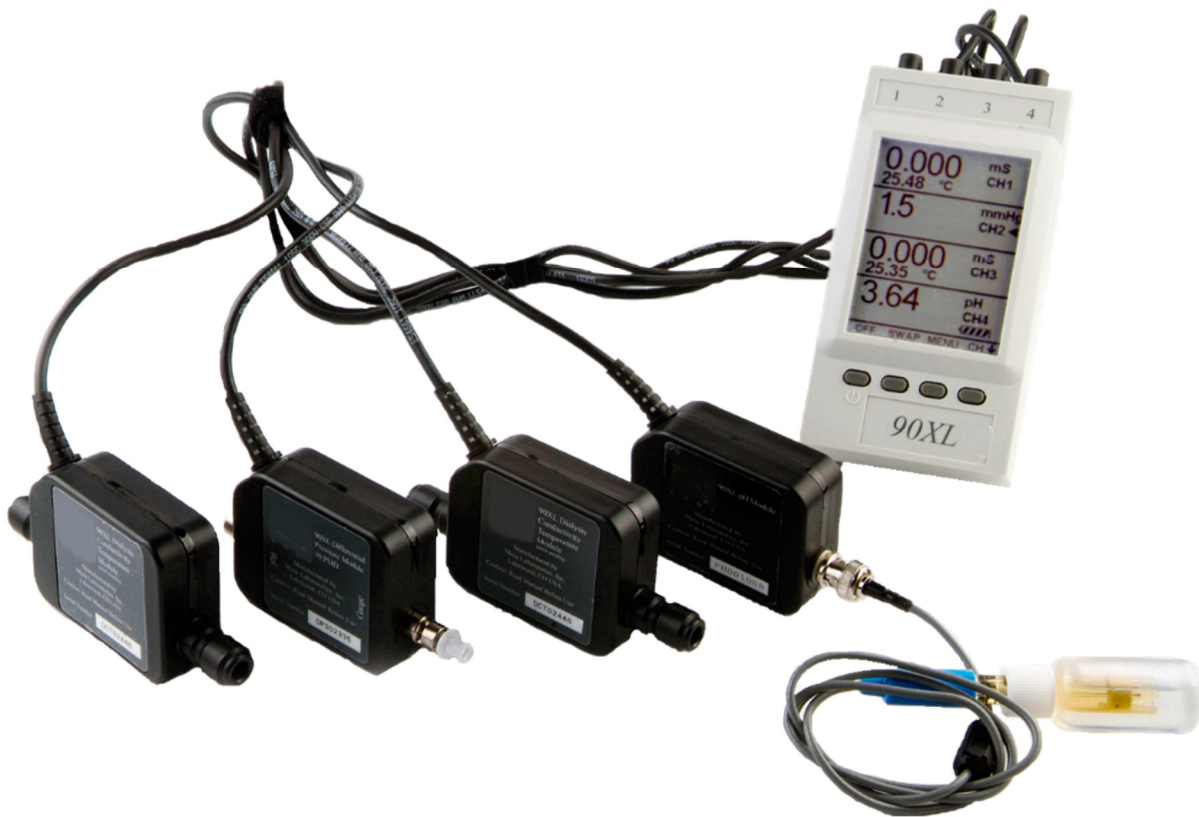


# 90XL™ Meter

## User's Guide



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## I. DESCRIPTION

The 90XL meter is designed to be used by hemodialysis professionals to measure and display readings of conductivity, temperature, pH, and pressure of the dialysate fluids used in hemodialysis delivery systems.

The display module includes the LCD display as well as the user interface. It is used in conjunction with specific measurement sensor modules that contain the appropriate sensor for the desired measurement. The following sensor modules are currently available:

- Conductivity / temperature
- pH
- Pressure (Gauge or differential)

The multichannel LCD screen allows the display of up to 4 simultaneous readings from any combination of sensor modules.

The 90XL timer function allows routine event timing.

**NOTE:** Throughout this User's Guide, the terms 90XL Instrumentation system and 90XL meter are equivalent descriptors for this device.

## II. INDICATIONS FOR USE

The 90XL instrumentation system is intended for use by hemodialysis professionals to measure the conductivity, temperature, pH, and pressure of the dialysate solution associated with hemodialysis delivery systems. Water purification specialists may also use the 90XL meter to verify proper characteristics of the water used in hemodialysis. These parameters are key indicators of system performance that require periodic monitoring and adjusting to maintain safe and effective hemodialysis systems.

### III. SAFETY INFORMATION



#### WARNINGS AND CAUTIONS



**WARNING:** The 90XL Display Module and its attached sensor modules should never be used without first verifying accuracy of measurement functions. Using the device without verifying accurate function could result in improper calibration of the dialysis delivery system. An improperly calibrated dialysis delivery system could result in compromised dialysis treatment(s) and/or patient injury.

Mesa Labs recommends verifying sensor module calibration using National Institute of Standards and Technology (N.I.S.T.) traceable reference standards before use or whenever inaccurate readings are suspected.

**WARNING:** The device is not suitable for use in a potentially explosive environment. The device cannot be used inside an oxygen tent.

**CAUTION:** Use only sodium chloride (NaCl) standard solution. The conductivity/temperature sensor module is temperature-compensated for NaCl solution. Other solutions, such as potassium chloride (KCl), may result in an inaccurate calibration.

**CAUTION:** DO NOT use the 90XL Instrumentation System in place of the dialysis delivery system's primary sensors, controls, and/or monitors.

**CAUTION:** DO NOT submerge your 90XL display module or the sensor module connector ends in liquids, as this may result in damage to the instrument and/or the sensor modules.

**CAUTION:** DO NOT use abrasive cleaning agents and/or full-strength bleach or acid to clean the display module or sensor modules, as this will cause damage.

**CAUTION:** DO NOT open the display module or sensor modules. There are no user-serviceable parts inside and it will void the warranty.

**CAUTION:** Federal (USA) law restricts this device to sale to or by order of a physician.

**CAUTION:** Dispose of this device properly.  
It should not be disposed of in a landfill.



**WARNING:** The user can be exposed to the following materials when using this device: Polyester, Aluminum, Acrylic, Glass, Natural Polypropylene, \*Noryl™, Stainless Steel, Santoprene, Silicone, ABS Plastic, Polycarbonate Plastic, Powder Coat Paint. No latex or latex containing materials are used in the manufacture of the device.

\*Noryl™ is a registered trademark of SABIC Innovative Plastics IP B.V.

## IV. GENERAL OVERVIEW

The 90XL meter is a portable, multifunction meter designed to measure the conductivity, pH, temperature, and pressure of the dialysate fluids associated with hemodialysis delivery systems, and of the water used in hemodialysis.

The display module houses the electronic circuitry, navigation keys, digital display, and rechargeable lithium-ion battery. The four navigation keys are labeled by the display according to context.

The individual sensor modules contain the appropriate sensors and circuitry for measuring the desired parameter of the dialysate solution or hemodialysis water. The sensor modules attach to the display module with cables that plug into connectors on the meter. Up to four different sensor modules may be simultaneously connected to the display module for the desired measurements.

Measurements for conductivity and temperature are taken as the solution flows through the dialysate lines to which a sensor module is connected. pH measurements may be taken by using the pH sensor module directly from a container using the dip configuration. For water purity measurements, a water sample is removed from the water purification system via a valve and then tested using an appropriate sampling method. The 90XL pressure sensor module can be used to verify the accuracy of arterial and venous monitors, measure negative pressure and differential pressure of the delivery system fluid.



In-Line method using adapters  
(Condo/temp, Pressure)



Dip sample method for pH  
measurement



Sample tray and syringe for  
conductivity measurement

## V. FEATURES, COMPONENTS, AND CONTROLS

Sensor module measurements are shown on the display module screen. Using the navigation keys, the user may access numerous display screens and views to select individual functions, such as:

