

# **OPERATION MANUAL**

## **JENCO MODEL 3107 MICROCOMPUTER BASED Conductivity/Salinity/Temperature BENCH METER**

**JENCO** ELECTRONICS, LTD.

**MANUFACTURER OF PRECISION INSTRUMENTS**

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## INITIAL INSPECTION

Carefully unpack the instrument and accessories. Inspect for damages made in shipment. If any damage is found, notify your Jenco representative immediately. All packing materials should be saved until satisfactory operation is confirmed.

## GENERAL INTRODUCTION

The Jenco Model 3107 bench type Conductivity, Salinity, Temperature System is a rugged, microprocessor based instrument designed for use in field laboratories and process control applications, using a four electrode cell, it is an essential tool for precise measurements of conductivity, salinity and temperature.

The model 3107 micro-processor allows the user to easily recalibrate the parameters for the probe. A few keystrokes will adjust all the parameters for compensated and uncompensated conductivity and will also give the user the option to select three types of probe cell constant for a better selection of available probes and applications. The micro-processor also performs a self-diagnostic routine every time you turn on the unit providing you with basic information about the current cell constant and stability of the instrument.

The system simultaneously displays temperature in °C along with either Compensated Conductivity, Uncompensated Conductivity or Salinity. The user can switch back and forth from all these displays by just pushing a single key.

This instrument is powered by six AA-size alkaline batteries or with a UL approved AC adapter. The instrument also displays a "**LO BAT**" message when the batteries are in need of replacement.

The model 3107 comes with a RS232C interface with a proprietary driver which can easily let the user log all data simultaneously to interface with an IBM<sup>®</sup> PC/AT compatible computer.

This instrument is also splash proof and CE approved making it a versatile tool for conductivity/salinity /temperature applications.

# USING THE JENCO MODEL 3107

## THE CASE

The Model 3107 case is SPLASH PROOF, but the instrument is not waterproof. The SPLASH PROOF feature is to prevent permanent damage to the instrument when accidentally splashed with a non-corrosive solutions.

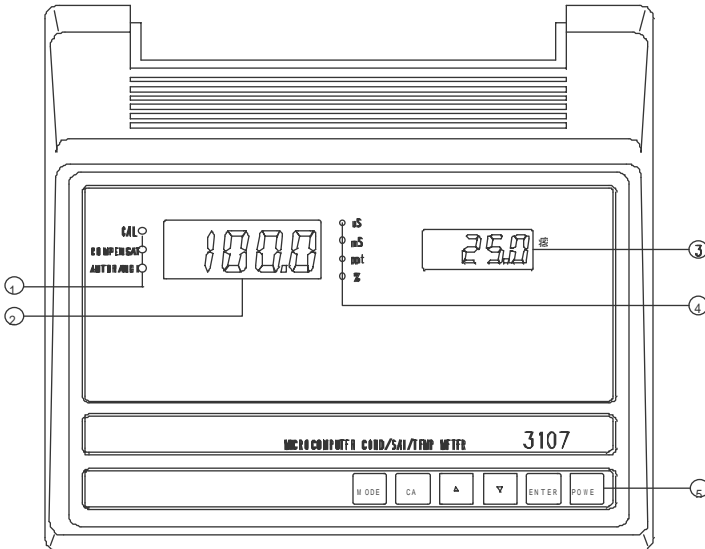


Figure 1

- (1). Annunciators : **CAL**, **COMPENSATED** and **AUTORANGING**
- (2). Primary LCD display
- (3). Secondary LCD Display
- (4). Annunciators : **uS** , **mS** , **ppt** , **%**
- (5). Keyboard

