

# BPD17

pH / Redox Monitor



Operation Guide



# Preface

## Product warranty

The BPD17 pH / Redox Monitor has a warranty against defects in materials and workmanship for three years from the date of shipment. During this period LTH will, at its own discretion, either repair or replace products that prove to be defective. The associated software is provided 'as is' without warranty.

## Limitation of warranty

The foregoing warranty does not cover damage caused by accidental misuse, abuse, neglect, misapplication or modification.

No warranty of fitness for a particular purpose is offered. The user assumes the entire risk of using the product. Any liability of LTH is limited exclusively to the replacement of defective materials or workmanship.

## Disclaimer

LTH Electronics Ltd reserves the right to make changes to this manual or the instrument without notice, as part of our policy of continued developments and improvements.

All care has been taken to ensure accuracy of information contained in this manual. However, we cannot accept responsibility for any errors or damages resulting from errors or inaccuracies of information herein.

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BPD17 is a trademark of LTH Electronics Ltd

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## Manufacturing Standards



### Electromagnetic compatibility

This instrument has been designed to comply with the standards and regulations set down by both the United Kingdom EMC Regulations S.I. 2016/1091 and the European EMC Directive 2014/30/EU using BS EN 61326-1: 2013.

### Safety

This instrument has been designed to comply with the standards and regulations set down by both the United Kingdom Equipment Safety Regulations S.I. 2016/1101 and the European Low Voltage Directive 2014/35/EU using BS EN 61010-1: 2010.

### Restriction of Hazardous Substances

This instrument has been produced to comply with the standards and regulations set down by both the United Kingdom Equipment Restriction of Hazardous Substances Regulations S.I. 2012/3032 and the European Restriction of Hazardous Substances Directive 2011/65/EU using BS EN IEC 63000 : 2018.

### Quality

This instrument has been manufactured under the following quality standard:

ISO 9001:2015. Certificate No: FM 13843

Note: The standards referred to in the design and construction of LTH products are those prevailing at the time of product launch. As the standards are altered from time to time, we reserve the right to include design modifications that are deemed necessary to comply with the new or revised regulations.

### Disposal



As per regulation S.I. 2012/3032 and directive 2012/19/EU, please observe the applicable local or national regulations concerning the disposal of waste electrical and electronic equipment.

## Declaration of Conformity



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### DECLARATION OF CONFORMITY

LTH Electronics Ltd

declare, accepting full responsibility, that the product(s)

**BPD17, BPD17LV, BPD17A, BPD17LVA**

conforms with all relevant United Kingdom regulations:

---

BS EN 61326-1 : 2013

(Electrical Equipment for Measurement, Control  
and Laboratory Use)

in accordance with the provisions of  
the S.I. 2016/1091 (EMC) regulations.

---

BS EN 61010-1 : 2010 (Equipment Safety)

in accordance with the provisions of  
the S.I. 2016/1101 (Equipment Safety) regulations.

---

BS EN IEC 63000 : 2018

(Electrical and Electronic Products)

in accordance with the provisions of  
the S.I. 2012/3032 (RoHS) regulations.

---

Issued in the United Kingdom on  
07<sup>th</sup> January 2021 for the company by:



Neil Adams  
Managing Director

LTH Electronics Ltd

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**DECLARATION OF CONFORMITY**

LTH Electronics Ltd

declare, accepting full responsibility, that the product(s)

**BPD17, BPD17LV, BPD17A, BPD17LVA**

conforms with all relevant European Directives:

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BS EN 61326-1 : 2013  
(Electrical Equipment for Measurement, Control  
and Laboratory Use)

in accordance with the provisions of  
the 2014/30/EU (EMC) directive.

---

BS EN 61010-1 : 2010 (Equipment Safety)

in accordance with the provisions of  
the 2014/35/EU (Low Voltage) directive.

---

BS EN IEC 63000 : 2018  
(Electrical and Electronic Products)

in accordance with the provisions of  
the 2011/65/EU (RoHS) directive.

---

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## Introduction

The BPD17 is a microprocessor controlled pH and Redox (ORP) measurement instrument that can be used with a wide range of Single ended or differential electrodes to measure and control a broad spectrum of solution pH or Redox. To achieve this, the instrument utilises a multifunction LCD to display the primary reading and temperature, show operational status and to provide an intuitive user interface.

As standard the instrument is a simple to install IP66 rated Wall-mount instrument, however with the addition of a suitable mounting kit it can either be installed as a Panel-mount or Pipe-mount instrument.

The instrument has two on-board volt-free normally-open relays with adjustable setpoint value and hysteresis. Either one can be set to activate if the process variable or temperature is above or below the setpoint allowing the instrument to be used in a variety of dosing or bleeding applications. Other setpoint functions include activation on alarm, time and pulse proportion, delayed activation, dose alarm timer, and scheduled cleaning, whilst the status of the relays can be seen via the main screen of the instrument.

Additionally, the instrument features up to two industry standard, isolated, 0/4-20mA current outputs that features adjustable scaling, selectable on-error states and loop fault detection. Either allows the instrument to transmit the primary reading or observed process temperature for remote monitoring purposes.

Also fitted is a single contact input which allows the instrument to be remotely set to either an offline state that forces the relays to deactivate and the current output to a pre-defined state, or to change the whole configuration of the instrument by switching the setup to a preconfigured state.

Depending upon version purchased the instrument is powered by either 85-265V AC or 12-30V DC.

