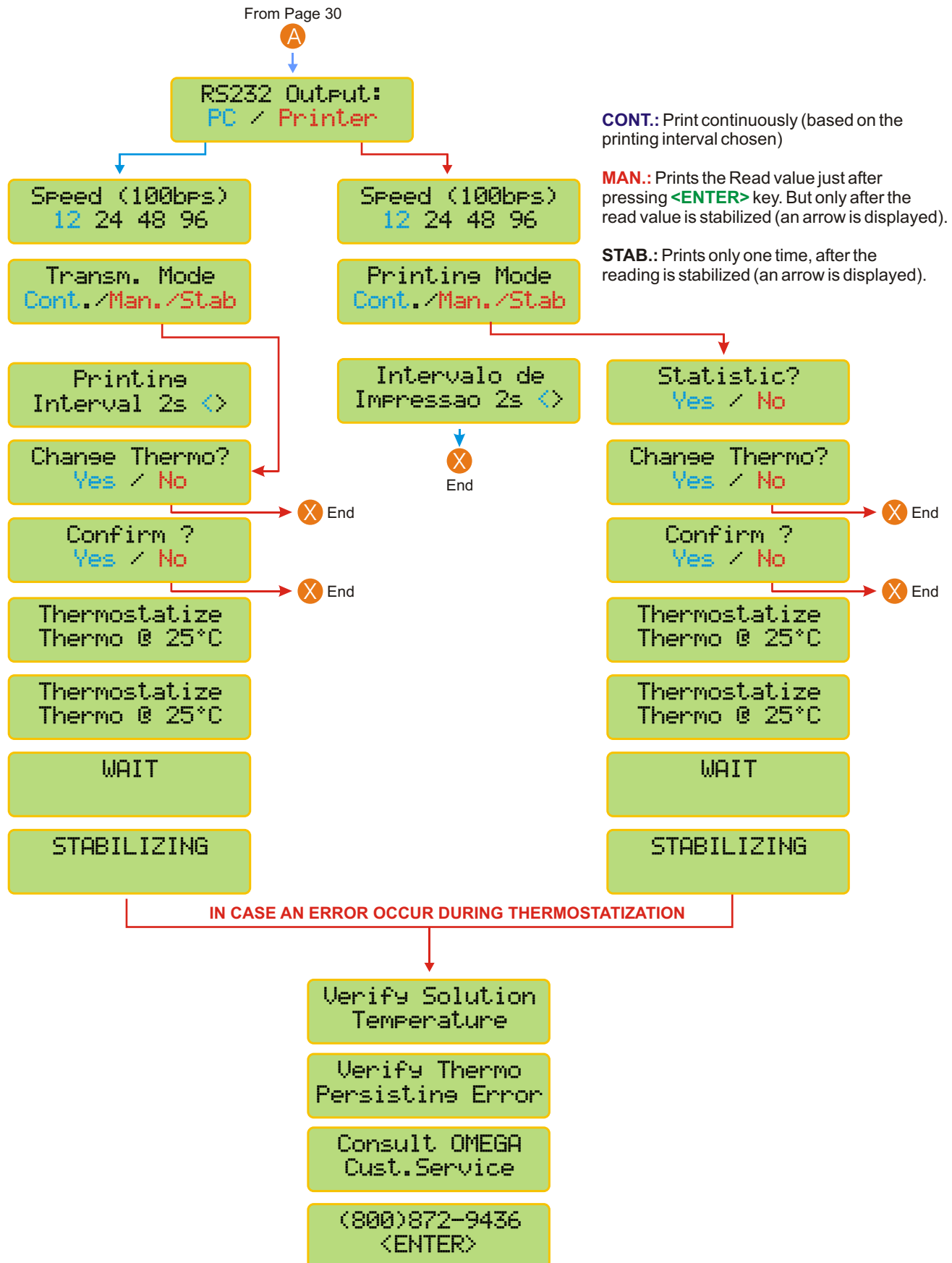
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8.9 Equipment Operation °C - Set Up (cont.)

User can change the last Electrode Change date. This is not done Automatically	Change Thermo ? Yes / No
User can now insert the electrode change date into the instrument. Use <SELECT> key to change numbers and when finished, press <ENTER> key. If a mistake is made, press <ESCAPE> key to move back.	Inform new Thermo Date: 12/06/2006 15:00:00
User can choose if instrument would Beep when Stability is reached during Read Mode or Not.	Stability Beep? Yes / No
User can choose if instrument would Beep on Keyboard touch or Not.	Keyboard Beep? Yes / No
User has the option to program the user name of the operator. In order to program the operator name press <SELECT> key to change numbers and when finished, press <ENTER> key. If a mistake is made, press <ESCAPE> key to move back.	Operator ? Yes / No Operator Name : -----
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.	Max. Alarm? Yes / No
Press <SELECT> key until desired option flashes, then press <ENTER> key to confirm the option chosen.	Max. Value: 100°C <>
In order to adjust the values, refer to page 16.	Min. Alarm? Yes / No
	Min. Value: 0°C <>
User can choose to use RS 232 Output or not!	RS232 Output? Yes / No

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

User can program the PC or the Printer to be used at the RS 232 output, Speed Transmission and Printing modes, intervals and Statistics.