## THE KEYPAD

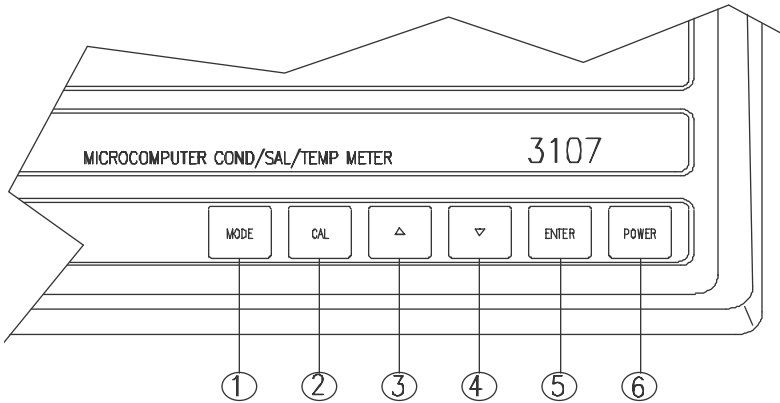
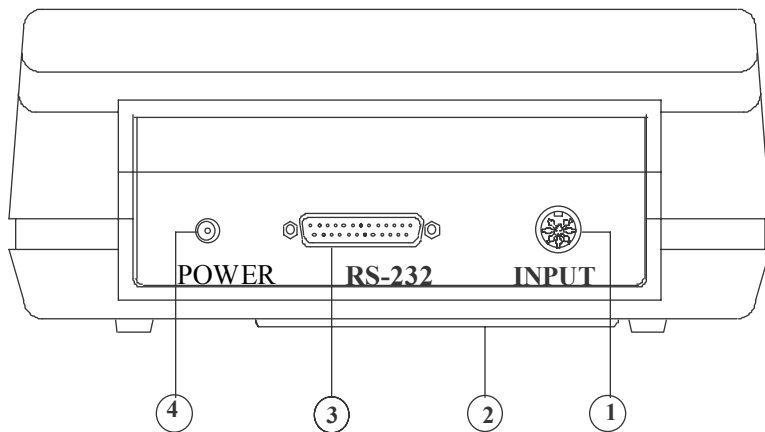


Figure 2

1. The [**MODE**] key. In normal operation this key will change the display to Conductivity, Compensated Conductivity and Salinity displays. In Calibration mode this key will exit the current calibration and go to the next calibration parameter.
2. The [**CAL**] key. During normal operation this key will change the mode from normal to Calibration mode. See CALIBRATION SET-UP.
3. The [**Δ**] key. This key is used during Calibration to increment the value/option of the display.
4. The [**∇**] key. This key is used during Calibration to decrement the value/option of the display.
5. The [**ENTER**] key. During Conductivity and Compensated Conductivity operation this key will change from Auto Ranging to Manual Ranging. During Auto Ranging the "AUTORANGING" annunciator will turn on.
6. The [**ON/OFF**] key. This key will turn on or turn off the instrument. The last display mode will be saved, except during calibration where it will default to Conductivity display.

## CONNECTORS



1. PROBE connector

3. RS232 connector

2. Battery case

4. AC adaptor

Figure 3

## REPLACING THE BATTERIES

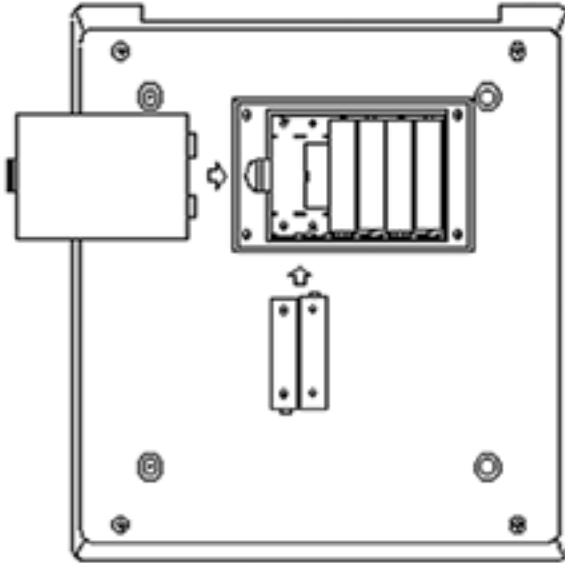


Figure 4

1. Replace the batteries when the **LO BAT** indicator on the LCD display starts to flash. The instrument can operate within specifications for approximately one hour after the **LO BAT** starts to flash.
2. To replace the batteries, position the meter so that the bottom part of the meter is facing up . (Refer to figure 4.) Lift up the battery cover to expose the battery compartment.
3. Remove all of the old batteries and insert a new set of batteries ensuring the polarities are correct.