# pH / Redox (ORP) Input Specification

<b>Measurement Input</b>	<p>Single ended or differential with solution ground.</p> <p><b>pH</b> Separate glass and reference electrode pair. Combination electrode.</p> <p><b>Redox (ORP)</b> Separate glass and reference electrode pair. Combination electrode.</p> <p>Other manufacturer's sensors can be accommodated.</p>		
<b>Connection Cable</b>	<p>Up to 30 meters (no preamp required) LTH type 54E or LN10 cable</p>		
<b>Ranges of Measurement</b>	<p>0.00 to 14.00 pH -1999mV to +1999mV.</p>		
<b>Accuracy</b>	<p>± 0.05 pH. ± 3mV.</p>		
<b>Linearity</b>	<p>± 0.1% of range.</p>		
<b>Repeatability</b>	<p>± 0.1% of range.</p>		
<b>Operator Adjustment</b>		<u>Slope</u>	<u>Offset</u>
	pH	60-120%	3 to 11pH
	Redox	NA	-400mV to +400mV
<b>Calibration Methods</b>	<p>Automatic 4pH / 9pH Buffer Calibration, Alternative buffers supported by user entry into instrument. Manual Slope and Offset Adjustment. Both methods feature post-calibration electrode condition indication</p>		
<b>Custom Buffer</b>	<p>13 point 4pH / 9pH custom buffer entry pre-loaded with standard LTH buffers, alternative buffers also supported by user entry into instrument.</p>		
<b>Sensor Input Filter</b>	<p>Adjustable filter that averages the sensor input over a user selectable time (10sec – 5mins).</p>		
<b>Temperature Sensor</b>	<p>Pt1000 or PT100 RTD input. Up to 30 meters of cable. Temperature sensor can be mounted in the sensor or separately.</p>		
<b>Range of Temperature Measurement</b>	<p>-50 °C to +150 °C (-58 °F to +302 °F) for full specification.</p>		
<b>Temperature Accuracy</b>	<p>± 0.5 °C (when using PT1000)</p>		

<b>Operator Adjustment (Temperature)</b>	$\pm 50\text{ }^{\circ}\text{C}$ or $\pm 122\text{ }^{\circ}\text{F}$
<b>Range of Temperature Compensation</b>	$-10\text{ }^{\circ}\text{C}$ to $+150\text{ }^{\circ}\text{C}$ ( $+14\text{ }^{\circ}\text{F}$ to $+302\text{ }^{\circ}\text{F}$ ) for full specification.
<b>Temperature Compensation Type</b>	Automatic or manual $-10\text{ }^{\circ}\text{C}$ to $+150\text{ }^{\circ}\text{C}$
<b>Off-Line Facility</b>	The relays are de-energised and the current output is held at a user defined level.
<b>Ambient Operating Conditions</b>	Temperature $-20$ to $+55\text{ }^{\circ}\text{C}$ , Relative Humidity 5 to 95%, non-condensing.
<b>Ambient Temperature Variation</b>	$\pm 0.01\%$ of range / $^{\circ}\text{C}$ (typical)
<b>Display</b>	3¾" 240x128 dot LCD Module
<b>Display Backlight</b>	Can be set to flash to indicate the instruments alarm status.
<b>Buttons</b>	5 tactile feedback micro-switched, silicone rubber
<b>Digital Input</b>	Single contact input for remote activation of user defined operations. Can be configured to operate in either normally open or normally closed modes.
<b>Current Outputs Specification</b>	Single current output as standard with option of two on advance models, selectable 0-20mA or 4-20mA into 750 ohms max, fully isolated to 2kV. Expandable up to 5% of any operating range and offset anywhere in that range.
<b>Current Outputs Adjustment</b>	$\pm 0.01\text{ mA}$ , 3 point 0/4-20 mA for remote monitor calibration.
<b>Setpoints and Control Relays Specification</b>	2 normally open fully configurable setpoints with volt free contacts for each relay. Rated at 5A @ 30V DC / 5A @ 250V AC.
<b>Setpoint Modes</b>	High, Low, Band, Latch High, Latch Low, Cleaning, Alarm. On/Off, Time Proportioning, Pulse Proportioning. Delay timer adjustable from 00:00 to 59:59 mm:ss. Hysteresis 0 to 9.99%. Dose alarm timer, with supplementary initial charge function. Both adjustable from 00:00 to 59:59 mm:ss. Adjustable cycle time and proportional band in proportional modes. Cleaning to operate a jet spray wash or rotary electrode cleaning system on a timed cycle. Adjustable Duration, Interval and Recovery. Flash backlight on setpoint trigger.
<b>MicroSD Card Interface</b>	Enables on site upgrading of instrument software. SD, SDHC and SDXC-FAT32 cards supported.

<b>EMC</b>	S.I. 2016/1091 & 2014/30/EU using BS EN 61326-1: 2013.
<b>Safety / Low Voltage Directive</b>	S.I. 2016/1101 & 2014/35/EU using BS EN 61010-1: 2010.
<b>Power Supply</b>	Universal 90-265V AC, 8W max. LV Option 12 – 30 V DC, 5W max.
<b>Instrument Housing</b>	UL 94-V0 PC/ABS.
<b>Ingress Protection Rating (IEC 60529 Protection Rating)</b>	IP66.
<b>Weight</b>	Maximum 800 grams (instrument only).
<b>Dimensions</b>	175 x 150 x 119 mm (H, W, D).

## Installation – Safety & EMC

This chapter describes how to install the instrument and how to connect the unit to a power source and auxiliary equipment.

Although today's electronic components are very reliable, it should be anticipated in any system design that a component could fail and it is therefore desirable to make sure a system will **fail safe**. This could include the provision of an additional monitoring device, depending upon the particular application and any consequences of an instrument or sensor failure.

### Wiring Installation

The specified performance of the instrument is entirely dependent on correct installation. For this reason, the installer should thoroughly read the following instructions before attempting to make any electrical connections to the unit.

**CAUTION !** : ALWAYS REMOVE THE MAIN POWER FROM THE SYSTEM BEFORE ATTEMPTING ANY ALTERATIONS TO THE WIRING. ENSURE THAT BOTH POWER INPUT LINES ARE ISOLATED. MAKE SURE THAT THE POWER CANNOT BE SWITCHED ON BY ACCIDENT WHILST THE UNIT IS BEING CONNECTED. FOR SAFETY REASONS AN EARTH CONNECTION MUST BE MADE TO THE EARTH TERMINAL OF THIS INSTRUMENT.

