

INSTRUCTION MANUAL

ORP-METER

MODEL COR-01

CONTECH

Instruments Ltd. EL-221, MIDC Electronic Zone, Mhape, Navi Mumbai-400701. Tel: 022-61944000

CHAPTER 1

INTRODUCTION

CONTECH ORP meter measures pH and mV , can used for Oxidation Reduction Potential (ORP) measurements. It is required to be measured in a wide variety of fields such as water testing laboratories and research institutions etc.

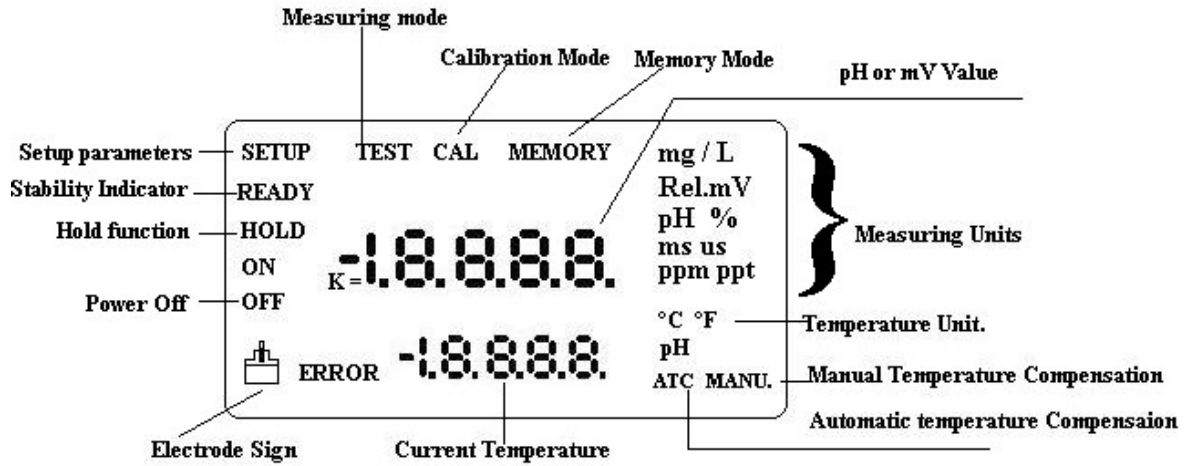
ABOUT ORP-01 MODEL.

ORP meter, Model ORP-01, is a microprocessor based instrument, which measures pH to a resolution of +/- 0.01 pH. It also has a mV mode, where it displays the measurement in milli volts. Meter supports ATC (Automatic temperature compensation) feature which corrects the electrode output changes due to temperature variation of the sample being tested. There is also an option to enter the temperature of measuring solution manually. The following are the salient features of pH/ORP meter.

- Advanced Microprocessor based design.
- pH and mV (Absolute and Relative) modes.
- Automatic and Manual temperature Compensation
- 3 point pH calibration.
- Buffers selectable from 1.68pH, 4.00pH, 4.01pH, 6.86pH, 7.00pH, 9.18pH, 9.20pH. 10.01pH and 12.45pH
- Automatic buffer recognition.
- Bi directional RS232 interface. Baud rate selectable from 1200,2400,4800 and 9600.
- Single and continuous print out of pH.
- Multiple Printout types. Combinations selectable from Sr. No., pH, mV, Date, time and temperature.
- Real Time Clock.
- Temperature setting (Manual temperature compensation).
- Calibration report as per GLP requirements.
- Electrode Slope and mV offset display.
- LCD display with Backlight.
- Memory storage of 100 pH measurements.
- Data logging facility up to 500 results. Data logging interval selectable from 5S, 10S, 20S, 30S, 1M, 2M and 5M.
- Temperature calibration.
- To be used with Combinational probe.