## TURNING ON/OFF THE INSTRUMENT

Once the batteries are installed correctly and/or an AC adapter is installed and plugged in the unit will turn ON at once. Pressing the [ON/OFF] key will turn on or turn off the instrument. When the unit is not in use the user should turn off the instrument to save battery life. By just unplugging the AC adapter will not turn off the instrument if batteries are present. It

would automatically switch to battery power and will continue to operate.

After the unit is turned on the unit will display all segments for a few seconds then it will display the current cell constant. If the instrument detects an internal problem it will display an error message for a few seconds. You can learn about these error messages by consulting the **ERROR DISPLAYS** of this manual.

After the self-diagnostic is complete the temperature will be displayed in the lower right of the display and the instrument is ready to make a measurement. Just immerse the probe half-way to the liquid. If possible do not allow the probe to touch any solid object in the solution. There should be no air bubbles around the probe either. Shaking or moving the probe vigorously before recording any measurement will dislodge any bubbles formed in the probe.

IF THE PROBE /INSTRUMENT IS NEW **A CELL CONSTANT CALIBRATION** MUST BE PERFORMED BEFORE USE, SINCE THE CELL CONSTANT IS SLIGHTLY DIFFERENT FOR EACH CONDUCTIVITY PROBE. REFER TO **CALIBRATION SET-UP** FOR PROCEDURES.

## **MODEL 3107 MODES**

This instrument is designed to provide 4 distinct measurements:

1. Temperature - current temperature of the solution which is always displayed.
2. Conductivity - a measurement of the conductive material in the solution with no regard to temperature.
3. Compensated Conductivity - which automatically adjusts to a calculated value which would have been read if the sample had been at 25°C ( or another reference temperature which the user can choose). See CALIBRATION SETUP.
4. Salinity - a calculation based on the Conductivity and Temperature.

Note : Every time the unit is turned OFF the last mode is saved so that when you turn the instrument ON again it will return to this mode.



To choose any measurement mode (temperature is always included) simply press and release the [MODE] key . Carefully observe the annunciators units at the far side of the LCD.

CAL	○	<h1>29.90</h1>	○	uS
COMPENSATED	○		●	mS
AUTORANGING	○		○	ppt
			○	% (LEFT LCD)
		<h1>25.0</h1>	°C	(RIGHT LCD)

Legends:

- : Lit LED
- : Unlit LED

If in Salinity mode the unit will be **ppt**.

## AUTORANGING

This model is an autoranging instrument. This means whatever the conductivity (with in the specifications of the instrument) of the solution all you need to do is immerse the probe into the solution. The "AUTORANGING" annunciator will be displayed if you are in any of the conductivity readings and if the instrument is in auto ranging display.

After immersing the probe into the solution , the instrument will be place in a search routine to find the right range for the solution, this autoranging will take as long as 5 seconds. During this search the instrument will display "RANG" on the LCD to indicate it is searching for the right range.

## MANUAL RANGING

If you choose to disable the autoranging feature and choose your own range, you can do this by pressing and releasing the [ENTER] key while in any conductivity mode. You will be switching to the four ranges of the

model 3107 then back to autoranging again. During MANUAL RANGING the "AUTORANGING" annunciator will turn OFF to signify you are in MANUAL RANGING. Every time you turn off the unit it will return to autoranging again.

## CALIBRATION SET-UP

### TEMPERATURE COEFFICIENT

To change the temperature coefficient follow these steps:

1. After the power-on diagnostics press the [CAL] key, the "CAL" annunciator will appear on the lower left of the display. The left LCD will display **1.91 %** or a value set previously using this procedure.

CAL	<input checked="" type="radio"/>	<div style="border: 1px solid black; padding: 10px; display: inline-block; font-size: 2em;">1.91</div>	<input type="radio"/> uS
COMPENSATED	<input type="radio"/>		<input type="radio"/> mS
AUTORANGING	<input type="radio"/>		<input type="radio"/> ppt
			<input checked="" type="radio"/> %

<div style="border: 1px solid black; padding: 10px; display: inline-block; font-size: 2em;">25.0</div>	°C
--	----

2. Using the [Δ] and [∇] keys you can now change the coefficient to the desired value.

3. To save the new value you can press the [ENTER] key or press [MODE] to exit (and go to the next calibration parameter). If you press the [ENTER] key, the word "SAVE" will be displayed to indicate that a new temperature coefficient is accepted and then will switch to Temperature Reference set-up.