**LOCAL WIRING AND SAFETY REGULATIONS SHOULD BE STRICTLY ADHERED TO WHEN INSTALLING THIS UNIT. SHOULD THESE REGULATIONS CONFLICT WITH THE FOLLOWING INSTRUCTIONS, CONTACT LTH ELECTRONICS OR AN AUTHORISED LOCAL DISTRIBUTOR FOR ADVICE.**

To maintain the specified levels of Electro Magnetic Compatibility (EMC, susceptibility to and emission of electrical noise, transients and radio frequency signals) it is essential that the types of cables recommended within these instructions be used. If the installation instructions are followed carefully and precisely, the instrument will achieve and maintain the levels of EMC protection stated in the specification. Any equipment to which this unit is connected must also have the same or similar EMC control to prevent undue interference to the system.

❖ Terminations at the connectors should have any excess wire cut back so that a minimal amount of wire is left free to radiate electrical pick-up inside or close to the instrument housing.

**N.B.** The use of CE marked equipment to build a system does not necessarily mean that the completed system will comply with the European requirements for EMC.

## Noise suppression

In common with other electronic circuitry, the instrument may be affected by high level, short duration noise spikes arising from electromagnetic interference (EMI) or radio frequency interference (RFI). To minimise the possibility of such problems occurring, the following recommendations should be followed when installing the unit in an environment where such interference could potentially occur.

The following noise generating sources can affect the instrument through capacitive or inductive coupling.

- ❖ Relay coils
- ❖ Solenoids
- ❖ AC power wires, particularly at or above 100V AC
- ❖ Current carrying cables
- ❖ Thyristor field exciters
- ❖ Radio frequency transmissions
- ❖ Contactors
- ❖ Motor starters
- ❖ Business and industrial machines
- ❖ Power tools
- ❖ High intensity discharge lights
- ❖ Silicon control rectifiers that are phase angle fired

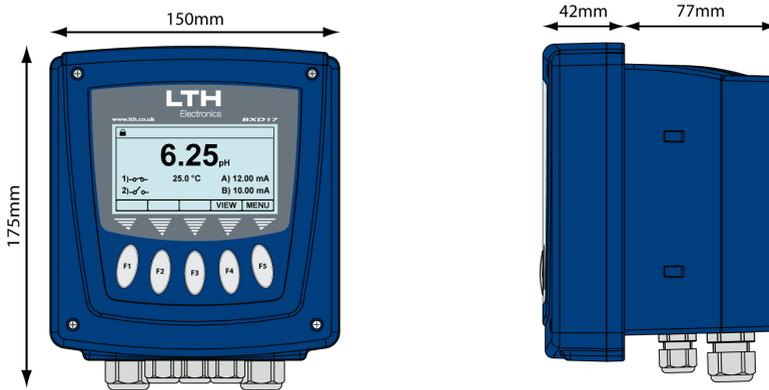
The instrument is designed with a high degree of noise rejection built in to minimise the potential for interference from these sources, but it is recommended that you apply the following wiring practices as an added precaution. Cables transmitting low level signals should not be routed near contactors, motors, generators, radio transmitters, or wires carrying large currents.

If noise sources are so severe that the instrument's operation is impaired, or even halted, the following external modifications should be made, as appropriate:

- ❖ Fit arc suppressors across active relay or contactor contacts in the vicinity.
- ❖ Run signal cables inside steel tubing as much as is practical.
- ❖ Use the internal relays to switch external slave relays or contactors when switching heavy or reactive loads.
- ❖ Fit an in-line mains filter close to the power terminals of the instrument.

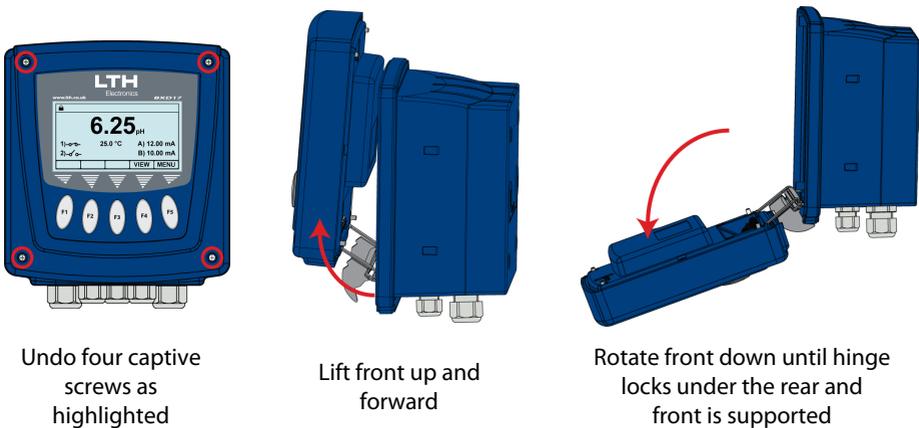
## Enclosure

The BPD17 as standard is designed to be mounted on a wall or surface via the two holes located in the rear half of the enclosure. Alternatively, it can be mounted to a panel or a pipe using optional mounting kits.



BPD17 Overall Dimensions

The enclosure should be opened as following.



