

**MODEL 3310 pH METER
OPERATING MANUAL**

SAFETY

Please read this information carefully prior to installing or using this equipment.

1. The unit described in this manual is designed to be operated only by trained personnel. Any adjustments, maintenance and repair must be carried out as defined in this manual, by a person qualified to be aware of the hazards involved.
2. It is essential that both operating and service personnel employ a safe system of work, in addition to the detailed instructions specified in this manual.
3. References should always be made to the Health & Safety data supplied with any chemicals used. Generally accepted laboratory procedures for safe handling of chemicals should be employed.
4. If it is suspected that safety protection has been impaired in any way, the unit must be made inoperative and secured against any intended operation. The fault condition should immediately be reported to the appropriate servicing authority.

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SECTION 1

INTRODUCTION

1.1 INSTRUMENT DESCRIPTION

The Model 3310 pH Meter is a versatile unit which utilises the best of modern technology to simplify operation without sacrificing accuracy or reliability.

With push button operation and a customised liquid crystal display, determination of pH, mV and associated temperature levels can be readily achieved with the minimum of operator training. Calibration routines are simplified by the automatic buffer recognition feature and consistent results are obtained by using the automatic stable reading indicator. Remote monitoring and data collection is facilitated by the provision of both analogue and digital outputs and in the event of power removal, all user defined parameters are retained.

1.2 INSTRUMENT SPECIFICATION

pH (1 or 2 point cal)

Range: -2 to 16.00pH
Resolution: 0.01pH
Accuracy: ± 0.02 pH

mV (Absolute or Relative)

Range: -1999 to +1999mV
Resolution: 1mV
Accuracy: ± 1 mV

Temperature Measuring

Ranges: -10 to +105°C
14 to 220°F
Resolution: 0.1°C 1°F
Accuracy: ± 0.5 °C ± 1 °F

ATC Range: 0 to 100°C

Auto Buffer Recognition: 4.00, 7.00, 9.20 and 10.05 (manual override)

Calibration: User selectable 1 or 2 pt

Outputs: Analogue 1mV per digit
Bi-directional RS232

Display: LCD

Power: Power Supply 9Vac

Size: 275(l)x240(w)x150(d)mm

Weight: 1.2Kgs

SECTION 2

INSTALLATION

2.1 UNPACKING

Remove the Model 3310 from the packaging and ensure the items contained within the package are as ordered.

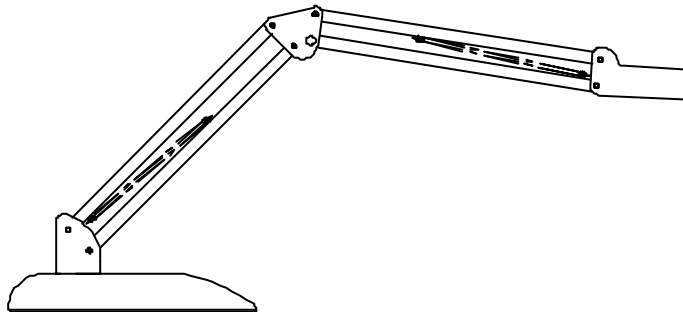
Any shortages or damage should be reported immediately to the Manufacturer or your local Distributor.

NOTE: Power Supply 021 033 is supplied with a moulded European plug. If this is not correct for your local supply it should be cut off and a suitable local connector fitted noting the colours of the internal conductors as follows: Brown - Live Blue - Neutral