Adjust date and time

Adjust screen contrast and brightness

Select units of measure for readings

Obtain detailed information about a sensor module

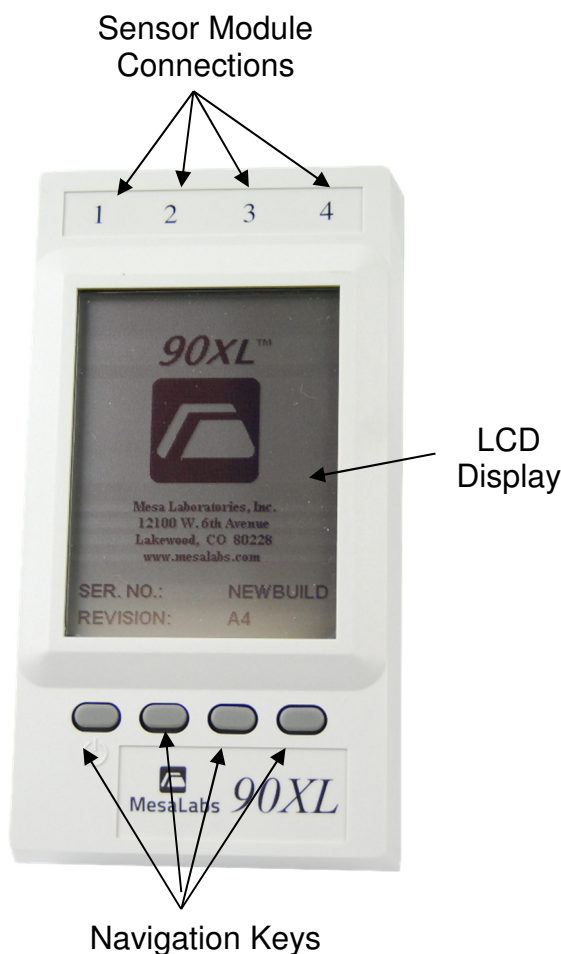
Calibrate sensor modules

Restore factory default values

Time events

Access help screens

Select auto-off time



Conductivity/Temp Sensor Module



pH Sensor Module and probe



Pressure Sensor Module



## A. Display Module Holder and IV Pole Holder

The Display Module is supplied with a protective holder. The holder may be used as a tilt stand on a flat surface, it may be used with the supplied IV Pole Holder to mount the Display Module on an IV pole, or the Display Module may be inserted with the LCD and buttons facing inside to protect it during transport and storage.



Case holder for the Display Module



Case holder used as a tilt stand on a flat surface












Place the Display Module in the case/holder with the screen side down as a protector











The IV Pole Holder conveniently slips into slots in the back of the case/holder

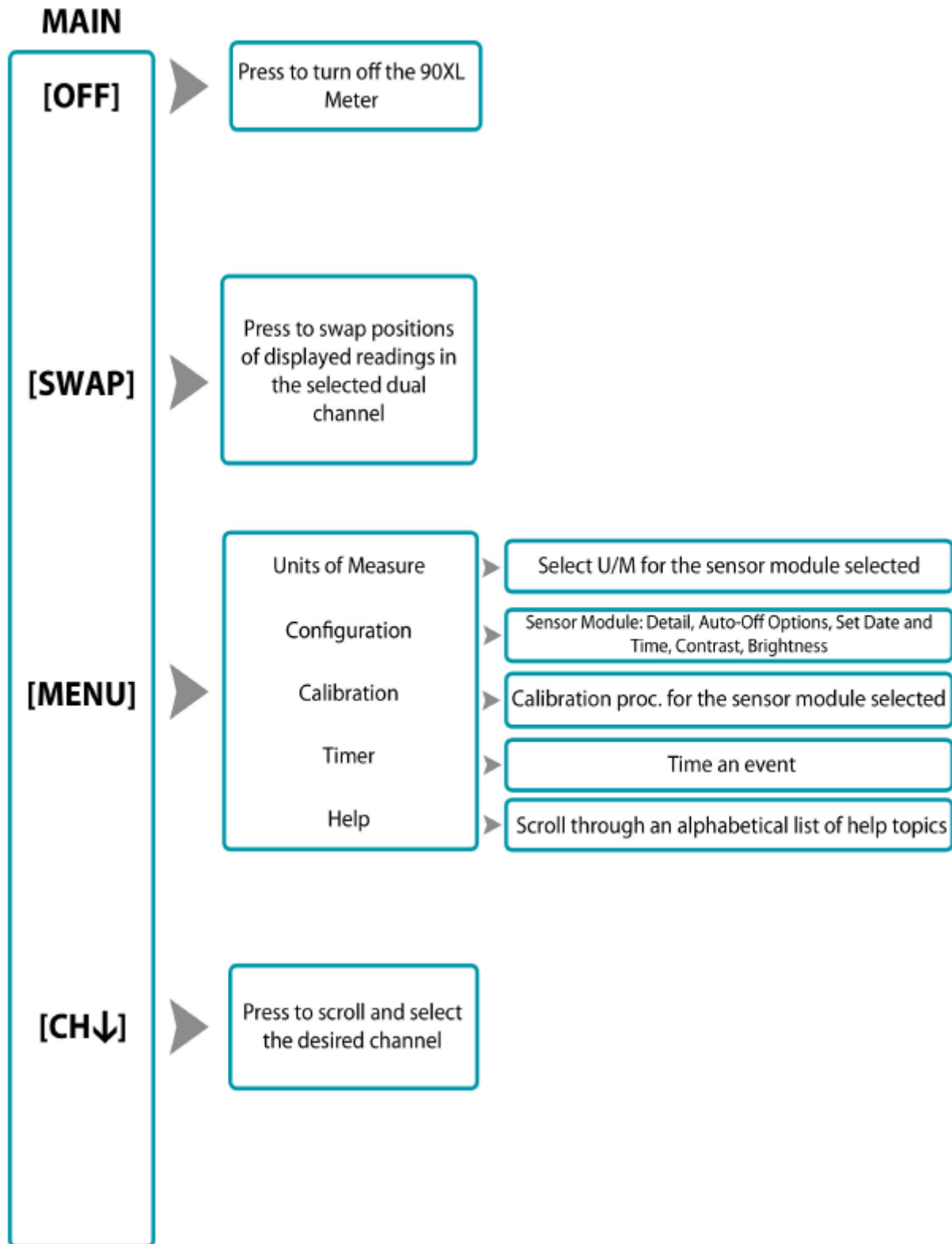


## B. Key and Symbol Descriptions

	SCROLL UP A LIST OF SELECTIONS, SCROLL UP ONE LINE IN HELP
	SCROLL DOWN A LIST OF SELECTIONS, SCROLL DOWN ONE LINE IN HELP
	SCROLL DOWN AN ENTIRE PAGE IN HELP
	SELECT THE CHANNEL OF INTEREST ON THE MAIN SCREEN
	RETURN TO THE MAIN SCREEN
	ACCESS THE SYSTEM MENU
	RESET THE TIMER FUNCTION TO ZERO
	SAVE A SELECTED PARAMETER
	SELECT A MENU ITEM

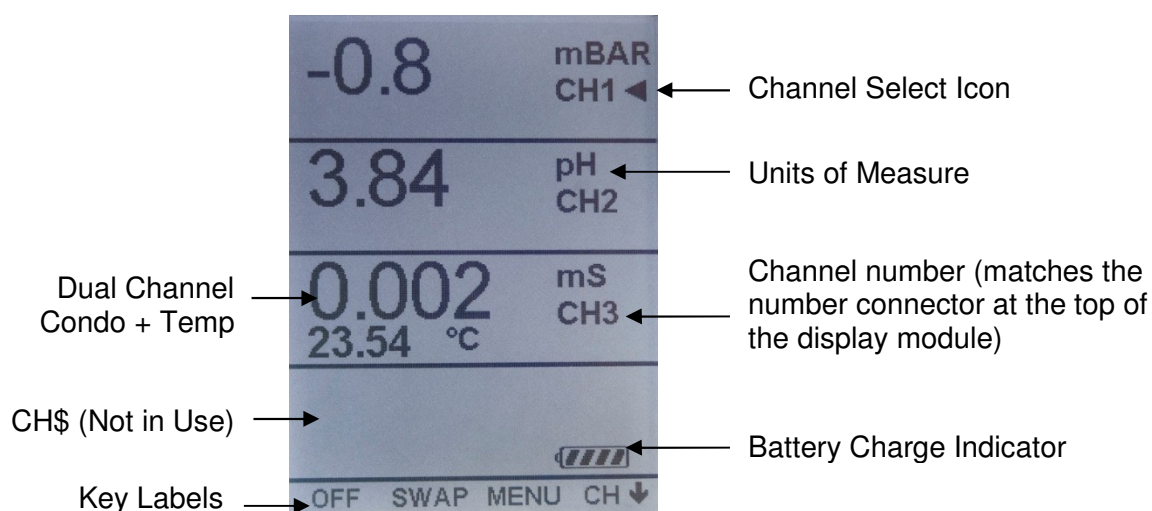
	START THE TIMER FUNCTION
	STOP THE TIMER FUNCTION
	CHANGE THE POSITION OF THE READINGS IN DUAL CHANNEL DISPLAY
	RETURN TO THE PREVIOUS SCREEN
	PRESS TO MANUALLY TURN OFF THE SYSTEM
	PRESS TO DISCONTINUE OR RESTART A CALIBRATION PROCEDURE
	PRESS TO SAVE A SETTING UNTIL THE UNIT IS TURNED OFF
	ADVANCE TO THE NEXT CALIBRATION STEP

## C. 90XL Screen Flow Diagram



## D. 90XL Display Screens

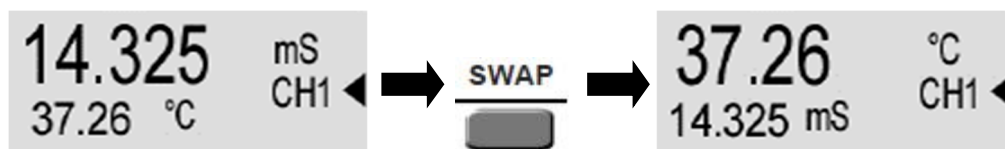
### 1. MAIN Screen Overview



The 90XL screen that displays all real-time measurement information is called the MAIN screen. The MAIN screen can display up to 4 channels of information based on the number and types of sensor modules that are connected. The readings from all sensor modules are displayed simultaneously on the one MAIN screen. If you are viewing multiple channels, there may be a need to select a particular channel for further actions. This may be done by pressing the key labeled **CH ↓**. This will scroll the selection indicator ( ◀ ) down one channel for every press of the key. The scrolling sequence is "CH 1 through CH 4, then back to CH 1..., etc." Unused channels on the display are ignored during the scrolling function.