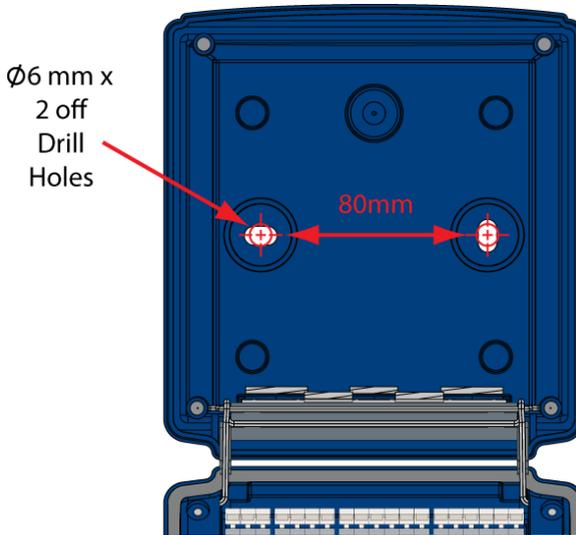
Undo four captive screws as highlighted

Lift front up and forward

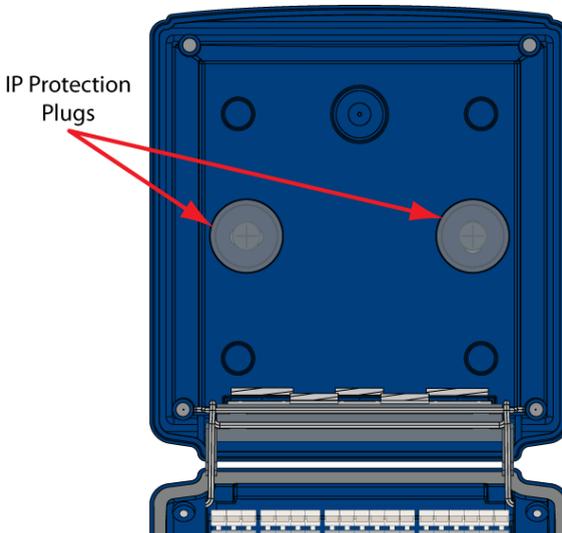
Rotate front down until hinge locks under the rear and front is supported

To close repeat process in reverse, folding the hinge into the rear.

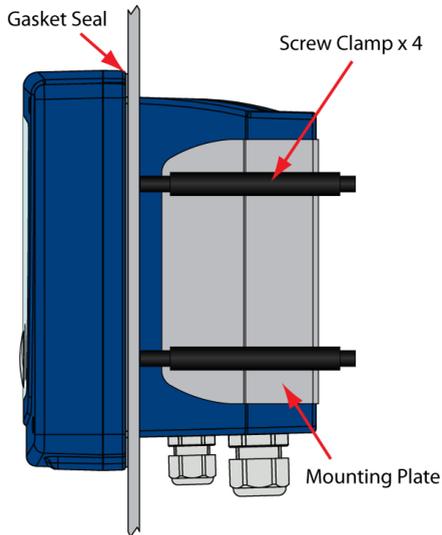
## Surface-Mounting



- LTH recommends using No. 10 x 1¼ inch round head screws or similar for mounting.
- Care must be taken when fitting the instrument on uneven walls or surfaces.
- Once installed make sure accompanying IP protection plugs are installed over the mounting holes on the inside rear of the enclosure.
- 

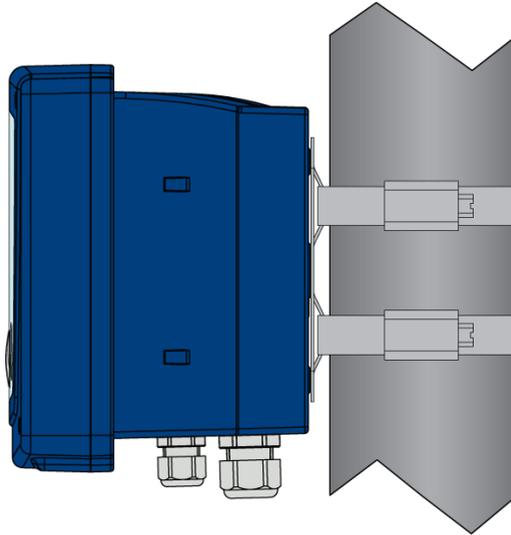


## Panel-Mounting



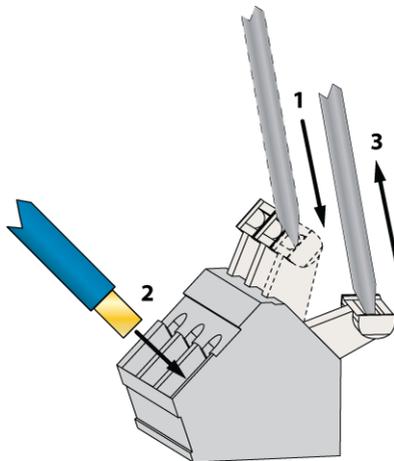
- 138.0mm Square Cut Out
- Uses Kit Part Number 6014.
- Fit the gasket seal into the groove on the back of the instrument front.
- Attach the Mounting Plate to the rear of the case with the supplied screws.
- To pass instrument rear through panel cut out remove cable glands.
- Use the 4 supplied screw clamps to affix the instrument to the panel.

## Pipe-Mounting



- Fits pipe 50-100mm
- Uses Kit Part Number 6024.
- Attach the Mounting Plate to the rear of the case with the supplied screws.
- Pass supplied mounting straps through plate loops and tighten round pipe as required.
- Fit the accompanying IP protection plugs over the internal mounting holes on the inside rear of the enclosure.

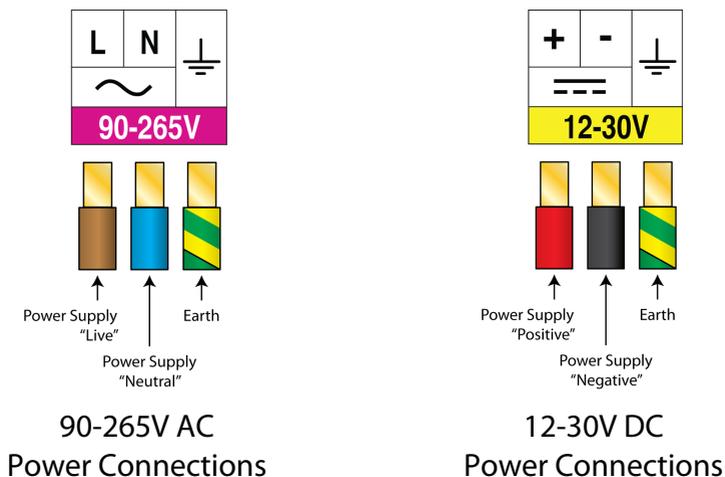
## Terminal Operation



Whilst pushing terminal lever down using a 3.5mm Slotted Screwdriver, insert wire into opening and release lever to retain.