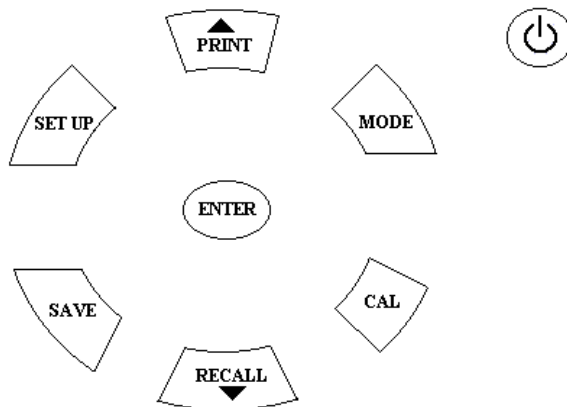
CHAPTER 2

PH/ORP METER DISPLAY



PH/ORP METER DISPLAY

PH/ORP METER KEYBOARD



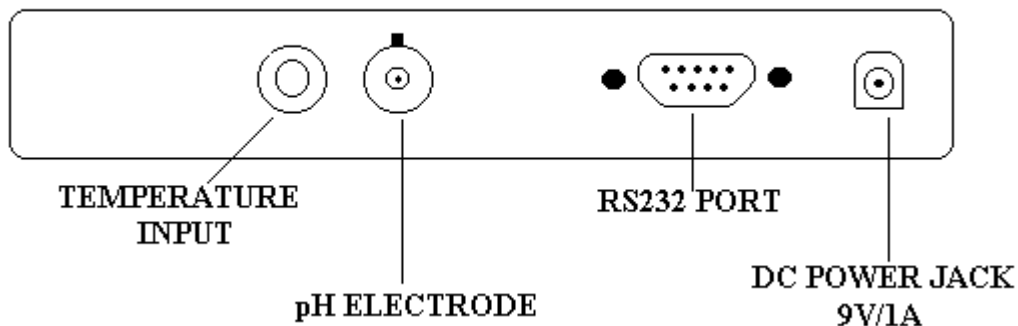
CHAPTER 3

BASIC OPERATION AND SETUP PARAMETERS


3.1 POWER AND INSTALLATION REQUIREMENTS

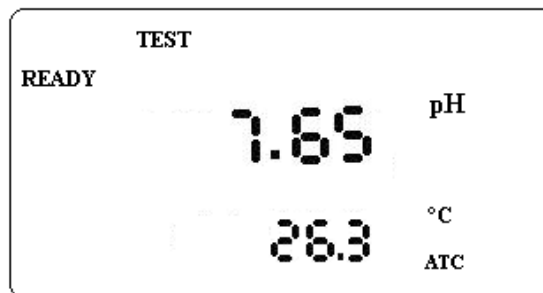
The meter requires good stable power. Meter is supplied with a 9V/1A switching adapter. Connect the adaptor to the instrument to the power jack located at the rear side of the meter. Connect the adaptor to a AC power outlet. Meter is supplied with a combinational probe. Connect the pH electrode to the BNC connector provided at the rear side. Connect the temperature probe to the temperature input connector(If ATC electrode is provided).

REAR PANEL

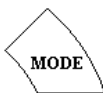


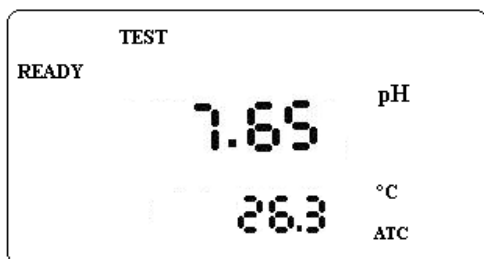
3.2 STARTING THE METER

Switch on the meter by pressing the  key. Instrument goes through self tests and subsequently display the measured pH, say 7.65

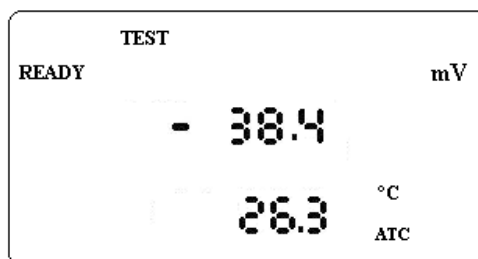


3.3 CHANGING MODES.

Use  to change between pH and mV modes.



pH MODE




mV MODE

3.4 SETUP PARAMETERS

3.4.1 SETTING DATE AND TIME.

Meter has an inbuilt Real Time clock. Hence there is no need to change or update date and time. However it is possible to change date and time.


Press  key. The Meter displays

set
up
buf
set

and subsequently displays

Press  or  key till it displays

date

Press  key. Meter displays current date say 07. Follow the instructions below for changing date, month and year.

TO CHANGE DATE

07
date



To change



To change



To save



To discard



To make zero

TO CHANGE MONTH

08
mon



To change



To change



To save



To discard



To make zero

TO CHANGE YEAR

11
year



To change



To change



To save



To discard




To make zero

12.23.
45.