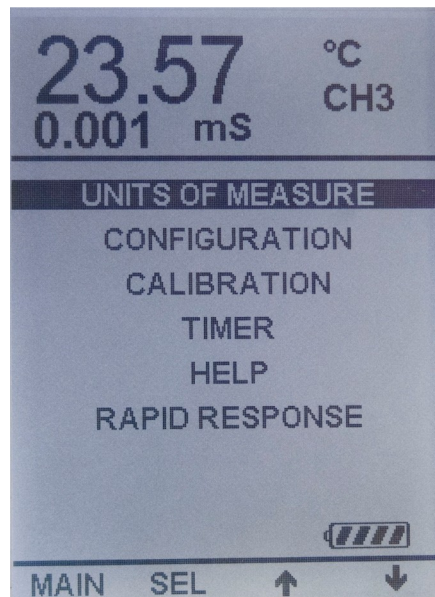
The SWAP function on the MAIN screen is used to swap the dominant and subordinate readings within a conductivity and temperature channel. Simply select the channel you would like to change using the **CH ↓** key, and press SWAP. (See Figure 1 below)

Fig. 1



The SWAP key has no affect for a single parameter channel.

## 2. MENU Screen Overview



The MENU key on the MAIN screen will advance you to the list of channel specific, as well as system related functions.


**NOTE:** The selected channel on the MAIN screen continues to be displayed on the MENU screen. Return immediately to the MAIN screen by pressing the MAIN key.

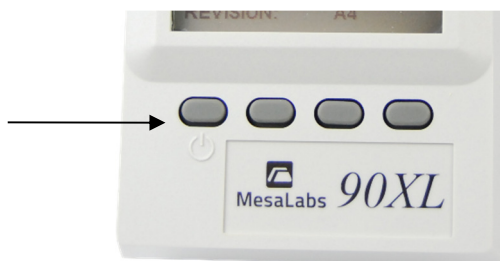
Scroll with the up/down arrows to highlight a menu item, then select using the “SEL” key.

## VI. OPERATING INSTRUCTIONS

### A. General

#### (a) Turn the 90XL ON...

To turn on the instrument, press the left most key at the bottom of the display. It is marked with the  symbol.



#### (b) Connect sensor module(s) to the 90XL meter

Select the sensor module or sensor modules that you would like to use and connect them to the ports at the top of the instrument. The system will sense the type of sensor module or sensor modules that are connected, and automatically orient the channels on the display.

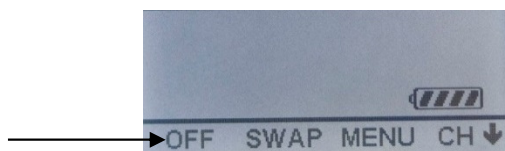
#### (c) Take measurements...

Once the sensor module(s) are connected to 90XL meter, you are ready to take your measurements.

**WARNING:** Mesa Labs recommends verifying sensor module calibration using National Institute of Standards and Technology (N.I.S.T.) traceable reference standards before taking measurements, or whenever inaccurate readings are suspected.


#### (d) Turn the 90XL OFF...

The 90XL may be turned off manually by pressing the OFF key at the bottom of the MAIN screen. Additionally, if an AUTO-OFF (see configuration section) function has been enabled, the instrument will power down automatically if no key activity is sensed during the selected time period.



## B. How to Connect / Disconnect a Sensor Module

### **To connect a sensor module to the 90XL display module:**

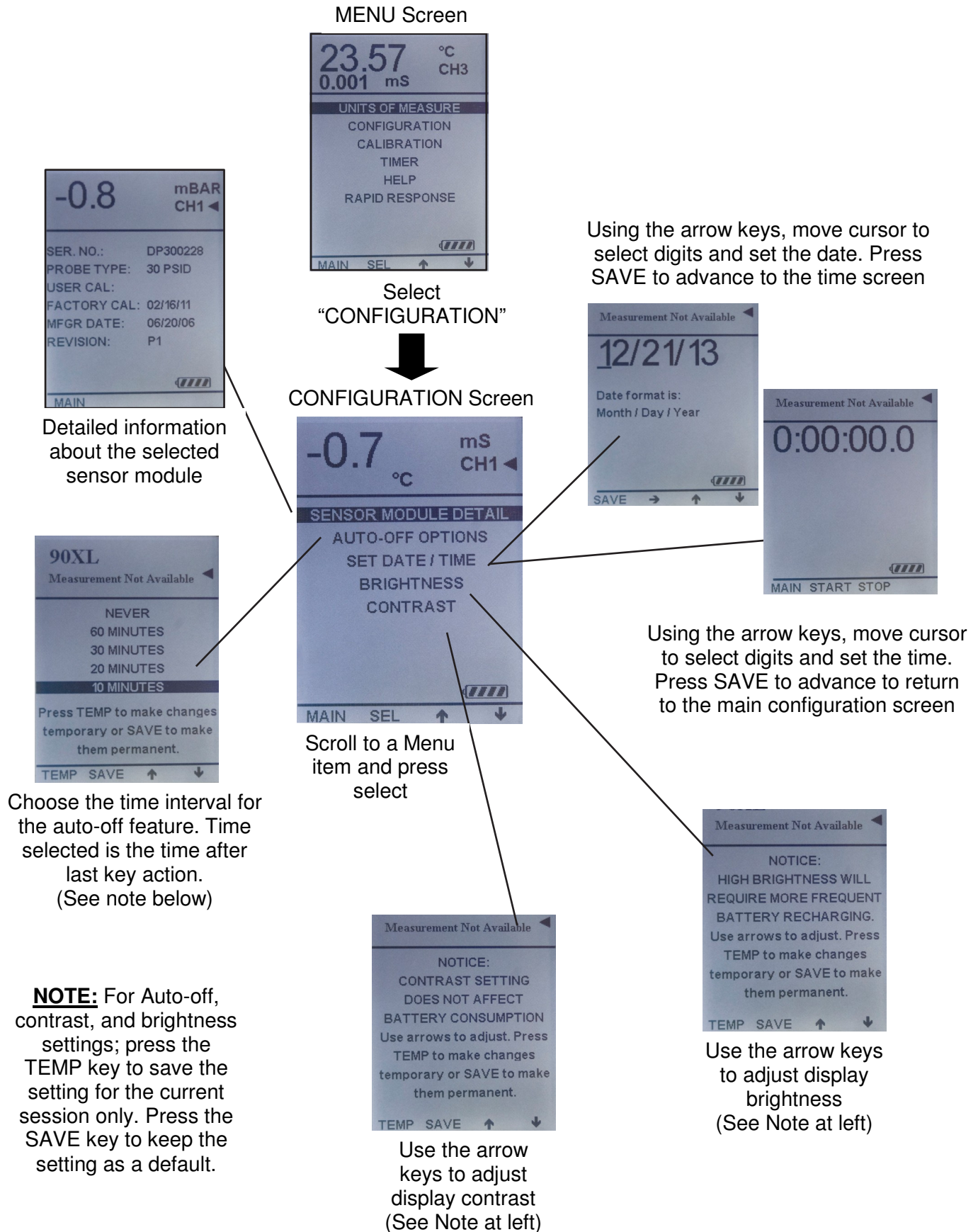
1. Turn the display module ON by using the left-most key, labeled with the symbol .
2. The sensor module may be connected to any vacant port.
3. Plug the connector into the port until a slight click is felt.

There is a slight pause while the sensor module establishes communication with the display module. The 90XL will then display the reading on the channel that matches the sensor module connector.

### **To disconnect a sensor module from the 90XL Display Module:**

Using your fingers, gently pull straight away from the socket to remove the connector from the port. Do not turn or rotate the cable end. Cover the port with the protective cap to prevent dirt, dust or fluids from entering the connector.

## C. Meter Configuration





## D. Changing the Units of Measure

Units of measure may be changed for conductivity, temperature, and pressure by using the following procedures. Once new units of measure have been selected, they will be retained in the sensor module until changed again by the user.

### Conductivity units:

Select the channel displaying conductivity on the MAIN screen using the arrow keys.