## Supply Voltage Connections

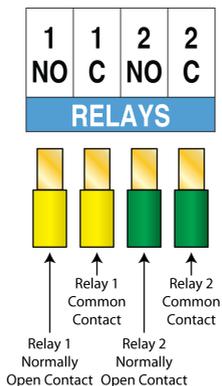
Depending upon version purchased BPD17 can be powered from either 90-265V AC or 12-30V DC supply voltage. **Refer to the label adjacent to the power supply terminals for the input voltage limits. Exceeding these limits may damage the instrument.**



The power supply should be taken from an isolated spur and fused to a maximum of 3 Amps. The incoming Earth connection must be connected to the Earth terminal.

## Relay Connections

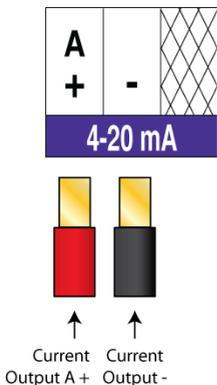
The BPD17 is supplied with 2 normally open volt free relays designated 1 & 2, The relay contacts are connected to the terminals only and are electrically isolated from the instrument itself. **They must be connected in series with a 5 Amp fuse.** A contact arc suppressor may be required to prevent excessive electrical noise, depending upon the load. To switch more than 5 Amps will require a slave relay.



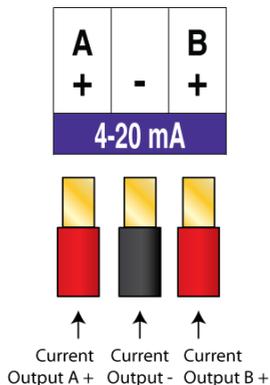
Relays 1 & 2 Connection Details

## Current Output Connections

The BPD17 is supplied as standard with a single current output or as an option with two, either can terminate into a load resistance not exceeding  $750\Omega$  and are both galvanically isolated from the rest of the instrument. For best noise immunity use a screened twisted pair cable, with the screen connected to Earth at one end. Use a sufficiently large cable to avoid a high resistance in the overall current loop.



Basic Instrument Current Output Connection Detail



Advanced Instrument Current Output Connection Detail

## Digital Inputs

The BPD17 features a single digital input, which can be used to initiate a user configurable instrument operation by use of a volt free link, switch or relay. The instrument can be configured to initiate the appropriate action when the contact either closes or opens.

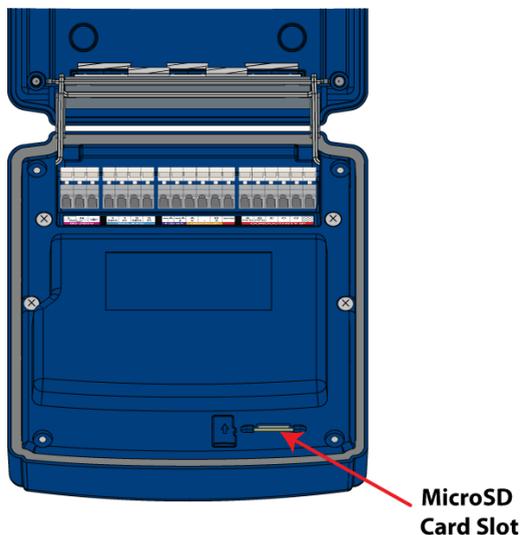


Current Output Connection Detail.

## MicroSD Card Interface

The BPD17 features a MicroSD card interface which is compatible with SD, SDHC and SDXC formatted cards (N.B. SDXC cards may need formatted to Fat32 before use). Its primary function is to enable the upgrading of the instruments operating software

To insert the card, ensure that the side notch is on the right-hand side of the card, and then just push it all the way in to the socket. To remove the card push it in then release and the card should then come out of the socket. N.B. It may be required to pull the card out of the last bit of the socket.



## Installation and Choice of pH / Redox Electrodes

The choice of the correct type of pH / Redox electrode, how and where to mount it, so that it has a representative sample of solution are probably the two most important considerations when installing a pH / Redox system.

The following criteria are of great importance during selection:

- The chemical makeup, temperature and the viscosity of the sample.
- The use of the correct materials for corrosion resistance.
- Position of electrode for robustness and service access.
- Ensuring a representative, uncontaminated solution sample.

The following tips might be useful. High temperature samples will restrict your choice to electrodes with high temperature references, note that low temperatures will also affect the response time of the electrode. When measuring high viscosity samples, it is important that the junction is easy to clean. Samples with high pH or salt concentrations require electrodes with alkali-resistant membranes.

**To ensure correct electrode mounting the following conditions should be observed:**

- The electrode system can only measure what is in the immediate vicinity of the sensor area of the probe.
- A moderate flow is maintained to provide an “up to date” sample. Excessive flow rates, however, can cause certain electrodes to rapidly deplete, which will result in inaccurate readings. In this case a sealed reference is recommended.
- Ensure that both the glass electrode and reference are in contact with the sample.
- Avoid points where air can be trapped.
- Avoid points of high turbulence as air bubbles will affect the measurement.
- If the sample has solids present then use a guard or filter to protect the glass electrode. Alternatively use a flat pH bulb.
- The glass electrode contains a liquid, ensure that the probe is mounted so that the internal filling solution is in contact with the glass bulb.

When a new pH electrode is first fitted or changed it must be calibrated (see page 33). Depending on the application it may also need periodic re-calibration, the BPD17 provides an inbuilt count down timer which will trigger an alarm when calibration interval has expired (see page 39).

## Care and Maintenance of pH / Redox Electrodes

All pH and Redox electrodes contain an electrolyte solution, gel or polymer that has a limited life in both operation and on the shelf. The electrode shelf life depends on its storage conditions, it is recommended that the electrode should be used within six to twelve months after purchase.