Meter Displays the current time, say 12.23.45

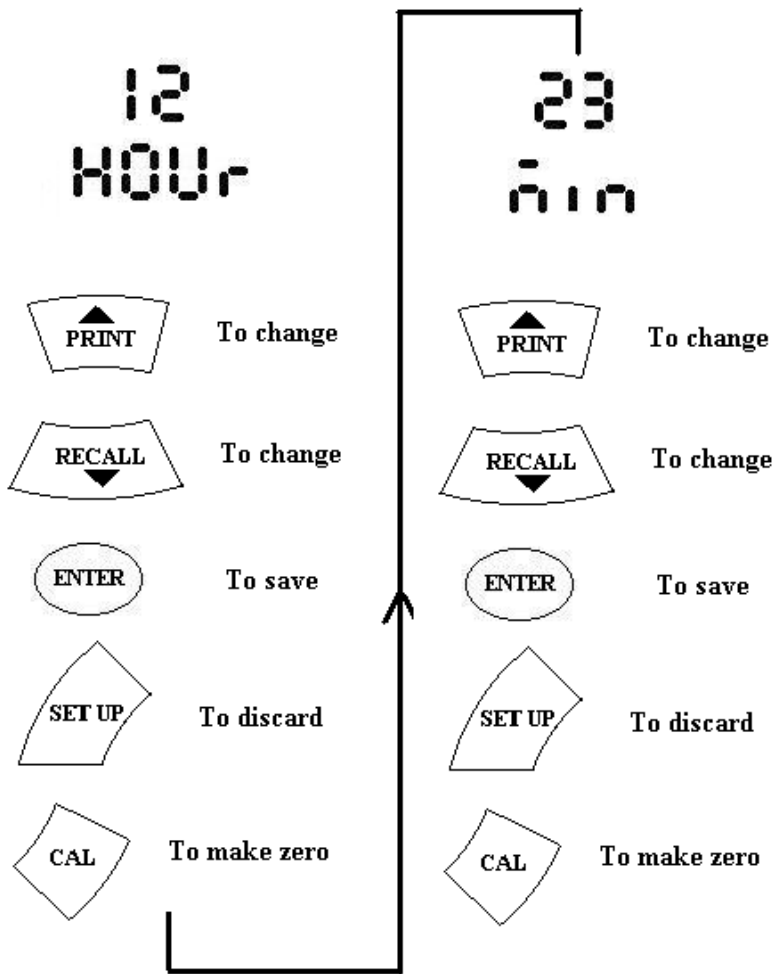


Press  key to change hour. Follow the instructions below for changing


Hour and Minute

TO CHANGE HOUR

TO CHANGE MINUTE



3.4.2 TO SET BAUD RATE

Press  key. The Meter displays

SET
UP

and subsequently displays




bUF
SET


Press  or  key till it displays

bAud


Press  key. Meter displays the set baud rate say 9600.

bd
9600

Press  or  key to change between 1200, 2400, 4800 and 9600 and press  key to save.

Press  key to quit without saving

3.4.3 TO SET TEMPERATURE (For Manual Temperature Compensation)

Press  key. The Meter displays

SET
UP
BUF
SET

and subsequently displays




Press  or  key till it displays


TEMP
SET

Press  key.


Meter shows the set or default temperature (25°C)

25.0
TEMP

Press  or  key to change temperature and press  key to save.

Press  key to quit without saving

3.4.4 TO SET READING SERIAL NUMBER

Press  key. The Meter displays

SET
UP
BUF
SET




and subsequently displays


Press  or  key till it displays


SEr

Press  key. Meter shows the current serial number.

0003


Press  or  key to change the serial number and press  key to save.

Press  key to quit without saving


Press  key to make the reading 0000.

3.4.5 TO SET PRINT OPTION

There are 2 options : **One** and **ALL**

One - Press  key to print current pH/mV through RS232 port.

ALL - Continuous data transfer to computer/printer through RS232 port.

Press  key. The Meter displays

SET
UP
BUF
SET

and subsequently displays


Press  or  key till it displays


Print

Press  key. Meter displays the current mode, say One

One

Use  or  keys to change between

One and All and Press  key to save.


Press  key to discard changes and quit.

3.4.6 TO SET PRINT FORMAT.

There are 6 print formats available in the meter.