### TEMPERATURE REFERENCE

To change the temperature reference follow these steps:

1. After the power-on diagnostics press the [CAL] key, the "CAL" annunciator will appear on the lower left of the display. The left LCD will display **1.91 %** or a value set previously using this procedure.
2. Press the [MODE] key. The left LCD will display **25.0 C** or a value set previously using this procedure.

CAL	•	25.0C	○ uS
COMPENSATED	○		○ mS
AUTORANGING	○		○ ppt
	○		○ %

25.0	°C
------	----

3. Using the [ Δ ] and [ ∇ ] keys you can now change the reference to the desired value.
4. To save the new value you can press the [ENTER] key or press to [MODE] exit (and go to the next calibration parameter). If you press [ENTER] key the word "SAVE" will be displayed to indicate that a new temperature reference is accepted and will switch to Cell Constant Calibration.

## CELL CONSTANT CALIBRATION

To calibrate the cell constant follow these steps:

1. After the power-on diagnostics, immerse the probe to a known standard conductivity solution ( Refer to PREPARING STANDARD SOLUTIONS.) which is chosen to calibrate your probe. Wait for the temperature to stabilize for a few seconds. Press the [MODE] key to go to any conductivity display.
2. Press the [CAL] key, the "CAL" annunciator will appear on the lower left of the display. The left LCD will display **1.91%** or a value set previously using the Calibration set-up.
3. Press the [MODE] key. The left LCD will display "**25.0 C**" or a value set previously using the Calibration set-up

4. Press the [MODE] key again. The left LCD will display the rough conductivity value of the standard solution, depending how far the current cell constant to the true cell constant of the probe. The "AUTORANGING" and "COMPENSATED" annunciators will turn ON to tell you that you are in autoranging and compensated conductivity. During cell constant calibration the following parameters are over-ridden : temperature reference (*fixed to 25 °C*) and temperature coefficient (*fixed to 1.91%*).

CAL	•	9.90	<input type="radio"/> uS
COMPENSATED	•		<input checked="" type="radio"/> mS
AUTORANGING	•		<input type="radio"/> ppt <input type="radio"/> %

25.0	°C
------	----

4. Using the [Δ] and [▽] keys you can now change the display to reflect the known standard conductivity solution at 25°C.

3. To save the new value you can press [ENTER] to save or the [MODE] key to exit (and go to the next calibration parameter). If you press [ENTER] the word "SAVE" will be displayed to indicate that a new probe cell constant is accepted and will switch to Probe Basic Cell Constant Calibration.

### PROBE BASIC CELL CONSTANT

To change the probe basic cell constant follow these steps:

1. After the power-on diagnostics press the [CAL] key, the "CAL" annunciator will lit up. The left LCD will display 1.91 % or a value set previously using the Calibration set-up.
2. Press the [MODE] key. The left LCD will display 25.0 C or a value set previously using the calibration set-up.

. Press the [MODE] key. The instrument will go to Cell Constant calibration.

4. Press the [MODE] key again. The left LCD will display the actual (calibrated previously or default) Cell constant while the right LCD will display the current selected basic probe cell number preceded with a capital "C" .

CAL	•	<h1>1.05</h1>	○ uS
COMPENSATED	○		○ mS
AUTORANGING	○		○ ppt
			○ %

<h2>C1.0</h2>	°C
---------------	----

5. Using the [ Δ ] and [ ∇ ] keys you can now change the cell probe constant to the 3 available constants (0.10, 1.00 and 10.00).

6. To save the new value you can press the [ENTER] key or press the [MODE] key to exit (and return to normal operation) . If you press the [ENTER] key the word "SAVE" will be displayed to indicate that a new probe cell constant is accepted. The instrument will return to normal reading mode.