For gel filled, non-flow electrodes the storage boot may become dried out during storage. This can result in evaporation of the water inside the electrode causing high impedance in the reference cell. If allowed to fully dry out the operation of the electrode will be irreversibly damaged. For electrodes in storage it is recommended that every three to four months the following procedure is carried out:

- Remove the black storage boot or transit cover at the end of the electrode
- Re-wet the fibre pack inside the storage boot with 3.8 Molar Potassium Chloride (KCl) saturated solution or if this is not available use a quantity of 4pH buffer solution. Note do not use deionised water.
- Re-seal the storage boot or transit cover.

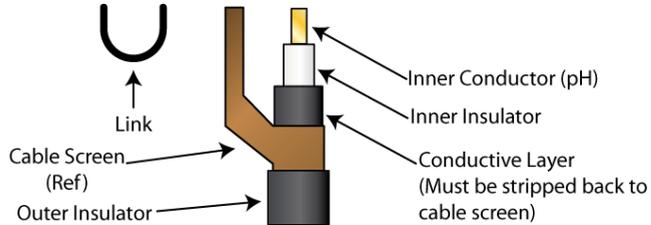
For electrodes with soaker bottles ensure that the electrode is stored upright in the soaker bottle, and replace the bottle solution with 3.8 Molar Potassium Chloride (KCl) saturated solution approximately every 6 months.

Depending on the issue the following glass body pH electrode maintenance procedures can be carried out:

- Initial Cleaning – Wash the electrode with a solution of liquid detergent and warm water by gently scrubbing with a soft tooth brush or wet tissue. Follow this by thoroughly rinsing the electrode in deionised water or clean tap water.
- Inorganic Scale Deposits – Dissolve the deposit by immersing the electrode bulb only in a solution of dilute (10%) Hydrochloric Acid for a few minutes. **Follow the supplier's data sheet when handling acids and dispose of as instructed by your local authority regulations.**
- Organic Oil or Grease Films – Wash the electrode with a solution of liquid detergent and warm water by gently scrubbing with a soft toothbrush or wet tissue. Follow this by soaking the pH electrode for between 10 and 30 minutes in a 3.8 Molar KCl solution.
- Plugged or Dry Wick – Remove contaminate with one of the above cleaning procedures. Then soak the electrode in an 80°C, 3.8 Molar KCl solution for 30 minutes. Before allowing the electrode to cool in the same solution to promote flow of internal electrolyte through the liquid junction.

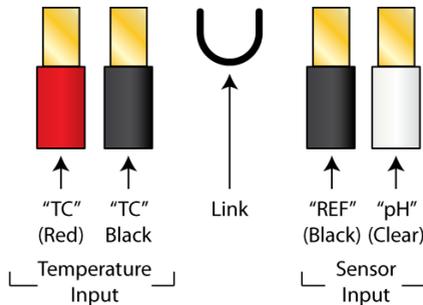
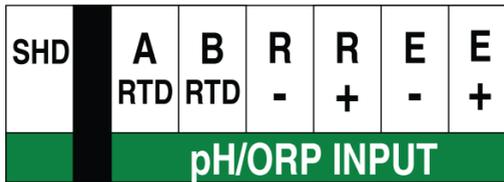
### BPD17 pH / Redox Input Connection Details

BPD17 pH / Redox Input



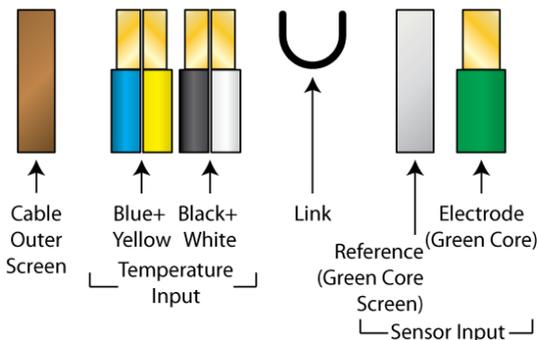
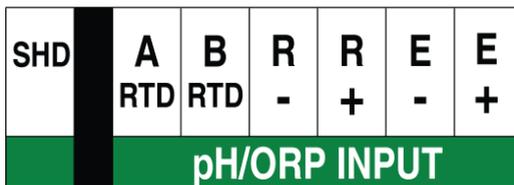
### pH / Redox LN10 Coax Cable Connection Details

BPD17 pH / Redox Input



### S400 ProcessProbe Cable Connection Details

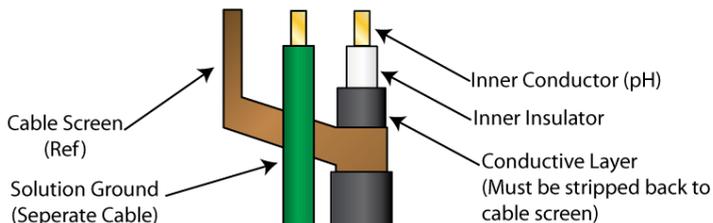
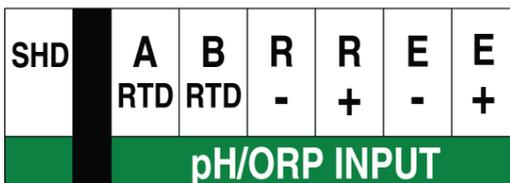
BPD17 pH / Redox Input



**pH / Redox 54E Extension Cable Connection Details**

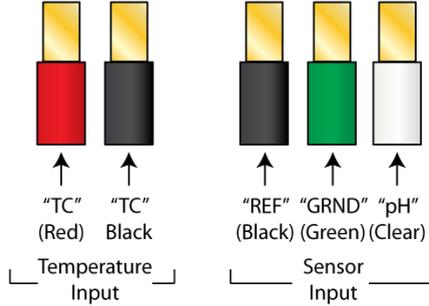
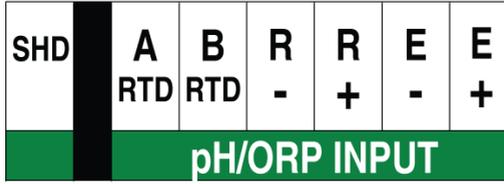
The pH / Redox input of the BPD17 also provides a differential input method of wiring the pH electrode. This provides better electrical noise immunity and allows the sensor to operate in solutions where flowing electrical currents may cause measurement problems.