- Prf1 - ONLY pH/mV
- Prf2 - SERIAL NO, pH/mV
- Prf3 - SERIAL NO, DATE, pH/mV
- Prf4 - SERIAL NO, TIME, pH/mV
- Prf5 - SERIAL NO, DATE, TIME, pH/mV
- Prf6 - SERIAL NO, pH/mV, TEMPERATURE

To change the format,

Press  key. The Meter displays

SET

UP

BUF


SET




Print


and subsequently displays

Press  or  key till it displays

Prf

Press  key. Meter displays the current mode

Use  or  keys to change between PRF-1 to PRF-6 and press  key to save.

Press  key to discard changes and quit.

3.4.7. TO SET PRINT TYPE.


Meter can be set to print the results in Horizontal and vertical form

A Typical printout in the horizontal form appears as below.

1. 12.30.34 4.00 pH
2. 12.30.45 4.01 pH


While a printout in vertical mode is as shown below.

Sr.No. : 1
Time : 12.30.34
Value : 4.00 pH
To set the mode,

Press  key. The Meter displays




and subsequently displays


Press  or  key till it displays

Press  key. Meter displays the current mode, say TYPE1

```
SET  
UP  
BUF  
SET
```


```
Print  
TYPE  
TYPE1
```

Press  or  key to change between **TYPE1** (horizontal) and **TYPE2** (Vertical) and press  key to save.

Press  key to discard changes and quit.

3.4.8. TO SET MACHINE ID.

Machine identification number can be assigned to the meter using this option.


Press  key. The Meter displays

```

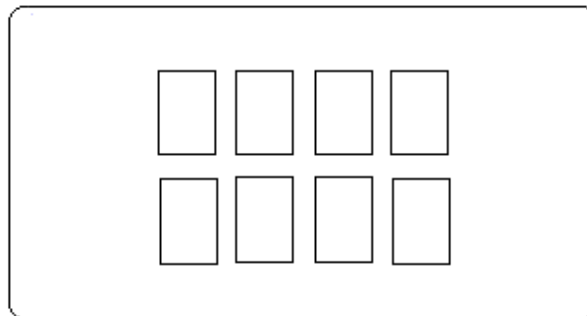
SET
UP
BUF
SET
MACH
id
  
```

and subsequently displays

Press  or  key till it displays

Press  key. Follow the instructions given below for setting id.

MACHINE ID SETTINGS



TO MOVE THE BLINKING CHARACTER LEFT



TO SAVE MACHINE ID



TO MOVE THE BLINKING CHARACTER RIGHT



TO QUIT WITHOUT SAVING



OR



TO CHANGE THE CHARACTER

CHAPTER 4

CALIBRATION OF METER

Meter needs to be calibrated with 3 buffers, ideally spanning the entire range of the measurement. User can select 3 buffers from the list of 9 buffer values available. User can select from 1.68, 4.00, 4.01, 6.86, 7.00, 9.18, 9.20, 10.01 and 12.45.

Since glass pH electrodes measure H^+ (hydrogen ion) concentration relative to their reference half-cells, they must be calibrated periodically to ensure accurate, repeatable measurements.


Requirement of calibration of meter largely depends on the samples being tested, electrode performance and the required accuracy.

For high accuracy measurements($< \pm 0.03\text{pH}$), the meter should be calibrated immediately prior to its use. For an accuracy requirement of $\pm 0.1\text{pH}$, once a week calibration is recommended.


There are various situations where the meter must be calibrated before use. They include,

- Electrode unused for a considerable amount of time.
- After measuring pH of less than 2.00 or more than 12.00.
- Solution temperature is much different from calibrated temperature.
- After measuring concentrated organic solutions.





4.1 SELECTION OF BUFFER.

Press  key and wait till the meter displays

buf
set





Press  key. The meter displays the first buffer value, say 4.00

4.00
buf1

Use  or  keys to change and press  key to select the 1st buffer value. Press  key to discard changes.





7.00
buf2

Meter display shows the 2nd buffer value say 7.00

Use  or  keys to change options and press  key to select the 2nd buffer value. Press  key to discard changes.

9.20
buf3


Meter display shows the 3rd buffer value say 9.20

Use  or  keys to change and press  key to select the 3rd buffer value. Press  key to discard changes.

METER SAVES THESE 3 BUFFER VALUES AND RETAINS THEM IN MEMORY EVEN WHEN IT IS SWITCHED OFF.