Make sure that conductivity is the dominant parameter being displayed and press MENU. Use the SWAP key to change the dominant parameter if necessary.

Select "UNITS OF MEASURE" from the MENU screen.

Scroll to the units desired using the arrow keys and press "SEL". After a brief pause, the display will return to the MAIN screen and display the parameter in the new units.



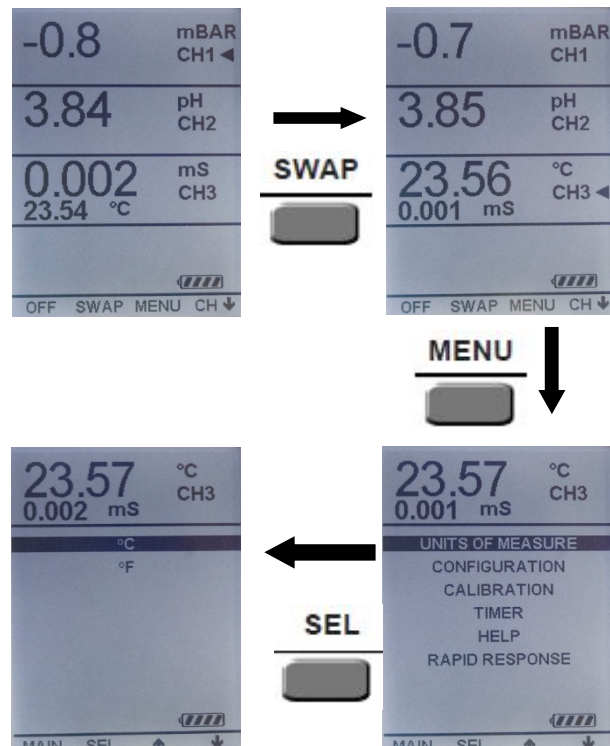
### Temperature units:

Select the channel displaying temperature on the MAIN screen using the arrow keys.

Make sure that temperature is the dominant parameter being displayed (if not press SWAP) and press MENU.

Select "UNITS OF MEASURE" from the MENU screen.

Scroll to the units desired using the arrow keys and press "SEL". After a brief pause, the display will return to the MAIN screen and display the parameter in the new units.



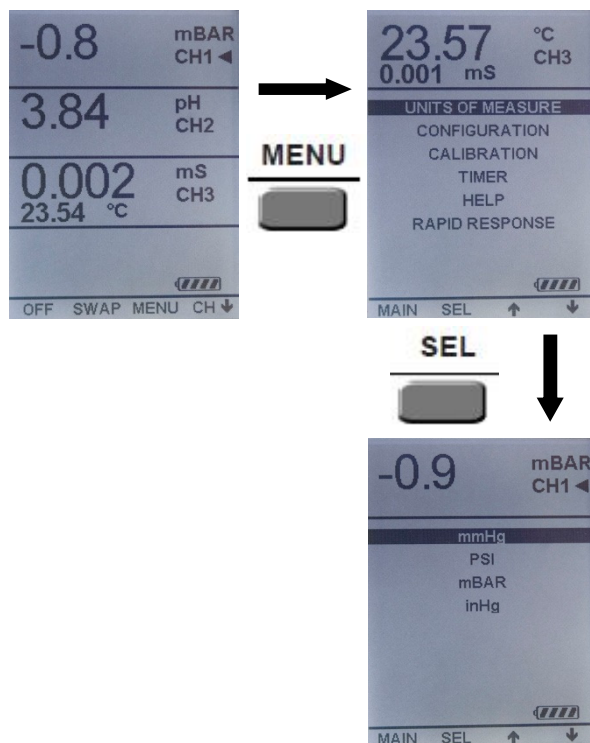


### Pressure units:

Select the channel displaying pressure on the MAIN screen using the arrow keys.

Select "UNITS OF MEASURE" from the MENU screen.


Scroll to the units desired using the arrow keys and press "SEL". After a brief pause, the display will return to the MAIN screen and display the parameter in the new units.

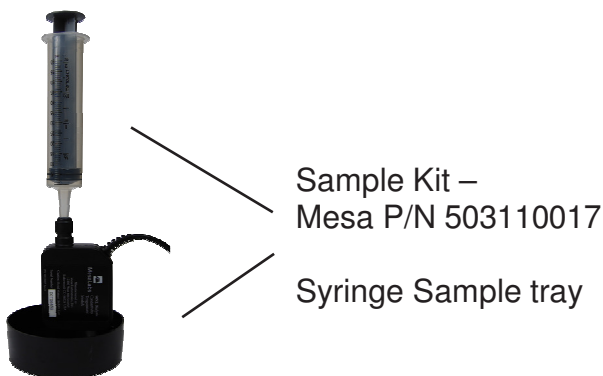


**NOTE:** pH units are standard and can not be changed.

## E. How to Take Measurements

### 1. Conductivity and Temperature Measurements

- Turn the display module ON by using the left-most key, labeled with the  symbol.
- Connect a conductivity/temp sensor module to any available port on the display module.
- Choose one of the following measurement methods:



**Sample Method:** Insert the sensor end of the conductivity/temperature sensor module into the container of test solution as shown above. Draw sample solution steadily through the sensor module. Note the display output while the solution is flowing. When the display is stable, take your reading.

**In-line Method:** Connect condo/temp sensor module directly to the delivery system using the Hansen connectors as shown above. Reestablish flow through the sensor module and take your readings when the display is stable.

### 2. pH Measurements

Module cable connected to 90XL display module



**Sample Method:** Insert the pH sensor module electrode into the sample as shown above. When the display is stable, take your reading.

### 3. How to Take Pressure Measurements

Turn on the 90XL meter and attach a pressure sensor module to any open port on the top of the display module. Once the pressure sensor module is sensed, pressure will be displayed in the appropriate channel section of the LCD screen.

The 90XL pressure sensor module can be used to verify the accuracy of arterial and venous monitors, measure negative pressure and differential pressure of the delivery system fluid.

#### **WARNING**

Use of transducer protectors is required when measuring pressure in liquid lines to prevent intrusion of fluids into the pressure sensor module.

#### ***CAUTION:***

If a transducer protector becomes wetted, it will not transmit pressure accurately and must be replaced with a dry protector.

Module cable connected to 90XL display module



## IMPORTANT:

Before measuring pressure, first verify that the display reads “0” with both pressure ports open to atmospheric pressure. If necessary, zero the pressure function using the procedure in the calibration section of this user’s guide.

### Positive or Negative Pressure

To measure either positive or negative pressure, attach monitor line tubing to the “Gauge” port. The “Ref” port must be open to atmosphere.

to positive or negative  
pressure source

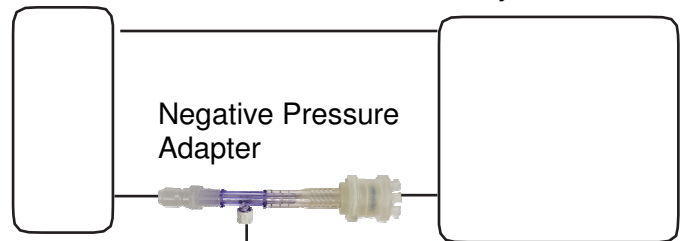


To 90XL Display Module

### Negative Pressure Measurement

Artificial Kidney

Dialysis Machine



Transducer Protector

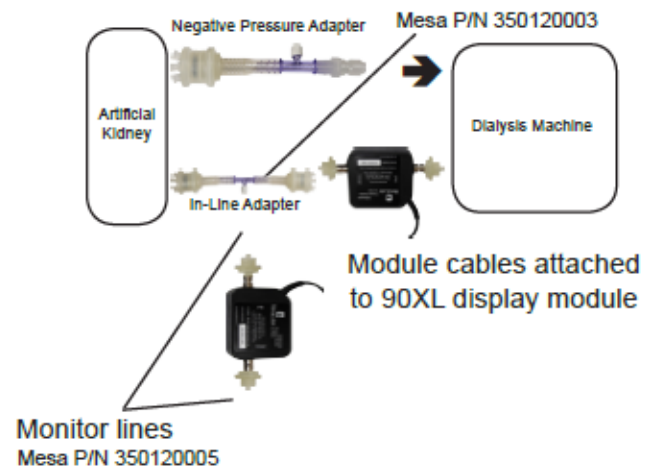


Open

### Differential Pressure Measurement

To measure differential pressure, attach monitor tubing to the “Gauge” and “Ref” Luer ports on the pressure sensor module. Pressure will read positive only if the greater of the two measurement points is connected to the “Gauge” port.

In-line and negative pressure adapters, as well as monitor lines are available as 90XL accessories.



## F. How to Verify Sensor Module Calibrations

Verify that the measurement sensor module is properly calibrated before use or whenever inaccurate readings are suspected. When required, always use reference standards that are traceable to the National Institute of Standards and Technology (N.I.S.T.) and that have not expired or are past the open bottle time.