8.10 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 CONC.
```

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

```
pH: Read /
Set Up
```

Dip electrode into sample and when Ready, press **<ENTER>** key to confirm.

```
Go to Sample!
Ready?
```

```
25.5 °C
```

If user desires to exit the reading mode, press and hold **<ESCAPE>** for about 6seconds and before exiting the following message will be displayed "End Report". This message shows in order for the user to inform the software that the job ended, so the report can be finalized.

```
End Report?
Yes / No
```

8.11 Equipment Operation Concentration - Set Up

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

```
Select Function
pH mV °C CONC.
```

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

```
Conc.: Read /
Set Up / Check
```

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

```
Password
- - -
```

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: Port./
English/Spanish
```

User can choose the desired element, refer to page 16 on how to modify the element.

```
Ion Selective:
Fluor F- <>
```

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

```
Units: PPM mg/L
mol/L meq/L
```

This Screen is default and cannot be changed.

```
Range
0.00 to 1900 PPM
```

This Screen is default and cannot be changed.

```
PH Range
5 to 8 pH
```

This Screen is default and cannot be changed.

```
Temperat. Range
0 to 80 °C
```

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 Standard values. In order to get to know how to change the values, please refer to Page 16 for instructions.

```
1° Point:
0.5 PPM <>
```

```
2° Point
5.0 PPM <>
```

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

```
Calibr. Inform.?
Yes / No
```

User can program the number of readings, before instrument prompts for calibration. Refer to page 16 on how to adjust the number.

```
Inform after
200 Readings <>
```

User can choose between Reference or Absolute Temperature. Press **<SELECT>** key until desired option flashes, then press **<ENTER>** key to confirm chosen option.

```
Temperature:
Ref. / Absolute
```

User can choose to adjust the Temperature Coefficient. Refer to page 16 on how to adjust this value.

```
TEMP. Coefic.:
-0.13% / °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