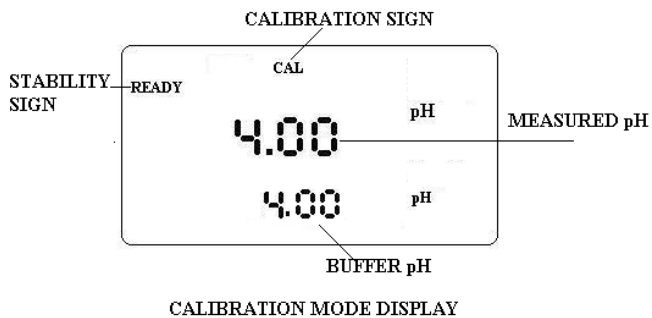
4.2 pH CALIBRATION.

After selecting the buffer values, meter is ready for calibration. Keep the 3 buffers ready for calibration.

Press the  key. The meter displays

CAL-1


and subsequently starts displaying the pH value.



Immerse the electrode in one of the 3 buffer solution.

The upper display shows the measured pH and the lower display shows the buffer value. The lower flashes the values of 3 buffers to be used for calibration.

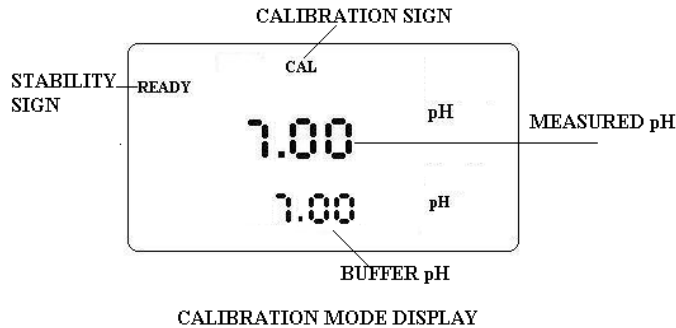
Meter is equipped with auto buffer recognition and when the measured pH reaches with +/- 0.75pH of one of the 3 buffer values, the lower display stops flashing and it shows the buffer value.

When the measured pH value stabilizes, Press  key. Meter displays

CAL


Meter starts displaying pH again.

Immerse the electrode in the next buffer solution



The upper display shows the measured pH and the lower display shows the buffer value. The lower flashes the values of the remaining buffers to be used for calibration.

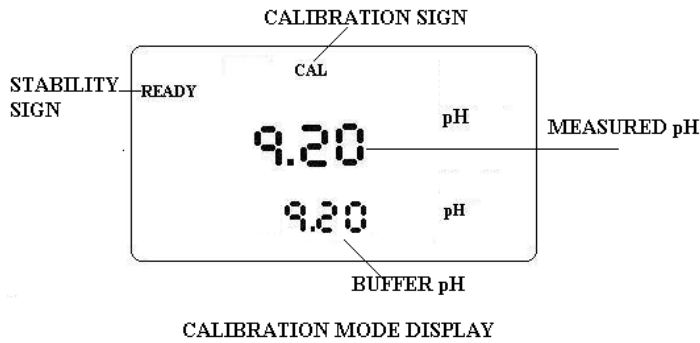
When the measured pH reaches with +/- 0.75pH of one of the 2 buffer values, the lower display stops flashing and it shows the buffer value.

When the measured pH value stabilizes, Press  key. Meter displays

CAL


Meter starts displaying pH again.

Immerse the electrode in the remaining buffer solution



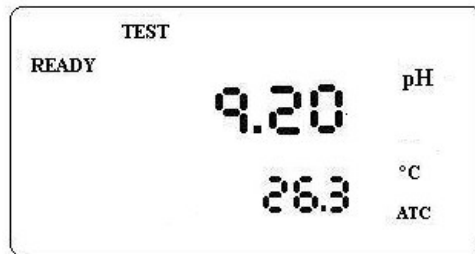
The upper display shows the measured pH and the lower display shows the buffer value. The lower flashes the value of the remaining buffer solution to be used for calibration.

When the measured pH reaches with ± 0.75 pH of third buffer value, the lower display stops flashing and it shows the buffer value.

When the measured pH value stabilizes, Press  key. Meter displays

CAL

and meter is calibrated and starts displaying pH in the normal mode.




Now the meter is ready for pH measurement.

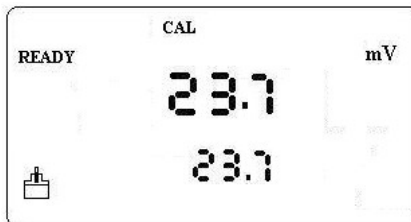
4.3 MV CALIBRATION (Offset adjustment)

Oxidization Reduction Potential (ORP or Redox) measurement is used to find relative potential. mV reading is compared with a reference. Commercial ORP solutions can be used as a reference standard.