### 1. 90XL Conductivity/Temperature Sensor Module

#### a) 90XL Conductivity

**CAUTION:** Use only sodium chloride (NaCl) standard solution. The conductivity/temperature sensor module is temperature-compensated for NaCl solution. Other solutions, such as potassium chloride (KCl), may result in inaccurate calibration.

**Gather the following supplies:**

- 14.0 mS conductivity standard solution (NaCl) Mesa P/N 02.0027
- 90XL Sample Kit Mesa P/N 503110017

**To verify calibration of the conductivity/temperature sensor module:**

1. To rinse the sample tray and sensor module, pour approximately 50 ml of fresh reference solution into the sample tray. Insert the conductivity sensor module into the center sensor holder of the tray.
2. Insert the syringe assembly to the top male Hansen fitting of the sensor module. Draw rinse solution through the sensor module, and expel through the sensor module.
3. Discard the rinse solution – do not pour used solution back into the original container.
4. Pour approximately 50 ml of fresh solution into the rinsed sample tray. Make sure the conductivity sensor module is inserted into the center sensor holder.
5. Draw standard solution slowly through the sensor module and observe the reading on the display. If the value on the display reads within specified limits based on the standard solution value used, then calibration is not needed. If this displayed value falls outside of specified limits, then calibration is required. See the section entitled “Calibration and Maintenance”.

14.0 mS conductivity  
standard solution

Center sensor holder



## b) 90XL Temperature Verification

The 90XL temperature calibration may be verified against any N.I.S.T. traceable standard, or a second 90XL sensor module. Liquid must be moving through the sensor module when a temperature reading is taken.

### To verify temperature calibration of the conductivity/temperature sensor module:

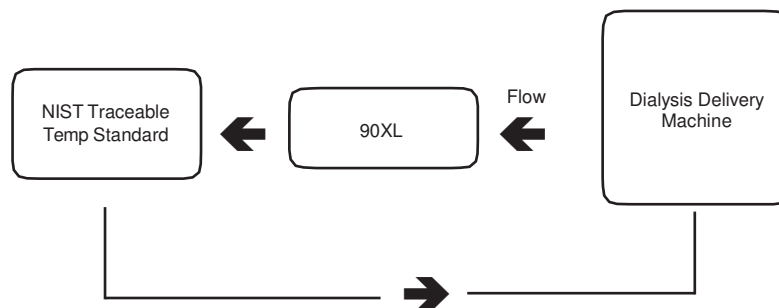
1. Place the 90XL condo/temp sensor module in a liquid flow path in series with the standard to be used. (See figure below)

**NOTE:** If the temperature standard to be used is a dip type probe or a glass thermometer, a holder must be used to allow flow around the sensing element and the correct immersion level must be observed.

2. After approximately one minute of flow through the sensor module, observe the temperature reading on the display module.

**NOTE:** If the temperature of the liquid in the flow path is different from the surrounding (ambient) temperature, the temperature of the liquid will be closer to the ambient temperature at the downstream temperature measuring point than at the upstream measuring point. The magnitude of the difference can be measured by reversing the direction of flow through the two sensors.

**IMPORTANT NOTE:** The temperature function of this sensor module cannot be calibrated by the user. Our experience indicates that if erroneous or inaccurate temperature readings are noted, it is almost always due to a faulty sensor module. Call Mesa Labs for assistance.



## 2. 90XL pH Sensor Module

### Gather the following supplies:

- 7.00 pH buffer solution, Mesa P/N 02.0031
- 90XL Sample Kit, Mesa P/N 503110017

### To verify calibration of the pH sensor module:

1. Rinse the sample tray and the pH sensor probe with some of the buffer solution to eliminate any contaminants. Discard the rinse solution – do not pour used solution back into the original container.
2. Pour approximately 50 ml of fresh solution into sample tray.
3. Insert the pH probe into the outer sensor holder. Gently swirl the solution in the tray and allow the display reading to stabilize.
4. Observe the reading on the display. If this displayed value is within specification based on the value of the buffer solution used, then calibration is not needed. If this value is outside of specifications, then calibration is needed. See the section entitled “Calibration and Maintenance”.
5. Using appropriate pH buffer solutions, calibration may be verified at values other than pH 7.00. Note that pH 10.00 buffer is temperature sensitive and may not display 10.00, except at 25.0°C. See label for temperature compensation information.

pH buffer solution



To 90XL pH Sensor Module



### 3. 90XL Pressure Calibration Verification

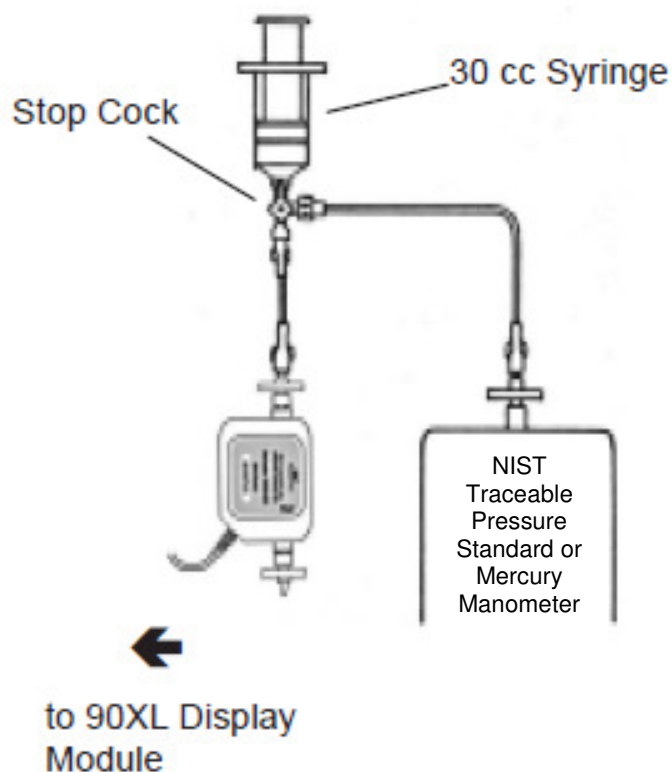
Positive or negative gauge pressure may be checked against a mercury manometer or other N.I.S.T. traceable standard.

**To verify calibration of the pressure sensor module:**

1. The 90XL “Ref” port must be open to the atmosphere.
2. Connect the 90XL pressure sensor module to the display module.
3. With the “Gauge” port open to atmospheric pressure, the display should read “0 mmHg”.

**NOTE:** If the display does not read zero, refer to the “Calibration and Maintenance” section of this User’s Guide.

4. Connect the 90XL and the reference standard using the stop cock and monitoring lines as shown below. Check for leaks.
5. Apply positive or negative pressure to both the 90XL pressure sensor module and the reference standard to verify accuracy.



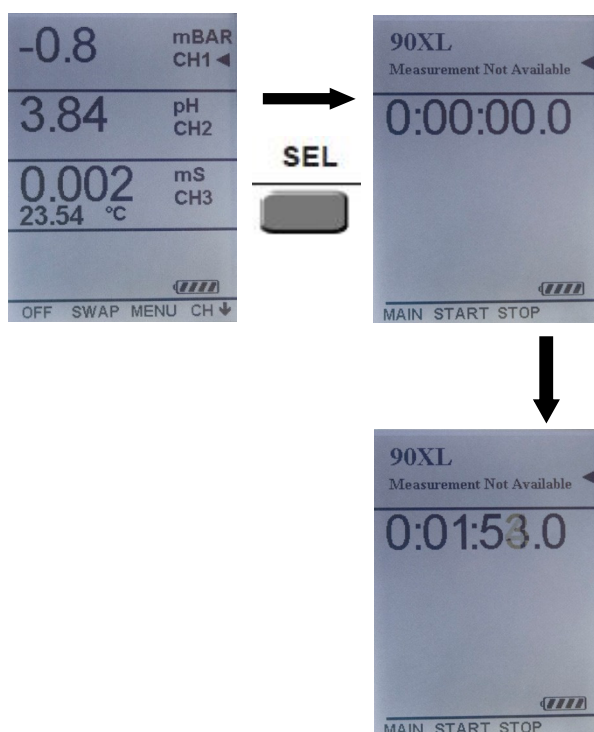


## G. Timer Function

### Event Timing

To access the timer function:

1. Select MENU from the MAIN screen and scroll to TIMER using the arrow keys.
2. Press START to begin event timing; Press STOP to stop event timing.
3. Press RESET to return the timer to zero. You may start to time another event at this point.
4. Press MAIN to return to the MAIN screen. This also resets the timer to zero.



## VII. CALIBRATION INSTRUCTIONS

### A. General Information

**SENSOR MODULE CALIBRATION** -The 90XL display module does not require calibration, although the menu options on the display module are used to calibrate the connected measurement sensor modules. Mesa recommends that users verify sensor modules values against non-expired NIST-traceable solutions before use and calibrate (adjust) the meter only when these verifications are out of tolerance.