2.2 INSTALLATION

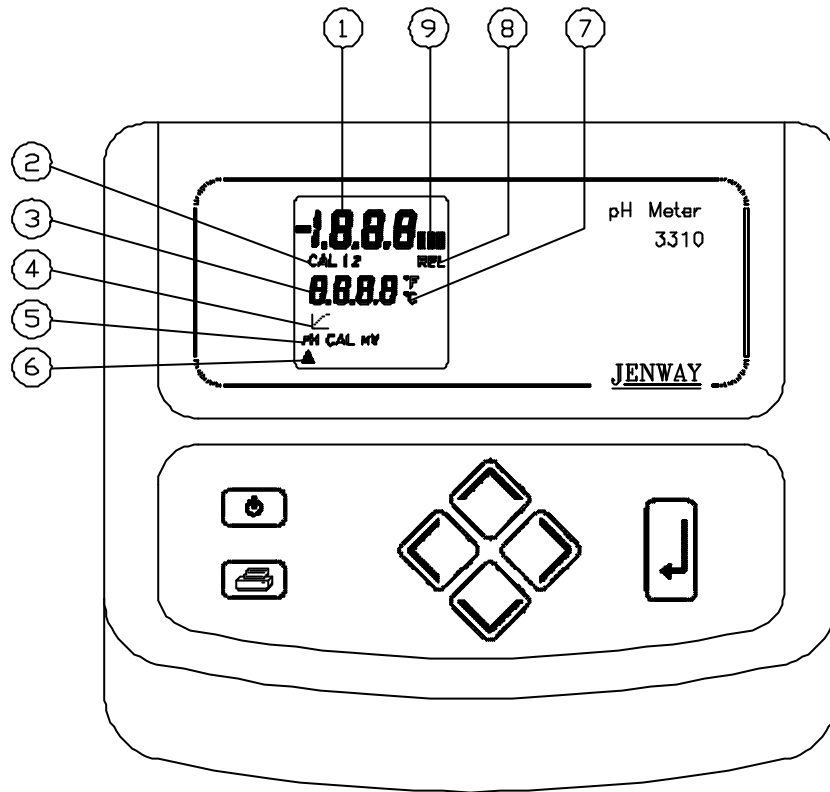
For units supplied with the swing arm electrode holder the following assembly instructions should be carried out:

1. Unpack the assembly and ensure the following items are present:
 - a) Base block and b) Swing arm. Assemble as illustrated. The moulded pivot is a tight push fit onto the pin.



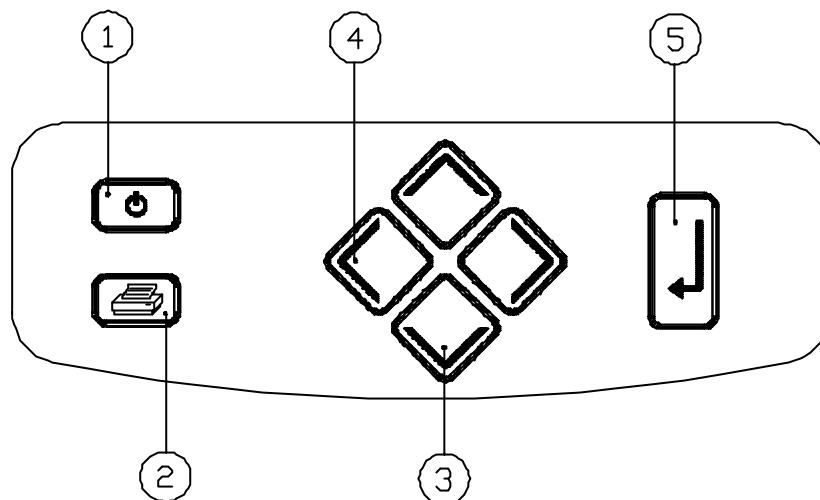
2. Fit the pH electrode into the cut-out in the support block. The optional temperature probe, if supplied, should be placed into the small hole in the centre of the block. The cable(s) should be passed through the retaining clip on the holder and connected to the respective socket on the rear panel.

2.3 DISPLAYS



1. Main display - provides direct readout of samples and standards.
The display will also show Underrange (-1) and Overage (1) symbols if the instrument is reading outside the ranges as shown below:
pH -2.00 to 16.00
mV -1999 to +1999
2. CAL 1 2 - indicates 1st or 2nd calibration point.
3. Temperature display - provides direct readout of temperature in °C or °F.
The display will also show Underrange (-1) and Overage (1) symbols if the instrument is reading outside the ranges as shown below:
Temp -10 to 105°C / 14 to 220°F
4. Endpoint Detection symbol - this is displayed once a stable reading is detected, and is maintained until the input changes.
5. Mode select menu.
6. Cursor - used to select/indicate required measurement mode.
7. Selected temperature measurement unit - °C or °F.
8. REL - relative mV indicator. This is displayed when the instrument is operating in this mode.
9. Measurement unit which is being used, pH, mV.