BPD17 pH / Redox Input



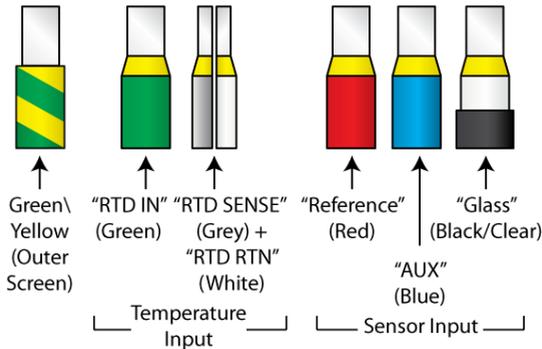
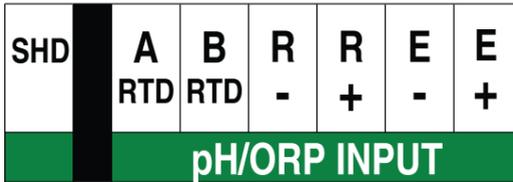
**pH / Redox LN10 Coax Cable Connection Details with Separate "Solution Ground" Connection**

BPD17 pH / Redox Input



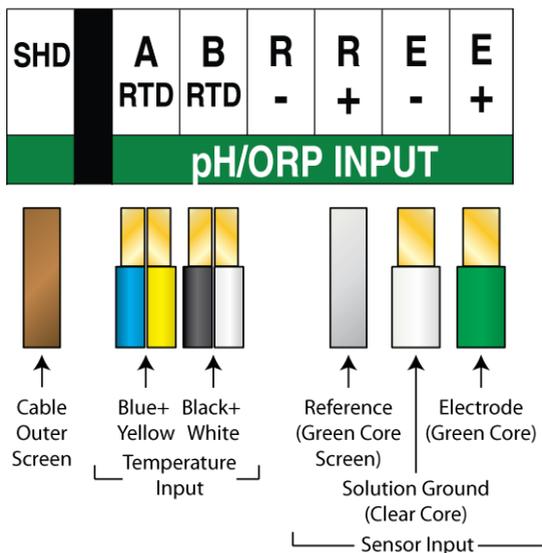
**S400 ProcessProbe Cable Connection Details with "Solution Ground"**

BPD17 pH / Redox Input



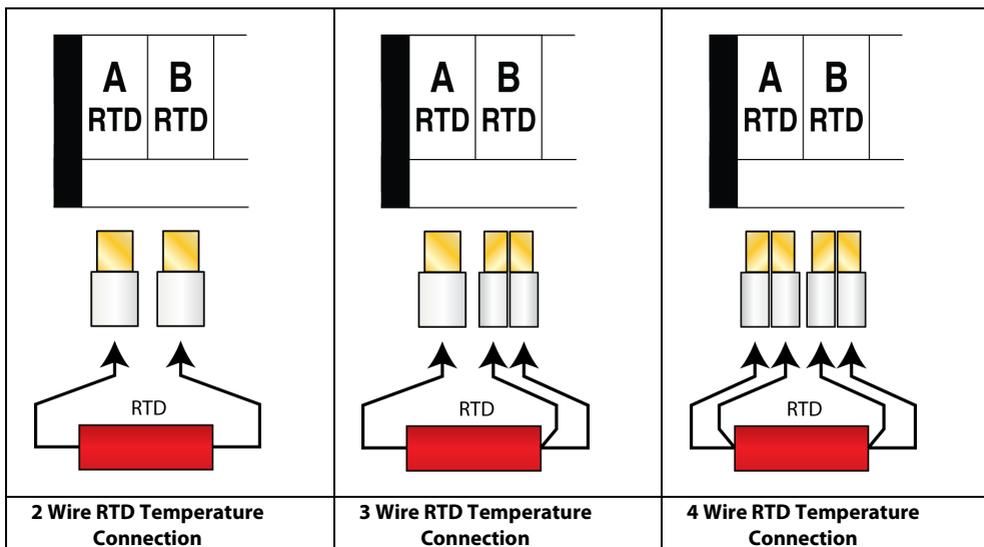
**VP6 Detachable Cable Connection Details with "Solution Ground"**