**NOTE:** Yearly factory calibrations are recommended on the Conductivity/Temperature and Pressure sensor modules. Factory Calibrations stickers are located on the sensor module and contain last known calibration date and calibration due date.

**CAUTION:** Always use reference standards that are traceable to the National Institute of Standards and Technology (N.I.S.T.). Mesa Laboratories reference solutions are highly recommended and are the same solutions used in the manufacture and factory calibration of your instrument. DO NOT use expired or out of date Solutions.

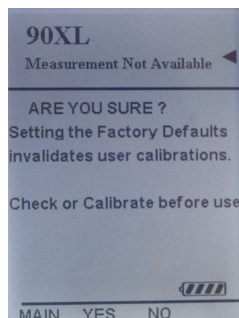
**CAUTION:** Use only sodium chloride (NaCl) conductivity standard solution. The conductivity/ temperature sensor module is temperature-compensated for NaCl solution. Other solutions, such as potassium chloride (KCl), may result in inaccurate calibration.

**NOTE:** Select the sensor module that you plan to calibrate by scrolling to it on the MAIN screen. When CALIBRATION is selected from the MENU screen, all procedural and on-line help information will be related only to the type of sensor module that was selected.

### B. Resetting Factory Defaults (Applies to all module types)

This procedure may be selected from the calibration menu and, when performed, will set the selected sensor module back to its original factory calibration state.

If this option is selected, the screen at the right will appear for the user to confirm that this is the procedure desired (YES) or return to the MAIN screen (MAIN or NO) to begin again.



**WARNING:** Always verify calibration sensor module calibration after performing this procedure and prior to taking any measurements.

## C. How to calibrate the conductivity/temperature sensor module

There can be up to 3 (three) calibration procedures for conductivity:

1. Low range (Air-zero) – no standard solution required
2. Mid-range (Standard) – 13.40 or 14.00 mS standard solution required
3. High range – 100.0 mS standard solution required

The 90XL conductivity/temperature sensor module is capable of measuring conductivities through a range of 1 uS to 200 mS. For the typical range of final dialysate conductivities, the sensor module needs to be calibrated at the mid-range only. This will yield high accuracy and precision in this range, with reasonable accuracy and precision at the low and high extremes. If a higher level of accuracy and precision is needed at the extreme ends of the total range, then the sensor module should be calibrated using the optional “air-zero” (Low-range) and 100.0 mS (High-range) calibration procedures. If enhanced accuracy and precision are required throughout the entire conductivity range, then all three calibration procedures should be performed in the order as indicated above: (i.e., Low--> Mid -->High)

To enter the calibration mode for the selected sensor module:

First, select the appropriate condo/temp module on the MAIN screen by using the **CH ↓** key.

From the MAIN screen press MENU. Scroll down using the down arrow key to “CALIBRATION” then press “SEL”.

# 1. Low Range Conductivity Calibration

## PROCEDURE

- No reference solution is required.
- Make sure a condo/temp sensor module is attached.

After “CALIBRATION” has been entered, Select “AIR ZERO” from the next menu list.

**Step 1** – Draw DI or RO water through the sensor module to rinse. Empty the sensor module as completely as possible and allow to dry. Press NEXT to continue...

**NOTE:** Gently tap the cell to expel droplets, or let dry. This initial step may be performed in advance of the actual calibration procedure.

**Step 2** – The 90XL will read the cell (theoretically zero) and perform an evaluation based on the factory set value. Press NEXT to continue...

**Step 3** – If the evaluation is successful, the calibration information will be stored within the sensor module.

**Step 3** – If the displayed factory cal value is greater than 0.02 mS, the AIR ZERO calibration will fail indicating possible sensor module malfunction. Press ABORT to exit. If the calibration fails on multiple attempts, call Mesa Labs for assistance.

## DISPLAY

14.00 mS STANDARD  
13.40 mS STANDARD  
100.0 mS HIGH  
**AIR ZERO**  
SET FACTORY DEFAULTS  
CALIBRATION HELP

STEP 1 AIR ZERO CAL  
  
RINSE CELL WITH D.I. OR  
R.O. WATER. EMPTY AND  
DRY THE CELL..  
  
Press NEXT to continue...

STEP 2 AIR ZERO CAL  
EVALUATING...  
  
Factory value must be less  
Than 0.02 mS.  
  
↓ FACTORY CAL VALUE  
  
“X.XX” mS

STEP 3 AIR ZERO CAL  
  
AIR ZERO SUCCESSFUL  
  
SENDING CALIBRATION  
INFORMATION...

STEP 3 AIR ZERO CAL  
  
AIR ZERO FAILED  
  
Factory value must be less than  
0.02 mS.  
  
Press ABORT to exit.

## 2. Mid-Range (Standard) Conductivity Calibration

### PROCEDURE

- 14.0 or 13.4 mS Reference Solution
- 90XL Sample Kit
- Make sure a condo/temp sensor module is attached.

After "CALIBRATION" has been entered, Select either 14.00 or 13.4 mS STANDARD from the next menu list. (14.00 mS is chosen for this example.)

**Step 1** - Empty any liquids from the sensor module. The value of conductivity read internally by the 90XL must be less than 1 mS to proceed. The factory calibration value is displayed in this step also.

**Step 2** - Rinse the sensor module by drawing reference solution up through it. The value read internally must be within 0.2 mS of the reference value to proceed to the next step. If the factory value is off by more than 0.2 mS, calibration will not be performed. Press ABORT and contact Mesa Labs.

**Step 3** - Empty reference solution from the sensor module, and discard. The 90XL must detect a value of less than 1 mS to proceed.

**Step 4** - Draw fresh reference solution slowly through the sensor module. While reference solution is flowing, the 90XL must detect 4 stable conductivity values within 0.2 mS of the reference to proceed to the next step.

**NOTE:** Draw slowly so that up to 10 seconds of flow can be maintained.

### DISPLAY

14.00 mS STANDARD  
13.40 mS STANDARD  
100.0 mS HIGH  
AIR ZERO  
RESET FACTORY DEFAULTS  
CALIBRATION HELP

STEP 1 14.00 mS CAL  
EMPTY CELL  
  
Value must be less than 1 mS  
to proceed  
  
↓ FACTORY mS VALUE  
  
XX.XX mS

STEP 2 14.00 mS CAL  
DRAW REF. SOLUTION  
THROUGH THE CELL  
  
Value must be within 0.2 mS  
of the reference to proceed.

STEP 3 14.00 mS CAL  
EMPTY CELL  
DISCARD RINSE  
  
Value must be less than 1 mS  
to proceed.

STEP 4 14.00 mS CAL  
SLOWLY DRAW REF. SOL  
THROUGH THE CELL  
4 stable values within 0.2 mS  
of the reference are required  
to proceed.

**Step 5** - Expel the reference solution from the sensor module and discard. The 90XL must detect an internal value of less than 1 mS to proceed.

STEP 5      14.00 mS CAL  
EMPTY CELL  
DISCARD REF. SOL.  
Value must be less than 1 mS  
to proceed.

**Step 6** - Draw fresh reference solution through the sensor module for verification. While reference solution is flowing, the 90XL must detect 4 stable conductivity values for verification before proceeding.

STEP 6      14.00 mS CAL  
SLOWLY DRAW REF. SOL.  
FOR VERIFICATION  
4 stable values are required  
to proceed.

**Final Step** - Calibration is complete. Calibration information is stored within the sensor module.

FINAL STEP   14.00 mS CAL  
CALIBRATION COMPLETE  
  
SENDING CALIBRATION  
INFORMATION...

**OR**

If during Step 6, the calibration value differs from the verification value by more than 0.02 mS, the calibration will fail. Press ABORT to exit. If the calibration fails on multiple attempts, call Mesa Labs for assistance.

**OR**

CALIBRATION FAILED  
CAL VALUE DIFFERS BY  
MORE THAN 0.02 mS FROM  
VERIFICATION VALUE.  
  
Press ABORT to exit.

### 3. High-Range Conductivity Calibration

#### PROCEDURE

- 100.0 mS Reference Solution
- 90XL Sample Kit
- Make sure a condo/temp sensor module is attached.

After "CALIBRATION" has been entered,  
Select 100.0 mS HIGH from the next menu list.


**Step 1** - Empty any liquids from the sensor module.  
The value of conductivity read internally by the 90XL  
must be less than 4 mS to proceed. The factory  
calibration value is displayed in this step also.

**Step 2** - Rinse the sensor module by drawing  
reference solution up through it. The value read  
internally must be within 4 mS of the reference value  
to proceed to the next step.

**Step 3** - Empty reference solution and discard. The  
90XL must detect a value of less than 4 mS to  
proceed.

**Step 4** - Draw fresh reference solution slowly  
through the sensor module. While reference solution  
is flowing, the 90XL must detect 4 stable conductivity  
values within 4 mS of the reference to proceed to the  
next step.