THIS PROCEDURE IS USUALLY NOT REQUIRED SINCE THIS OPTION IS SET AT THE FACTORY, BUT IF YOU WILL USE ANOTHER PROBE WHICH IS DIFFERENT FROM THE DEFAULT THEN YOU HAVE TO DO THIS PROCEDURE. EVERY TIME YOU SET A NEW CELL CONSTANT YOU MUST CALIBRATE THE PROBE. REFER TO **CELL CONSTANT CALIBRATION**.

## **RS232C INTERFACE OPERATION**

### **INTRODUCTION**

This section assumes you are familiar with the basics of data communication, the RS232C interface, a rudimentary knowledge and a copy of the following computer languages : Turbo BASIC, Quick BASIC, Turbo PASCAL and Turbo C.

This meter can only be operated using the RS232C interface by using a special software driver included with this meter. A simple program must be written in order to send your command and receive data from the meter by using any of the above mentioned computer languages.

An annotated sample program for each computer language and a more detailed explanation of the software driver are included in the accompanying disk.

## **PREPARING THE METER**

This meter comes equipped with an RS232C interface. This meter communicates with a PC computer (100% IBM PC/AT compatibles) through a DB-25 interface connector. A standard RS232C cable used for interconnecting two IBM PC/ATs can also be used for this operation.

After you have connected the cable and turned on both the meter and the computer, you are now ready for the software preparation.

## **SOFTWARE**

The accompanying disk includes a special driver to let you write a simple program to read data from the meter. By incorporating the driver into your software, you can then use the special commands without worrying about the protocol between the meter and your computer.

Read the file "MAN3107.TXT" in the accompanying disk to jump-start you in using the meter with its RS232C interface.

## **ERROR DISPLAYS**

### **Display**

Main display : "OvEr"  
2ndary display : "ovr"

### **Possible Cause(s)**

Temperature > 95.0°C

Main display : **"OvEr"** Temperature < -5.0°C  
 2ndary display : **"udr"**  
 Main display : **"OvEr"** Conductivity > 3.000mS  
 basic cell K : 0.10

Main display : **"OvEr"** Conductivity > 30.00mS  
 basic cell K : 1.00

Main display : **"OvEr"** Conductivity > 300.0mS  
 basic cell K : 10.00 or Salinity > 80.0 ppt

Main display : **"OvEr"** Cell constant  
 during cell constant calibration is greater  
 calibration than ± 10% of selected  
 basic cell constant.

Main display : **"Undr"** Cell constant calibration  
 during cell constant calibration is greater  
 calibration than ± 10% of selected  
 basic cell constant.

Main display : **"rErr"** Conductivity exceeds  
 during manual ranging selected manual  
 range.

Main display : **"Perr"** Computed new cell  
 during cell constant constant is  
 calibration undefined.

Main display : **"Lerr"** Temperature exceeds the  
 limit, computed using the  
 current temperature coefficient and  
 temperature reference.

2ndary display : **"rEr"** Temperature is set  
 to °F, and the temp.  
 reading is >199.9°F  
 but <203.0°F.

Main display : "Err" Ram test has failed.  
2ndary display : "ra\_"

Main display : "Err" ROM test has failed.  
2ndary display : "ro\_"

## SPECIFICATIONS

### **Conductivity with 1 cm<sup>-1</sup> cell constant probe**

Range	Resolution	Accuracy
0.00 to 99.99 $\mu$ s/cm	0.01 $\mu$ s/cm	$\pm$ 0.5% FS
100.0 to 999.9 $\mu$ s/cm	0.1 $\mu$ s/cm	$\pm$ 0.5% FS
1.000 to 9.999 mS/cm	0.001 mS/cm	$\pm$ 0.5% FS
10.00 to 30.00 mS/cm	0.01 mS/cm	$\pm$ 0.5% FS

### **Conductivity with 0.1 cm<sup>-1</sup> cell constant probe**

Range	Resolution	Accuracy
0.000 to 9.999 $\mu$ s/cm	0.001 $\mu$ s/cm	$\pm$ 0.5% FS
10.00 to 99.99 $\mu$ s/cm	0.01 $\mu$ s/cm	$\pm$ 0.5% FS
100.0 to 999.9 $\mu$ s/cm	0.1 $\mu$ s/cm	$\pm$ 0.5% FS
1.000 to 3.000 mS/cm	0.001 mS/cm	$\pm$ 0.5% FS