```
Read Mode:
Cont./Aver./Hold
```

8.11 Equipment Operation Concentration - Set Up (cont.)

User can program the time between Readings. Refer to Page 16 for instructions on how to adjust this time.

Reading Time:
1s <>

User has the option to choose the Sample Time, based on ISE Process being used. Press <SELECT> key until the desired option flashes, then press <ENTER> key to confirm.

Sample Time:
1/2/3/4/5 min

User can program the display to show information like Barr graph, Clock, Calibr., Check and Electr. Change Dates and more.

Display ?
Yes / No

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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!

Bar-graph ?
Yes / No

User can now adjust the Minimum and Maximum values for the Bar Graph.

Min.: 0PPM <>
Max.: 14PPM <>

User can choose to display date/clock on display, when equipment is turned off.

Clock ?
Yes / No

User can adjust date and clock, if desired.

ADJUST ?
Yes / No

Use <SELECT> key to change numbers and when finished, press <ENTER> key. If a mistake is made, press <ESCAPE> key to move back.

12/06/2006
15:00:00

User can set up the instrument to store and display the last Calibration date or Not.

Calibration Date?
Yes / No

User can set up the instrument to store and display the last Check date would or Not.

Check Date?
Yes / No

User can change the last Electrode Change date. This is not done Automatically

Change ISE ?
Yes / No

User can now insert the electrode change date into the instrument. Use <SELECT> key to change numbers and when finished, press <ENTER> key. If a mistake is made, press <ESCAPE> key to move back.

Inform New
Electrode Date:

00/00/0000
00:00:00

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

Stability Beep?
Yes / No

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

Keyboard Beep?
Yes / No

User has the option to program the user name of the operator.

Operator?
Yes / No

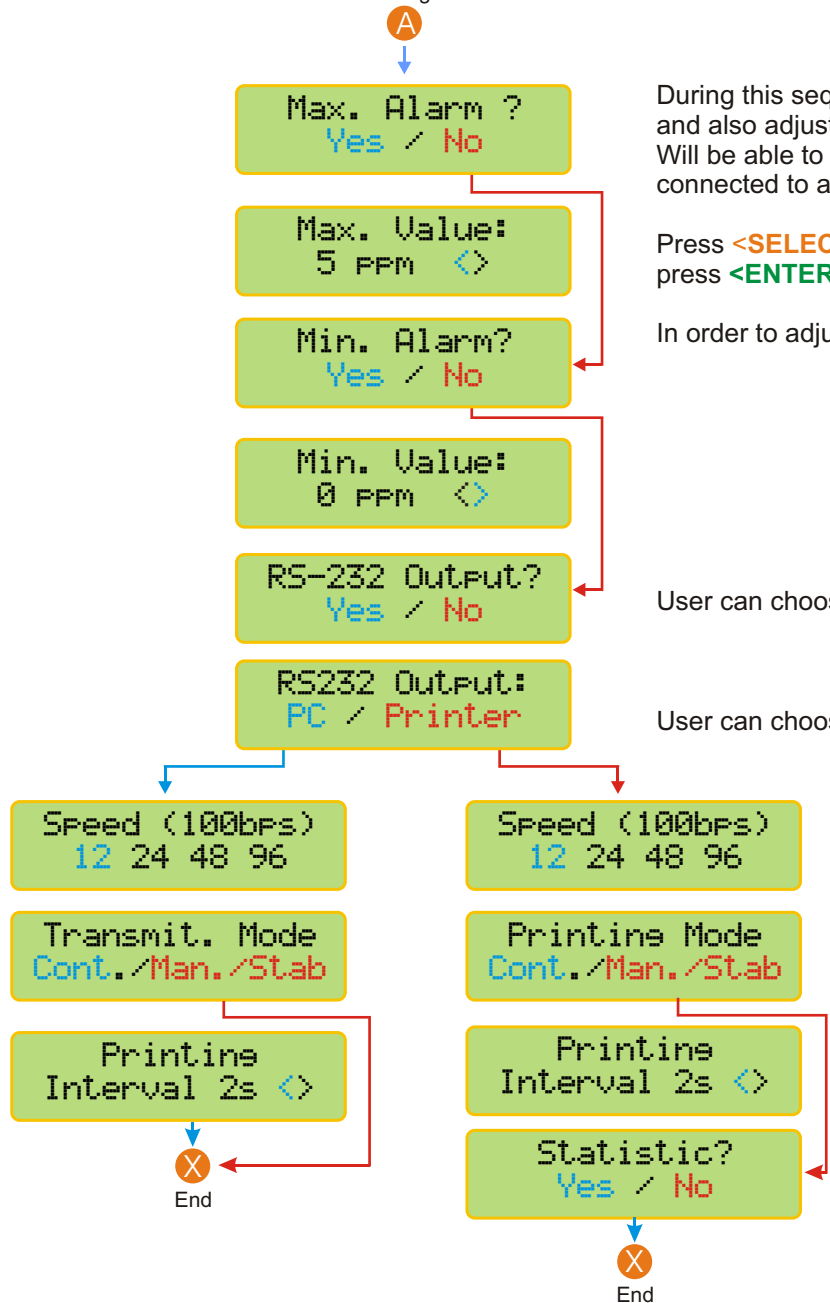
In order to program the operator name press <SELECT> key to change numbers and when finished, press <ENTER> key. If a mistake is made, press <ESCAPE> key to move back.

Operator Name:
- - - - -

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8.11 Equipment Operation Concentration - Set Up (cont.)

From Page 34



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 16.

User can choose to use RS 232 Output or not!

User can choose between PC or Printer for output.

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).

8.12 Equipment Operation Concentration - Calibration

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

Select Function
pH mV °C **CONC.**

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

Conc.: **Read** /
Set Up / Check

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

Conc.: Read/
Calibrate

The last ISE Change date and time will be displayed. This date/time is changed manually during Set Up operation.

ISE Change:
00/00/00 08:00

The last Calibration date/time will be displayed!

Last Calib.Date:
00/00/00 08:00

Dip electrode into 0.5mg/L Standard. This Standard value was chosen at Set Up Operation.

Place Electrode
Pt 1: 0.5 mg/L

Then press **<ENTER>** key when ready to continue

READY?

Wait.

WAIT

Remove the electrode from 0.5mg/L Standard and wash it using deionized water. Press **<ENTER>** key when finished.

Wash Electrode
Ready ?

Dip electrode into 5.0mg/L Standard. This Standard value was chosen at Set Up Operation.

Place Electrode
Pt 2: 5.0 mg/L

Then press **<ENTER>** key to when ready to continue.

READY?

Wait

WAIT

At this moment, the Sensibility of the electrode will be displayed!

Sens.=100.0%

Remove the electrode from 5.0mg/L Standard and wash it using deionized water. Press **<ENTER>** key when finished.

Wash Electrode
Ready ?

User is prompted to go to sample for Reading, if desired, place ISE into sample, then press **<ENTER>** key.

Go to Sample!
Ready ?

The display will show the element being measured, the Sample Temperature, the Read value and the reference temperature, if user had chosen Reference Temperature during Set Up operation, otherwise the Absolute (ABS) will be displayed, as shown!

F- 25.5°C
0.1 mg/L @ 25°C

100.0% 25.5°C
190.2 mV ABS

Press **<SELECT>** key in order to adjust manually the Compensation temperature. Refer to page 16 for instructions on how to adjust this value..

Man. Temp. Comp.
25.0 °C <>

End Report?
Yes / No

If user desires to exit the reading mode, press and hold **<ESCAPE>** for about 6seconds and before exiting the following message will be displayed "End Report". This message shows in order for the user to inform the software that the job ended, so The report can be finalized.

8.13 Equipment Operation Concentration - Check

Select Function
pH mV °C **CONC.**

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

mV: Read /
Set Up / **Check**

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

Electrode
Check

Last ISE Change:
00/00/00 08:00

The last ISE Change date and time will be displayed. This date/time is changed manually during Set Up operation.

Last CheckDate:
00/00/00 08:00

The last Calibration date/time will be displayed!

Response Time?
Yes / No

User can check the ISE response time. Press **<SELECT>** key until the desired option flashes, then press **<ENTER>** key to Confirm.

Place Electrode
Pt 1: 0.5PPM

Place Electrode
Pt 1: 0.5PPM

Dip electrode into 0.5mg/L Standard. This Standard value was chosen at Set Up Operation. Then press **<ENTER>** key to when ready to continue.

READY ?

WAIT

Wait.

WAIT

WASH ELECTRODE
READY ?

Remove the electrode from 0.5mg/L Standard and wash it using deionized water. Press **<ENTER>** key when finished.

RESPONSE TIME
2s <ENTER>

Place Electrode
Pt 2: 5.0PPM

Dip electrode into 5.0mg/L Standard. This Standard value was chosen at Set Up Operation. Then press **<ENTER>** key to when ready to continue.

READY ?

WAIT

Wait.

Check Result

Pt 100 100C
<ENTER>

WASH ELECTRODE
READY ?

8.14 Equipment Operation Concentration - Read

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