#### DISPLAY

14.00 mS STANDARD  
13.40 mS STANDARD  
  
AIR ZERO  
SET FACTORY DEFAULTS  
CALIBRATION HELP

STEP 1 100 mS CAL  
EMPTY CELL  
  
Value must be less than 4 mS  
to proceed  
  
↓ FACTORY mS VALUE  
  
"XX.XX" mS

STEP 2 100 mS CAL  
DRAW REF. SOLUTION  
THROUGH THE CELL  
  
Value must be within 4 mS  
of the reference to proceed.

STEP 3 100 mS CAL  
EMPTY CELL  
DISCARD RINSE  
  
Value must be less than 4 mS  
to proceed.

STEP 4 100 mS CAL  
SLOWLY DRAW REF. SOL  
THROUGH THE CELL  
4 stable values within 4 mS  
of the reference are required  
to proceed.

**Step 5** - Expel the reference solution from the sensor module and discard. The 90XL must detect an internal value of less than 4 mS to proceed.

STEP 5            100 mS CAL  
EMPTY CELL  
DISCARD REF. SOL.  
Value must be less than 4 mS  
to proceed.

**Step 6** - Draw fresh reference solution through the sensor module for verification. While reference solution is flowing, the 90XL must detect 4 stable conductivity values for verification before proceeding.

STEP 6            100 mS CAL  
SLOWLY DRAW REF. SOL.  
FOR VERIFICATION  
4 stable values are required  
to proceed.

**Final Step** - Calibration is complete. Calibration information is written to the sensor module.

FINAL STEP       100 mS CAL  
CALIBRATION COMPLETE  
  
SENDING CALIBRATION  
INFORMATION...

**OR**

If during Step 6, the calibration value differs from the verification value by more than 0.25 mS, the calibration will fail. Press ABORT to exit. If the calibration fails on multiple attempts, call Mesa Labs for assistance.

**OR**

                                 100 mS CAL  
CALIBRATION FAILED  
CAL VALUE DIFFERS BY  
MORE THAN 0.25 mS FROM  
VERIFICATION VALUE.  
  
Press ABORT to exit



## D. How to Calibrate the pH Sensor Module

### GENERAL INFORMATION

The pH calibration procedure is identical for each of the pH buffer standards. Described below is the procedure for the 7.00 pH standard, since this is the one commonly used. If you desire to calibrate the sensor module with 4.00 buffer solution, a 7.00 pH calibration should always be done first, then 4.00 may be performed.

### PROCEDURE

- 7.00 or 4.00 pH buffer Solution
- Sample Kit or clean beaker
- Make sure a pH sensor module is attached.

First, select the pH sensor module on the MAIN screen using the **CH ↓** key. Press MENU and select "CALIBRATION". Select "7.00 pH" from the next screen.

**NOTE:** If 4.00 pH is selected, the following screen will appear: Press NEXT to continue.

**Step 1** - Remove pH buffer solution bottle from sensor. Place about 50 ml of buffer solution in the sample tray or beaker and place the pH sensor module in the outer sensor holder and allow to stabilize. Press NEXT to continue.

**Step 2** - Remove the pH sensor from the sample tray and discard the rinse buffer solution. Press NEXT to continue.

### DISPLAY

UNITS OF MEASURE  
CONFIGURATION  
**CALIBRATION**  
TIMER  
HELP

**7.00 pH**  
4.00 pH  
SET FACTORY DEFAULTS  
CALIBRATION HELP

NOTE:  
ALWAYS CALIBRATE  
WITH pH 7.00 FIRST  
  
Press ABORT if pH 7.00 has  
not been done or press NEXT  
to continue.

STEP 1                      pH 7.00 CAL  
PLACE pH PROBE IN  
RINSE BUFFER  
  
Press NEXT to continue.  
  
↓ FACTORY pH VALUE  
  
**x.xx pH**

STEP 2                      pH 7.00 CAL  
REMOVE pH PROBE  
DISCARD RINSE BUFFER  
  
Press NEXT to continue.

**Step 3** - Pour about 50 ml of fresh buffer solution into the sample tray. Place the pH sensor in the outer sensor holder and allow reading to stabilize. The displayed factory pH value should be within 0.2 pH unit of the reference solution value. Press NEXT to continue.



**Step 4** - When the pH reading stabilizes on the display, press the SAVE button. Slow stabilization times may indicate a need to replace the pH electrode. As in the previous step, the displayed factory pH value must be within 0.2 pH unit of the reference used.

**OR**

pH sensor module calibration has failed. Call Mesa Labs for assistance.

**Final Step** - Store your pH sensor module with the soaker bottle attached filled with enough soaker solution or 4.0 pH buffer solution to cover the glass bulb.

**NOTE:** If the Factory pH value is “out of range”, the pH sensor may have exceeded normal life (12-18 months with proper care) and may need to be replaced. Call Mesa Labs for assistance.

To replace the pH probe, grasp the black base of the probe and gently twist it counterclockwise to unlock it, then pull it straight out. Plug the new one in. After it is seated, twist gently clockwise to lock it in. Do not allow fluids to enter the sensor module connection while the probe is not installed. Calibrate the new probe according to the procedure starting on the previous page.

STEP 3      pH 7.00 CAL  
PLACE PROBE IN  
REFERENCE BUFFER  
Factory pH should be within  
0.2 pH unit of the reference.  
Press NEXT to continue.

↓ FACTORY pH VALUE

**x.xx pH**

STEP 4      pH 7.00 CAL  
PRESS SAVE WHEN STABLE  
Slow response may indicate a  
need for sensor replacement.

Factory pH should be within  
0.2 pH unit of the reference.

↓ FACTORY pH VALUE

**x.xx pH**

**OR**

FINAL STEP  
CALIBRATION FAILED

Factory value and reference  
differ by more than 0.2 pH.  
Sensor may  
need replacing. Press  
Abort to continue.

## E. How to Calibrate the Pressure Sensor Module

### PROCEDURE

Make sure the pressure sensor module is connected to the display module. Remove all monitor lines and transducer protectors from both “Gauge” and “Ref” sensor module ports. Both ports on the sensor module must be open to atmosphere.

Select the pressure module on the MAIN screen using the **CH ↓** key.

PRESS “MENU” from the MAIN screen and scroll to “CALIBRATION” using the arrow keys. Press “SEL” .

At the next screen, scroll to “PRESSURE ZERO” and press “SEL”

**Step 1** - Assure that both pressure ports are open to atmosphere at the sensor module. When the pressure is stable on the display, press “SAVE”.

**Final Step** - Calibration is complete. Calibration information is stored within the sensor module.

**OR**

If the factory value differs from zero by more than 10 mmHg, the pressure zero calibration will fail. Press ABORT to exit. If the calibration fails on multiple attempts, call Mesa Labs for assistance.

### DISPLAY

UNITS OF MEASURE  
CONFIGURATION  
**CALIBRATION**  
TIMER  
HELP

**PRESSURE ZERO**  
SET FACTORY DEFAULTS  
CALIBRATION HELP

STEP 1     mmHg ZERO CAL  
WHEN PRESSURE IS STABLE  
PRESS SAVE

Factory Value must be  
within 10 mmHg of zero.

↓ FACTORY mmHg VALUE  
**X.XX**

FINAL STEP mmHg ZERO CAL  
CALIBRATION COMPLETE

SENDING CALIBRATION  
INFORMATION...

**OR**

CALIBRATION FAILED

Factory Value was not within  
10 mmHg of zero

Press ABORT to exit.

## VIII. CLEANING, DISINFECTION, AND STORAGE

**CAUTION:** DO NOT leave any disinfectant solution in sensor modules, longer than 10 Minutes.

### Display Module and Sensor Modules

If necessary, wipe the exterior of the display module with a soft cloth dampened with a mild soap solution. If disinfection is required, use household bleach (5.25%) at a dilution of 1 part bleach to 99 parts water.

The 90XL display module and sensor modules should be stored in a clean, dry environment between 0°C and 50°C. It may be stored connected to the AC charger when not in use.

**CAUTION:** DO NOT use abrasive materials or organic solvents such as acetone. They may damage the front panel overlay as well as the case.

**CAUTION:** DO NOT allow liquid to enter the display module which may damage the electronics.

### Conductivity/Temperature Sensor Module

Rinse the sensor thoroughly with RO/DI water after use.

**CAUTION:** DO NOT allow fluids to enter the sensor module electrical connector. If disinfection is required, use household bleach solution as describes above. The condo/temp sensor module should be rinsed with RO/DI water and allowed to air dry. This will prevent deposits from forming on the electrodes which could affect accuracy.

### pH Sensor Module

Rinse the sensor module thoroughly with RO/DI water after use. If disinfection is required, use household bleach solution as describes above. Store your pH probe in the soaker bottle and filled with enough soaker solution or 4.0 pH buffer solution to cover the glass bulb at the end of the probe.