2.4 CONTROLS



Switches the instrument on and to Standby.



Print Key. Provides a printout of the current reading with an incremental sample number. When pressed for the first time after a calibration, the printout will give calibration information. The incremental sample number will be reset after a calibration.



The keys are used in pH CAL mode to change the calibration value when performing a manual calibration.
To change the manual temperature compensation value when using alternative electrodes and no ATC probe is fitted.

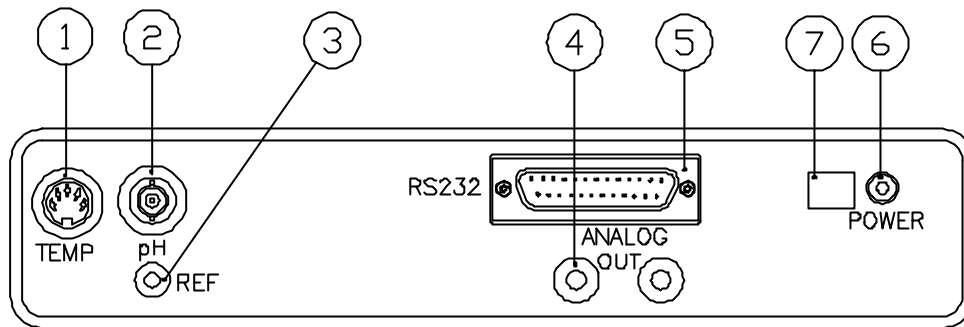


These keys are used to move the cursor between the menu options.



This key (Enter key) is used to select the displayed menu option.

2.5 INPUTS/OUTPUTS






- | | | |
|----|----------------------|--|
| 1. | TEMP SOCKET | 5 pin DIN socket which allows the automatic temperature compensation probe to be connected |
| 2. | pH SOCKET | BNC socket. Connection socket for pH and Redox electrodes |
| 3. | REF SOCKET | 2mm pin socket. Connection socket for a separate reference electrode |
| 4. | ANALOG OUT | 2 x 4mm sockets. Analogue output 1mV per digit |
| 5. | OUTPUT SOCKET | 25 way D type socket for RS232 |
| 6. | POWER IN | 2.1 x 5.5mm socket allowing the power supply to be connected to the unit |
| 7. | DIP SWITCHES | Used to select temperature units in °C or °F |

SW1

1	°C or °F	on=°C
2	Not used	off
3	Not used	off
4	Not used	off

SECTION 3




OPERATION


Switch the instrument on. The display will either power up in the mV mode or the pH mode dependent on previous usage. This will be indicated by the displayed measurement unit. The display cursor will also indicate the mode selected. To change mode, move the cursor beneath the required menu option using the   keys, and then press the  key.

3.1 AUTOMATIC pH CALIBRATION



Auto buffer recognition operates over the range of 0 to 100°C, and will recognise 4.00, 7.00, 9.22 and 10.05pH.


NOTE: Rinse electrode(s) in deionised water between measurements.

From the pH mode calibration is performed by moving the cursor to the CAL menu option by using the  or  keys, and then pressing the  key to select. The readout will then display CAL 1.

The electrode(s) should be placed into the required buffer and the reading allowed to stabilise (the endpoint symbol will be displayed) prior to pressing the  key. The display will then update to the standard buffer value.




The display will then indicate CAL2.




If a one point calibration only is required, move the cursor beneath the pH menu option using the  key and then press the  key. The instrument will return to the pH mode.

If a two point calibration is required, the electrode(s) should be rinsed and then placed into the second buffer solution. Allow the reading to stabilise (the endpoint symbol will be displayed) prior to pressing the  key. The display will update to this calibration value and then return to the pH mode.

3.2 MANUAL pH CALIBRATION



NOTE: Rinse the electrode(s) in deionised water between measurements.