Press Mode key to select mV mode


Dip the electrode into a solution with a known mV value (quinhydrone etc) and stir. Wait for the reading to become stable

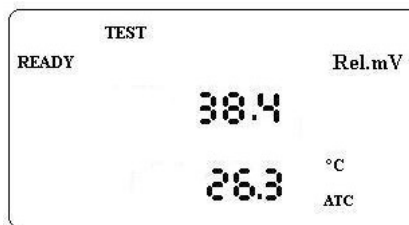
Press  key. Meter displays



The Upper display shows the Relative mV value and the lower display shows the absolute mV value. If the meter is not calibrated before, both will show the same reading.

Press  or  key to change mV to the required value.

Press  key to save the new mV calibration value.




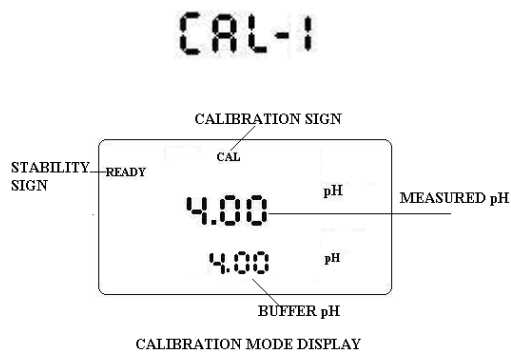
Meter will start displaying the value in Relative mV.

4.4 TEMPERATURE CALIBRATION


To calibrate the temperature sensor, Keep the meter in pH measurement mode.

Immerse the temperature probe in to a solution with known temperature.

Press the  key. The meter displays

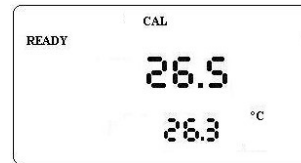


and subsequently starts displaying the pH value.




Keep the  key pressed , till meter displays



Subsequently meter displays



Upper display shows the measured temperature and lower display shows the temperature to be set.

Press  or  key to change the temperature to the known value and press  key to save the new temperature calibration. Meter will start displaying the new value.

CHAPTER 5

pH MEASUREMENT

To ensure accurate and reliable analytical measurements, a routine care and maintenance regime should be adopted. In addition to giving the correct measurement result, correct care and maintenance of pH electrodes will result in improved electrode performance and prolonged working life. It also reduces the necessity for corrective intervention, thus saving time and money.

There is a soak solution for the protection of the pH electrode. The Electrode head is soaked into the solution kept in a bottle attached to it. Turn the cap and remove the bottle containing the liquid and keep it safely. Wash the electrode with pure water. After the measurement, insert the electrode into the bottle again and tighten the cap.

Always keep the electrode immersed in the soak solution, when not in use. Do not let the electrode head to run dry. For preparing the soaking solution, take 25g of analytical KCL and dissolve into 100ml pure water completely. The electrode should avoid soaking into pure water, protein solution or acid fluoride solution for long time.

The sensitive glass bulb in front of the combination electrode should not touch hard substances. Before and after measuring electrode should be washed with pure water for better accuracy. It should be washed thoroughly to remove any sample stuck on it during measurement.

The sensor should never be stored dry. Always keep pH electrode moist. Proper pH electrode storage maximizes electrode performance and extends electrode life. It is best to store electrodes in clean containers filled with pH storage solution 3.3M KCL . Do not store an electrode in distilled or deionised water - this will cause ions to leach out of the glass bulb and render your electrode useless.

It is important that the sensing membrane is kept wet at all times and therefore electrodes are supplied with a storage device which contains a small amount of electrode storage solution. This device together with the electrode box should be reserved for long-term storage.

During use the following points should be borne in mind:

- Electrodes should be calibrated using buffers that bracket the expected value of the sample. Calibration should be performed on a daily basis or more frequently if sample throughput is high.
- Stirring the sample during measurement is recommended but is not essential. But same procedure must be followed for both calibration and pH measurement.
- The electrode should be rinsed with a wash bottle of purified water between measurements.


Do not rub the electrode with tissue paper as this induces static charges which results in Drift.

- Keep the electrical parts of the electrode (the cable and connector) dry at all times.
- After a measurement is completed, remove the electrode from the sample. For short term storage, suspend the electrode in a pH 4 buffer or for longer term (e.g. overnight) in specially formulated electrode storage solution - this will ensure the electrode is kept in an optimum condition for rapid response times and to prolong its lifespan.