### **Conductivity with 10 cm<sup>-1</sup> cell constant probe**

Range	Resolution	Accuracy
0.0 to 999.9 $\mu$ s/cm	0.1 $\mu$ s/cm	$\pm$ 0.5% FS
1.000 to 9.999 mS/cm	0.001 mS/cm	$\pm$ 0.5% FS
10.00 to 99.99 mS/cm	0.01 mS/cm	$\pm$ 0.5% FS
100.0 to 300.0 mS/cm	0.1 mS/cm	$\pm$ 0.5% FS

### **Salinity**

Range	Resolution	Accuracy
0.0 to 80.0 ppt	0.1 ppt	$\pm$ 1% FS



## **Temperature**

Range	Resolution	Accuracy
-5.0 to 95.0 °C	0.1 °C	±0.2 °C
23.0 to 199.9 °F	0.1 °F	±0.2 °F

## **Temperature Compensation**

Reference temperature : 15.0 to 25°C, keypad selectable at 0.1 °C .increment

Temperature coefficient : 0.0 to 4.0%, keypad selectable at 0.1% increment

## **Probe cell constant**

Basic probe cell number : 0.1, 1.0 & 10.0, keypad selectable

Cell constant calibration : Easy calibration by immersing the probe in a known standard solution and keying-in the known conductivity.

## **PC Communication**

Connector : RS232C compatible DB25 connector, connects directly to PC (IBM PC/AT 100% compatible).

Protocol : Source code libraries are provided for Turbo Basic, Quick Basic, Turbo Pascal and Turbo C. Supports Com1 to Com4 .

Baud Rate : 4800 (fixed)

## **POWER**

Power supply : 6 AA batteries/ 9V AC adapter

Battery Life (Alkaline) : ~ 25 Hours (typical)

## **OTHERS**

Ambient temperature  
operating range : 0 - 50 °C

### Dimensions

Left LCD	: 12.7mm high
Right LCD	: 12.7mm high
Case length	: 240 mm
Case height	: 100 mm
Width	: 250 mm
Weight	: 1040g (batteries included)

## **PREPARING STANDARD SOLUTIONS**

Suitable conductivity standards are available commercially or the user can prepare them using research grade reagents.

Here are some standard solutions the user can prepare to calibrate the probe of the model 3107.

1. Standard solution of 1413  $\mu\text{S}$  at 25°C : accurately weight out 0.746 grams of research grade dried Potassium Chloride (KCl). Dissolve in 1000ml of deionized water

1. Standard solution of 12.90 mS at 25°C : accurately weight out 7.4365 grams of research grade dried Potassium Chloride (KCl). Dissolve in 1000ml of deionized water

1. Standard solution of 111.0 mS at 25°C : accurately weight out 74.2640 grams of research grade dried Potassium Chloride (KCl). Dissolve in 1000ml of deionized water

### **STORAGE**

You can store the remaining solution in a plastic container for one week but the air space between the cap and the solution must be kept to an absolute minimum. The storage life can be increased by storing the solution

below 4°C. If you have any doubt of the accuracy of the stored solution, a fresh batch should be prepared.

## **WARRANTY**

Jenco Instruments, Ltd. Warrants this product to be free from significant deviations in material and workmanship for a period of 1 year from date of purchase. If repair or adjustment is necessary and has not been the result of abuse or misuse, within the year period, please return-freight-prepaid and the correction of the defect will be made without charge. If you purchased the item from our Jenco distributors and it is under warranty, please contact them to notify us of the situation. Jenco Service Department alone will determine if the product problem is due to deviations or customer misuse.

Out-of-warranty products will be repaired on a charge basis.

## **RETURN OF ITEMS**

Authorization must be obtained from one of our representatives before returning items for any reason. When applying for authorization, please have the model and serial number handy, including data regarding the reason for return. For your protection, items must be carefully packed to prevent damage in shipment and insured against possible damage or loss. Jenco will not be responsible for damage resulting from careless or insufficient packing. A fee will be charged on all unauthorized returns. **NOTE:** Jenco Instruments, Inc reserves the right to make improvements in design, construction, and appearance of our products without notice.

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