Select the pH menu and then CAL by moving the cursor to the CAL menu option by using the  or  keys, and then pressing the  key to select. The readout will then display CAL 1.


The electrode(s) should be placed into the required buffer and the reading allowed to stabilise (the endpoint symbol will be displayed). Set the display to the required buffer value using the   keys. Press the  key to calibrate the instrument to that value.

3.2 MANUAL pH CALIBRATION (continued)

The display will then update to the set buffer value. The display will then indicate CAL 2.

If a one point calibration only is required, move the cursor beneath the pH menu option using the  key and then press the  key. The instrument will return to the pH mode.

If a two point calibration is required, the electrode(s) should be rinsed and then placed into the second buffer solution. Allow the reading to stabilise (the endpoint symbol will be displayed). Set the display to the required buffer value using the   keys.

Press the  key to calibrate the instrument to that value. The display will then update to that calibration value and return to the pH mode.



3.3 ERROR CODES

If a problem is detected during calibration the following error codes will be displayed:

Err1 This indicates that the instrument has not recognised the buffer. The displayed reading must be within 1pH of the calibration buffer value for automatic buffer recognition and calculated electrode offset at pH7 must be in the range of -30 to +30mV. The error code will be displayed for 3 seconds and will then reset the calibration data back to the ideal Nernst response of 0mV offset at 7 pH and a slope of 59.16mV/pH at 25°C.



Err2 This indicates that the slope value is out of range. The error code will be displayed for 3 seconds and will then reset the calibration data back to the ideal Nernst response of 0mV offset at 7 pH and a slope of 59.16mV/pH at 25°C. The allowable range for slope is 75 to 125% of the ideal Nernst figure.

3.4 mV MODE

Move the cursor beneath the mV menu option and press . The instrument can toggle between Absolute and Relative mV by moving the cursor to CAL and then pressing . Relative mV mode is indicated by REL appearing on the display.

3.5 MANUAL TEMPERATURE COMPENSATION

NOTE: This is only operational in “pH MODE”.

When using an alternative electrode without ATC, the displayed temperature reading can be adjusted to the correct value using the   keys. The instrument will default to this mode if a temperature sensing element is not connected to the instrument.

3.6 GOOD PRACTICE GUIDELINES

The types of pH electrodes are many and various. For the majority of tests carried out on aqueous solutions; with a reasonable ionic strength, at ambient temperatures and with limited use in strongly acidic solutions, the epoxy bodied combination electrode supplied is ideal.

For other applications a more suitable pH/reference electrode pair may be required. Details or advice supplied on request.

The following general guidelines indicate the care and maintenance required:

1. **After Use**

Rinse thoroughly with distilled water.

Short Term Storage

Immerse in pH4 buffer

Long Term Storage

Fit wetting cap filled with pH7 buffer (Combination). Fit wetting cap filled with pH4 buffer (pH/Reference)

2. Electrodes should be stored:

- a) away from direct sunlight
- b) in a vertical position
- c) within their specified temperature range

3. Always ensure the electrode is used within its specified temperature range of 0 to 80°C. Ageing of electrodes used above their specified temperature is rapid and irreversible.

4. **DO NOT** touch the sensitive glass pH membrane or reference junction during use.

Excess droplets of solution may be removed by gently blotting with filter paper or tissue.

DO NOT rub the electrode as this may induce an electrostatic charge.

5. During use ensure the electrode is rinsed between each measurement to eliminate the contamination of solutions.

SECTION 4

MAINTENANCE

4.1 GENERAL

The Model 3310 is designed to give optimum performance with minimum maintenance. It is only necessary to keep the external surfaces clean and free from dust. To give added protection when the unit is not in use the unit should be covered with the optional dust cover (544 008). For longer term storage or re-shipment it is recommended that the unit be returned to its original packing case.

4.2 CLEANING/RE-CONDITIONING OF GLASS ELECTRODES

For general purpose use, combination electrodes can be cleaned with a mild detergent solution or a commercial glass cleaning solution (provided these are not strongly acidic). The electrode surface should be wiped with a clean cloth soaked in the cleaning agent, and/or allow the membrane to stand in the solution until clean. Rinse and repeat as necessary.