**CAUTION:** DO NOT allow fluids to enter the sensor module electrical connectors.

### Pressure Sensor Module

Wipe the exterior of the sensor module with a soft cloth dampened with mild soap solution. If disinfection is required, use household bleach solution as describes above.

**CAUTION:** DO NOT allow fluids to enter the sensor module connector.

**CAUTION:** DO NOT allow fluid to enter the pressure port connectors.

The pressure sensor module should be stored with transducer protectors on the Luer ports, and carefully protected from impact or moisture damage.

### Sample Kit

Rinse sample tray and syringe with RO/DI water and store in a clean, dry place.

## IX. BATTERY INFORMATION

**WARNING** - Use only the charger supplied by Mesa Laboratories. Use of any other charger will void the warranty, could cause damage the instrument, or cause personal injury.

**CAUTION:** Do not open or dismantle the 90XL meter as there are no user serviceable parts inside. Return the Display Module to Mesa Labs or authorized distributor for service.

**CAUTION:** Do not charge the 90XL when ambient temperature is greater than 45°C. (113 °F)

**CAUTION:** If the battery fully discharges, the date and time functions must be reset.

The lithium-ion rechargeable battery in the 90XL meter is designed to provide years of reliable service. After 500 complete charge/discharge cycles, it will retain approximately 80% of its original capacity. The amount of time that a fully charged battery will operate the 90XL meter depends greatly on how brightly the display's backlight is illuminated. At full brightness, the running time will be less than half the running time when the backlight is turned off.


Sensor modules use significantly less power than the display module and won't affect the amount of operating time as much as the backlight.

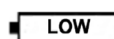
### 90XL Battery Facts

- From a fully discharged state, the display module battery may take up to 4.5 hours to fully charge.
- The 90XL meter may be operated continuously while charging.
- The 90XL meter may be left connected to the charger continuously.
- The 90XL meter may be stored approximately 1000 hours while turned off before a fully charged battery is depleted.
- The sensor modules do not contain a power source; they receive their power from the display module.
- State of battery charge will not affect accuracy of measurements. When the battery falls below a certain level, the meter will turn itself off.

#### BATTERY INDICATOR

 - FULLY CHARGED

 - 50% CHARGED

 - BATTERY LOW  
(less than 1 Hr of  
power remaining)

## X. 90XL ACCESSORIES

The following accessories are available for the 90XL meter.

Item	Part No.
Charger	201110021
Replacement pH electrode	201110005
90XL User's Guide	901120027
Standard Solutions	Visit <a href="http://dialyguard.mesalabs.com">dialyguard.mesalabs.com</a>
pH buffer Solutions	Visit <a href="http://dialyguard.mesalabs.com">dialyguard.mesalabs.com</a>

Sampling Kit  
P/N 503110017



Transducer Protector  
P/N 503110023



Negative Pressure Adapter  
P/N 350120002



Monitoring Line and Stopcock  
P/N 350120005



In-Line Adapter  
P/N 350120003



Display Module Cover/Holder  
P/N 303110075



Carrying Case w/ Cut Outs  
P/N 201110003-1



pH Probe Assembly  
P/N 201110005



IV Pole Connector  
P/N 503110024



Sensor Module Extension Cable  
2 Meter P/N 350110015  
5 Meter P/N 350110016



## **XI. TROUBLESHOOTING**

1. Do not open the display module or the sensor modules. There are no user-serviceable parts inside, and it will void the warranty.
2. If the display module does not turn on, or shuts down right after it turns on, the battery may be depleted. Charge the display.
3. If the display module becomes unresponsive and the charger is connected, press all four buttons at the same time to reboot it. If the display module is still unresponsive, contact Mesa Labs or an authorized distributor for service.
4. If a sensor module does not show a reading after connection to the display module (a slight pause is normal) the sensor module may be inoperable. Contact manufacturer or an authorized distributor for service.
5. If the pH sensor module can not be calibrated, or stabilization time becomes unacceptably slow, the pH probe may have reached the end of its life expectancy and may need to be replaced. See page 33 for instructions, and contact manufacturer or an authorized distributor for service.



## XII. USER ASSISTANCE AND FACTORY SERVICE

Mesa Laboratories, Inc. (Mesa Labs) provides user assistance, full repair and calibration /factory certification services for the 90XL Meter and its components at its corporate headquarters or at authorized distributor locations throughout the world.

**NOTE:** Yearly factory calibrations are recommended on the Conductivity/Temperature and Pressure sensor modules. Factory Calibrations stickers are located on the sensor module and contain last known calibration date and calibration due date.

**Warranty Information - DO NOT** attempt to repair or modify the meter, as this will void the warranty. For warranty information contact Mesa Labs or your local distributor. Any service required other than cleaning or calibration must be referred to either Mesa Labs or an authorized distributor.

### How to Reach Us

Please contact Mesa Labs for further information and product return instructions.

<b>Write to:</b>	Mesa Laboratories, Inc. 12100 W. 6th Avenue Lakewood, Colorado 80228 USA
<b>Telephone:</b>	1-800-992-6372, USA or Canada (+) 1-303-987-8000
<b>Fax:</b>	(+) 1-303-987-8989
<b>E-mail:</b>	<u>Service</u> – <a href="mailto:customerservice@mesalabs.com">customerservice@mesalabs.com</a>  On the web: <a href="http://dialyguard.mesalabs.com">dialyguard.mesalabs.com</a>

## XIII. 90XL SPECIFICATIONS

TECHNICAL	pH	Conductivity	Temperature	Pressure
Range	0 to 14 pH units	0 to 200.0 mS	10 to 90°C	-600 to +1600 mmHg
Resolution	0.01 pH units	0.1 $\mu$ S from 0 - 80 $\mu$ S 0.001 from 0 to 22.00 mS 0.01 from 22.00 to 80.00 mS 0.1 above 80.00 mS	$\pm 0.1^\circ$ from 10 to 40°C	0.1 mmHg
Accuracy	$\pm 0.1$ pH units	$\pm 0.35\%$ of reading + 0.002mS from 0 to 1.99 mS $\pm 0.20\%$ of reading + 0.002 from 2 to 29.99 mS $\pm 0.50\%$ of reading above 30 mS	$\pm 0.1^\circ$ C	$\pm 1.0$ mmHg from 0 to 199 mmHg gauge $\pm 1.5$ mmHg from 200 to 300 mmHg gauge $\pm 0.5\%$ of reading + 1 mmHg above 300 mmHg and below 0 mmHg
Temperature Compensation		10 to 90°C (optimized for 20 to 40°C)		

PHYSICAL	Dimensions	Weight	Power	Battery Type
	3.3" x 6" x 1.5"	9.9 ounces	Battery	3.6 V Lithium Ion, rechargeable

ENVIRONMENTAL CONDITIONS	Temperature	Relative Humidity
Storage	0°C to 50°C (-32°F to +122°F)	0 to 90% RH (Non-Condensing)
Operating	10°C to 35°C (50°F to 95°F)	0 to 80% RH (Non-Condensing)

## **XIV. LIMITED WARRANTY**

MESA LABORATORIES, INC. warrants to the original purchaser of the 90XL Meter that it will repair or replace, at its option, any malfunctioning or defective part without charge for the terms listed below. Parts used for replacement are warranted for the remainder of the original warranty period. Mesa Laboratories, Inc. will provide labor without charge to the original purchaser for a warranty repair.

<b>WARRANTED COMPONENT</b>	<b>WARRANTY TERM *</b>
90XL Display Module	12 Months

**TO OBTAIN WARRANTY SERVICE**, the original purchaser must deliver, at its own expense, the product to MESA LABS at the address below:

Mesa Laboratories, Inc.  
12100 W. 6<sup>th</sup> Avenue  
Lakewood, Colorado, USA 80228

**\*Please complete and include the Service Order Form from our website.**

### **OPENING THE DISPLAY MODULE OR SENSOR MODULE WILL VOID THE WARRANTY**

#### **THIS WARRANTY DOES NOT COVER:**

- 1) Disposable items such as the battery or pH probe.
- 2) Routine calibration or cell cleaning.
- 3) Defects caused by:
  - a) modification, alteration, repair or service of the product by anyone other than MESA LABS or an authorized service center
  - b) misuse due to negligence or accident
  - c) operation or maintenance of the product in a manner contrary to the manufacturer's instructions

Any express warranty not provided herein, and any remedy for breach of contract that but for this provision might arise by implication or operation of law, is hereby excluded and disclaimed. The implied warranties of merchantability and of fitness for any particular purpose are expressly limited to the terms mentioned above. Some states do not allow limitations on the duration of an implied warranty, so the above limitation may not apply to you.

Under no circumstances shall MESA LABS be liable to the original purchaser or to any other person for any special or consequential damages, whether arising out of breach of warranty, breach of contract, or otherwise. Some states do not allow the exclusion or limitation of special or consequential damages, so the above exclusion or limitation may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights that vary from state to state. For further warranty information, contact Mesa Laboratories, Inc.