```
Select Function
pH mV °C CONC.
```

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

```
mV: Read /
Set Up / Check
```

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

```
Conc. Read/
Set Up/Check
```

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

```
Conc. Read/
Calibrate
```

Dip electrode into sample and when Ready, press **<ENTER>** key to confirm.

```
Go to Sample!
Ready ?
```

This screen will be displayed only if a problem with the Thermo is detected. Verify the thermo connection!

```
Attention
Verify ATC
```

The display will show the element being measured, the Sample Temperature, the Read value and the reference temperature, if user had chosen Reference Temperature during Set Up operation, otherwise the Absolute (ABS) will be displayed, as shown!

```
F-      25.5°C
0.1 me/L 25.5°C
```

```
100.0% 25.5°C
3.591pH @ 25°C
```

```
Man. Temp. Comp.
25.0°C <>
```

If user desires to exit the reading mode, press and hold **<ESCAPE>** for about 6seconds and before exiting the following message will be displayed "End Report". This message shows in order for the user to inform the software that the job ended, so the report can be finalized.

```
End Report?
Yes / No
```

9. Service and Maintenance

Equipment Maintenance

For instrument cleaning, use isopropilic alcohol, using a clean tissue and drying it just after. After this operation, it is suggested to use a clear wax using a fine tissue and wax the instrument body but not the tactile membrane keyboard. Remove excess wax from the body, polishing it.

Electrodes Maintenance

1 - For storage purpose the electrodes must be dipped at the same electrolyte reference solution as used internally at the electrode, with Electrolyte Fill Hole (9) closed.

2 - In order to avoid Reading errors, the Bulb (1) and the Punctual Ceramic (3), must be always cleaned.

3 - For cleaning purpose, wash the electrode using neutral detergent, rubbing with your own fingers and rinse it using plenty of distilled water. Dip the electrode for about 15 minutes in Thiourea Solution and after this, dip it for 15 minutes in PEPSIN Solution.

4 - If necessary dip it for 5 minutes in HCl 0.1N and for 5 minutes in NaOH 0.1N. Repeat this operation and then rest the electrode for 30 minutes in 3 MKCl.

5 - In case noticed that the internal Electrolyte Reference is hazy or contaminated, replace it by removing the internal reference, using a syringe through Fill Hole (9) and wash the electrode internally using distilled water. Repeat this operation 3 times, then refill the electrode using the appropriate internal reference, depending on the electrode type.

6 - The membrane (1) must be cleaned manually using lint free absorbent paper. Any grease should be removed using benzine, or any other solvent.

7 - For tough dirt, use Chloridric Acid 0.1N and or sulphochromic solution. After this, leave the bulb of the electrode submersed for 12 hours, then dip it in 3 MKCl solution.

8 - Dehydrated membranes, must be dipped for about 30 seconds in HF (1-2%) solution, for renewal of the gel cap. After this, dip the bulb for 12 hours in 3 MKCl solution.

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.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

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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