TABLE FOR CLEANING OF GLASS ELECTRODES

NOTE: The epoxy bodied electrode supplied with the instrument should not be cleaned with aggressive solvents.

Deposit	Cleaning agents
General deposits	Mild detergent solution
Inorganic coatings	Commercial glass cleaning solution (not strongly acidic)
Metal compounds	Acid solution, not stronger than 1M
Oil/Grease	Complexing agent (EDTA) or suitable solvent
Resins/Lignins	Acetone, alcohol or detergent (not strongly alkaline)
Proteins (blood, etc)	Enzyme solutions e.g. Pepsin in 0.1M HCl
Stubborn deposits	Weak hydrogen peroxide solution, Sodium Hypochlorite solution or domestic bleach.

Electrodes which have been allowed to dry out, (often indicated by a hard, dry deposit of KCl crystals on the electrode body), should be rehabilitated by soaking overnight in warm distilled water.

SECTION 5

OPTIONAL ACCESSORIES

5.1 OPTIONAL ACCESSORIES

The following list of items are available for use with the Model 3310:

903 200 Electrode stand with swing arm electrode holder

027 024 Temperature probe/ATC

544 008 Dust Cover

021 030 Power Supply (UK Version)

021 031 Power Supply (European Version)

021 032 Power Supply (US Version)

021 033 Power Supply (230V leaded)

NOTE: **Power Supply 021 033 is supplied with a moulded European plug. If this is not correct for your local supply it should be cut off and a suitable local connector fitted noting the colours of the internal conductors as follows:**
Brown - Live Blue - Neutral

pH Electrodes

924 001 General purpose, epoxy bodied combination, 12mm diameter. For liquids.

924 003 Redox, platinum type combination, 12mm diameter.

924 004 Micro 4.5mm diameter glass combination. For liquids.

924 005 General purpose, glass bodied combination, 12mm diameter. For liquids.

924 010 Spear type 6mm diameter stem, glass combination. For semi-solids.

924 011 Spear type 4mm diameter stem, glass combination. For semi-solids.

924 015 Glass pH electrode.

924 030 Tris Buffer. 12mm diameter. For biological fluids.

924 047 3 in 1 pH electrode

Reference Electrodes

924 016 Sealed cap calomel reference.

924 036 Double junction calomel reference.

Buffer Solutions

025 163 2.00 pH Buffer (500ml)

025 037 4.00 pH Buffer (500ml)

025 038 7.00 pH Buffer (500ml)

025 162 9.22 pH Buffer (500ml)

025 039 10.05 pH Buffer (500ml)

025 160 3M KCl Electrode Fill Solution (100ml)

025 161 Electrode Cleaning Solution (500ml)

Redox Standards

025 157 200mV @ 25°C (500ml)

025 158 300mV @ 25°C (500ml)

025 159 465mV @ 25°C (500ml)

SECTION 6

ADDITIONAL FUNCTIONS

6.1 mV RANGES

Absolute Millivolts

When this mode is selected the instrument will display the actual voltage developed by the electrode when it is immersed in a solution containing ions to which the electrode is sensitive.

The electrode may be a combination type or a suitable sensing/reference pair, depending on the specific test being carried out.

pH, Redox and Ion Selective electrodes can all be used in this mode. Most of these determinations will require the preparation of calibration curves or other analytical methods to enable the mV reading to be converted to a concentration unit. For further information on these determinations refer to the electrode instructions, which will normally give details of calibration solutions, interferences and the limits of the methodology.

A very useful application of the Absolute mV range is for monitoring the performance of standard pH electrodes. Using accurate and fresh buffers at a constant temperature, the millivolt output of the electrode should be noted and compared to the theoretical ideal. As the electrode ages, becomes contaminated or dirty these values will drift, indicating that corrective action should be taken.

Recording these values as part of a routine Quality Control program can give a good indication of the condition of the electrode.