CHAPTER 5 DATA LOGGING

Data logging is useful for studying the pattern of pH change over time. Meter stores the pH/mV value along with temperature at a preset time interval. A maximum of 500 readings can be stored and recalled.

5.1 SET DATA LOGGING INTERVAL


Press  key. The Meter displays



```
SEt
UP
bUF
SEt
```

and subsequently displays


Press  or  key till it displays

```
data
LOG
5
SEC
```


Press  key. Meter displays the set baud rate say 5 seconds

Press  or  key to change between 5S, 10S, 20S, 30S, 60S, 120S, 300S

and press  key to save.

Press  key to quit without saving

5.2 START DATA LOGGING.

Press  key. The Meter displays

```
SEt
UP
```



Immediately press  key. Meter Displays
Meter starts storing the pH and temperature values at the set interval.

data
Log




Meter displays  every time it stores data.

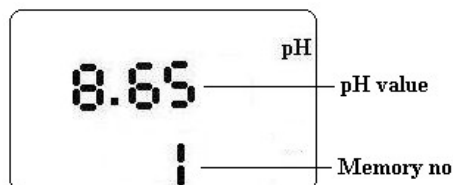
A maximum of 500 readings can be stored. When the data reaches 500, meter displays

FULL

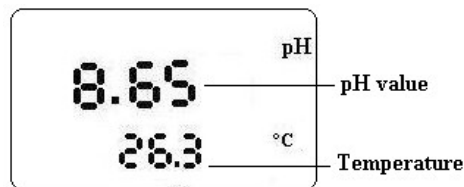
and it stops saving further data.



5.3 DATA RECALL.


Press  key. Meter displays




and followed by



Press  or  key to scan through the saved data.

Press  to quit.

TO PRINT DATA

Press  key . A sample printout appears as below.

1. 4.00 pH 26.8°C
2. 4.00 pH 26.8°C


- 3. 4.01 pH 26.9°C
- 4. 4.01 pH 26.9°C
- 5. 4.02 pH 26.9°C

CHAPTER 6

SAVE AND RECALL OF DATA

A maximum of 100 numbers of measurement data including pH/mV, Date, Time and temperature can be stored and recalled.

6.1 TO CLEAR MEMORY:

Press  key. The Meter displays


SEt
UP

and subsequently displays


buF
SEt

Press  or  key till it displays

datA
CLr


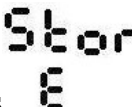
Press  key. Meter displays

CLr


Press  key again, Meter displays

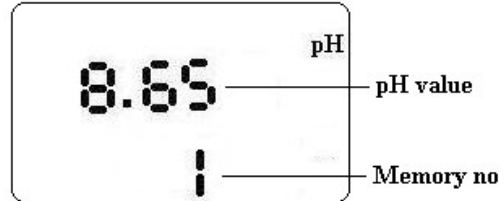
All the stored data will be cleared.

6.2 TO STORE DATA.

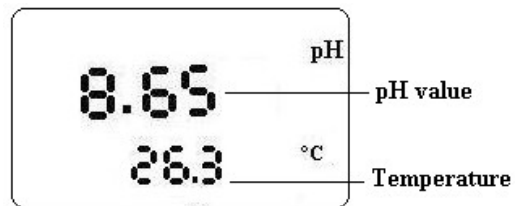
Press  key. Meter displays . The measurement data along with date, time and temperature will be stored in memory.

6.3 TO RECALL DATA:


Press  key. Meter displays




and followed by



Press  or  key to display saved data.

Press  to quit.

6.4 TO PRINT DATA

Press  key. Printout format can be selected by 3.4.6 and 3.4.7 in Chapter 3.

Selected Format Print output

- PrF1** - ONLY pH/mV
- PrF2** - SERIAL NO, pH/mV
- PrF3** - SERIAL NO, DATE, pH/mV
- PrF4** - SERIAL NO, TIME, pH/mV
- PrF5** - SERIAL NO, DATE, TIME, pH/mV

CHAPTER 7 DATA PRINT AND RS232 INTERFACE

7.1 BIDIRECTIONAL RS232 INTERFACE

Bi-directional RS-232 interface is provided in the meter to communicate with devices like computer, printer etc. The interface is provided through a nine pin D-type connector provided at the rear side. Connections are as below.