Relative Millivolts

This mode is also suitable for determination using Redox and Ion Selective electrodes and has the additional benefit of being able to zero any offset voltage developed by the electrode in a blank solution, i.e. a solution that has none of the ions to be measured, but has all the other characteristics of the unknown samples. A blank solution would normally have its ionic strength and pH adjusted as required for the electrode in use.

As the display is zeroed automatically when the Relative millivolt mode is selected, it is necessary to immerse the electrode in the blank solution with the Absolute mV mode selected. When the reading has stabilised the Relative mV mode should then be selected. The display will be set to zero, thereby removing any offset voltage.

Sample measurement is then carried out by using a variety of well tried analytical methods; from simple calibration curves through titrations, to single and multiple addition methods.

SECTION 7

INTERFACING

7.1 Analogue

All units are provided with 2 x 4mm sockets, marked as ANALOG OUT, on the rear panel. An analogue output voltage of 1mV per least significant digit is available from these sockets.

7.2 RS232

The Bi-directional RS232 interface is available on the rear panel 25 way D type connector.

The connections are as follows:

TXD 2	- INPUT TO 3310
RXD 3	- OUTPUT FROM 3310
RTS 4	- LINKED TO CTS
CTS 5	- LINKED TO RTS
DSR 6	- OUTPUT FROM 3310
DCD 8	- OUTPUT FROM 3310
DTR 20	- INPUT TO 3310 (must be active)
GND 7	

Suggested interconnections are detailed below:

3310		IBM PC XT (25 way "D")
TXD 2	_____	2 TXD (From PC)
RXD 3	_____	3 RXD (To PC)
RTS 4	_____	4 RTS (From PC)
CTS 5	_____	5 CTS (To PC)
DSR 6	_____	6 DSR (To PC)
DCD 8	_____	8 DCD (To PC)
DTR 20	_____	20 DTR (From PC)
GND 7	_____	7 GND

3310		IBM PC XT (9 way "D")
TXD 2	_____	3 TXD (From PC)
RXD 3	_____	2 RXD (To PC)
RTS 4	_____	7 RTS (From PC)
CTS 5	_____	8 CTS (To PC)
DSR 6	_____	6 DSR (To PC)
DCD 8	_____	1 DCD (To PC)
DTR 20	_____	4 DTR (From PC)
GND 7	_____	5 GND

NOTE: The Interface Cable Kit (Order Code: 542 009) can be used to implement the above interconnections.

INTERFACING (continued)

The RS232 communications parameters on the computer or printer need to be set to match those of the Model 3310, as detailed below:

1200 Baud
7 Data Bits
Odd Parity
1 Stop Bit

The Model 3310 supports both hardware (DTR/DSR) flow control and software XON/XOFF flow control.

Pressing the PRINT key outputs from the RS232 interface.

Sending an ASCII "D" to the 3310 causes a printout of the current displayed reading plus sample number.

Sending an ASCII "C" causes a printout of the last calibration parameters.

HEALTH & SAFETY

PRODUCT: **Buffer Capsules**

PHYSICAL DATA

Description: White powder

Solubility in water: Soluble

HEALTH HAZARD - Harmful if ingested in quantity. May be irritating or cause physical damage in contact with eyes.

FIRST AID

Eyes Irrigate thoroughly with water. If discomfort persists OBTAIN MEDICAL ATTENTION.

Lungs Remove from exposure.

Skin Wash off thoroughly with soap and water.

Mouth Wash out mouth thoroughly with water. In severe cases OBTAIN MEDICAL ATTENTION.

STORAGE AND HANDLING

Special requirements - none

EC Declaration of Conformity

JENWAY Model 3310 pH Meter complies with the following European Standards:

EN 50081-1:1992 Electromagnetic compatibility - Generic emission standard

EN 50082-1:1992 Electromagnetic compatibility - Generic immunity standard (Performance criterion B)

EN 61010-1:1993 Safety requirements for electrical equipment for measurement, control and laboratory use

Following the provision of:

EMC Directive - 89/336/EEC and Low Voltage Directive - 73/23/EEC

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