Pin 2 – RXD – Receive Data
Pin 3 - TXD – Transmit Data
Pin 7 – Ground.

The Serial data transmitted and received are in standard ASCII mode (+/- 12V) - ASYNCHRONOUS , 8 BITS, NO PARITY, 1 STOP BIT.

Baud rate: Selectable from 1200, 2400 ,4800 and 9600.

The data format is

<+/->PPPPPP.PPb <bUU> <CR><LF> (15 characters)

where PPPPPP.PP - Ph or mV value

b – blank space - 20 hex

CR- Carriage Return – 0D hex

LF – Line feed - 0A hex

for example, a pH 7.12 will be sent as


+bbbb7.12bPH<0D><0A>

Meter could be controlled by an external device like computer with the following commands.

P# - Number of times, a stable pH data is to be transmitted through the serial port.
can be any number from 1-9.


7.2 PRINT OPTIONS.

Meter can be attached to a serial printer for your printing needs. Print out can be programmed to suit most of the printing requirements. See sections 3.4.2, 3.4.4, 3.4.5, 3.4.6 and 3.4.7 for setting parameters required for printing.

Press  key to print data through the serial port.

Printing option and patterns are controlled by 3 SETUP parameters. They are

a) **Print**: There are 2 options : **One** and **ALL**

One - Press  key to print current pH/mV through RS232 port.

ALL - Continuous data transfer to computer/printer through RS232 port.

b) **Print**
File option:

- Prf1** - ONLY pH/mV
- Prf2** - SERIAL NO, pH/mV
- Prf3** - SERIAL NO, DATE, pH/mV
- Prf4** - SERIAL NO, TIME, pH/mV
- Prf5** - SERIAL NO, DATE, TIME, pH/mV
- Prf6** - SERIAL NO, pH/mV, TEMPERATURE

c) **Print**
type Print type (Horizontal or Vertical)

i) **type1** - Horizontal
Details will be printed horizontally.

A Typical printout in the horizontal form appears as below.


- 1. 12.30.34 4.00 pH
- 2. 12.30.45 4.01 pH

ii) **type2** - Vertical
Details will be printed vertically in a slip form.

Sr.No. : 1
Time : 12.30.34
Value : 4.00 pH

CHAPTER 8 ELECTRODE SLOPE AND GLP

8.1 ELECTRODE SLOPE AND mV OFFSET

Press  key. The Meter displays


SET
UP

and subsequently displays

BUF
SET


Press  or  key till it displays


ELEC
SLOP

Press  key. Meter displays
(Displaying slope1 – between buffer 1 and 2)




98.6 %
SLP1

Press  key. Meter Displays
(Displaying slope1 – between buffer 2 and 3)




99.6 %
SLP2

Press  key. Meter Displays
(Displaying mV offset at Buffer 7.00 pH)



8.2 GLP CALIBRATION REPORT

Report of the last calibration done, is available as per GLP requirements.

Press  key. The Meter displays

SEt
UP

and subsequently displays

bUF
SEt

Press  or  key till it displays

CAL
rPt

Press  key. Meter Prints report of last calibration as below.

CONTECH ORP METER
 MODEL : ORP-01
 MACHINE ID : ABCDEFGH
 CAL. DATE :
 CAL. TIME :
 BUFFERS :
 1. 4.00 pH at 25 DEG C
 + 176.5 mV
 2. 7.00 pH at 25 DEG C
 - 0.2 mV
 3. 9.20 pH at 25 DEG C
 -128.5 mV
 SLOPE 1 : 99.5%
 SLOPE 2 : 98.7%

MV OFFSET : -0.2mV

SPECIFICATIONS

- 1. Model : ORP-01
 - 2. pH Range : 0 to 14.00 pH
 - 3. Resolution : 0.01 pH
 - 4. Accuracy : +/- 0.01pH
 - 5. Temperature compensation : Auto or Manual
 - 6. Temperature range : 0 to 100°C
 - 7. mV Range : +/- 1999 mV
 - 8. Resolution : 0.1mV
 - 9. Accuracy : 0.1% of FS
 - 10. Input Resistance : $> 1 \times 10^{12}$ ohms
 - 11. Power : +9V/1A power adapter
 - 12. Operating temperature : 15 to 45° c
 - 13. Dimensions :
 - 14. Electrode :
- Box Contents : Meter, Combination electrode, 9V adapter, Instruction manual, Electrode stand, Rod and holder.