BPD17 pH / Redox Input

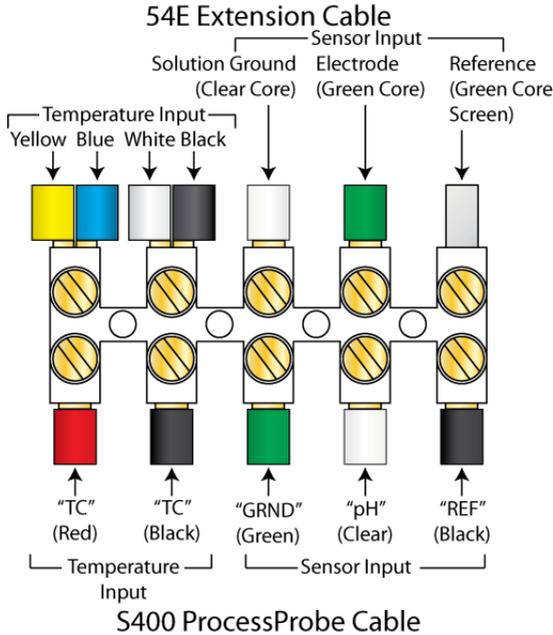


**pH / Redox 54E Extension Cable Connection Details with "Solution Ground"**

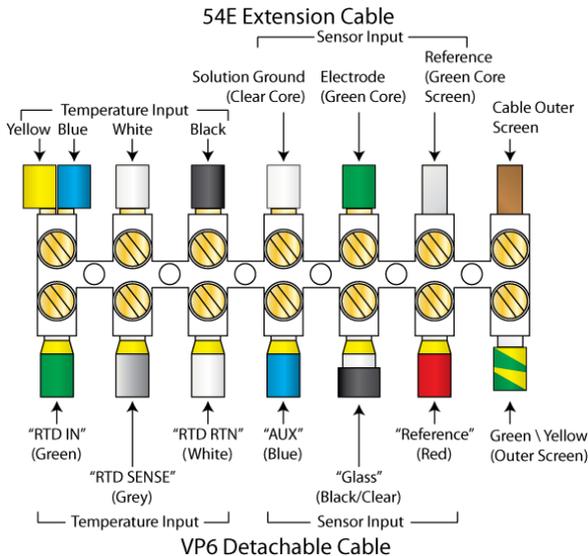
**Temperature Sensor Connections**



## Extension Cable Connections



### S400 ProcessProbe to 54E Extension Cable Connection Details

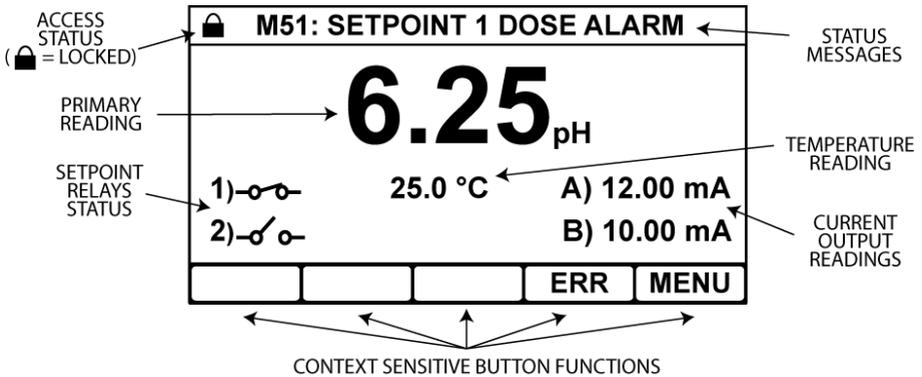


### VP6 Detachable Cable to 54E Extension Cable Connection Details

# User Interface

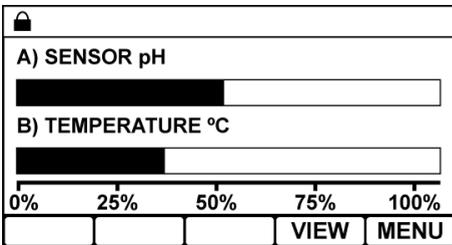
**CAUTION!** BEFORE PROCEEDING, ENSURE THAT THE INSTALLATION INSTRUCTIONS HAVE BEEN FOLLOWED CORRECTLY. FAILURE TO DO SO MAY RESULT IN AN ELECTRICALLY HAZARDOUS INSTALLATION OR IRREPARABLE DAMAGE TO THE INSTRUMENT.

The BPD17 uses a 3¾" 240x128 dot LCD Module to display the primary reading and temperature, show operational status and to provide an intuitive user interface. This is accompanied by 5 control buttons whose function varies depending upon which screen the user is viewing. The button function is indicated by the control section at the bottom of the display.

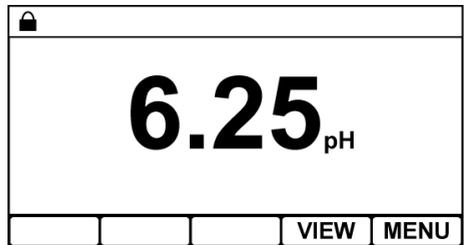


**The Front Screen**

Pressing the view button on the front screen cycles through 2 additional front screen options, note if an error occurs the instrument will return to the standard front screen.



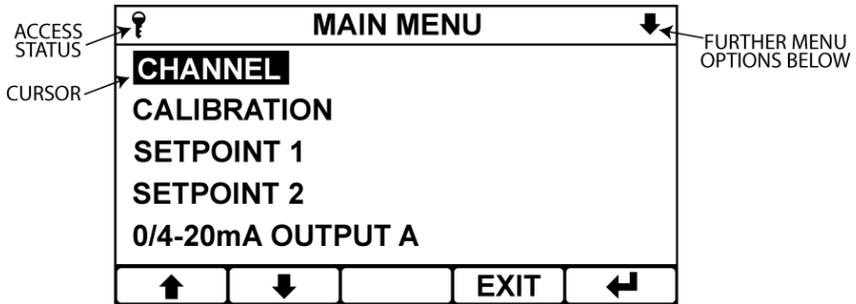
Current Output Bar Graph



Main Reading Only

## Additional Front Screens

The instrument configuration is accessible by pressing the menu button on the front screen.



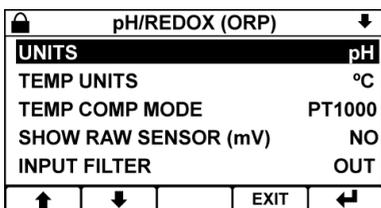
The main menu is split into two main sections. The top shows the current menu you are currently in the access status of the instrument and whether there are further menu options below. The bottom section shows the current options for that menu which may be selected by moving the cursor with the arrow buttons and pressing the enter button. The exit button is used to return to the previous menu. If no buttons are pressed after 2 minutes the instrument will default back to the front screen.

## Security Code Access

To protect the instrument setup from unauthorised or accidental tampering, a security access code system is present. This is implemented via the instrument’s menu system which operates in two modes, “locked” as indicated by a padlock symbol and “unlocked” as indicated by a key symbol. The locked mode allows the user to observe the instruments configuration but without the ability to change it. If the user wishes to change a setting then the “Security Code” menu will appear that will prompt them to enter the security code which will then change the instruments mode to “unlocked”. Once unlocked, the user can change any setting without having to re-enter the security access code, however the instrument will automatically lock itself if no further buttons are pressed after 2 minutes 30 seconds.

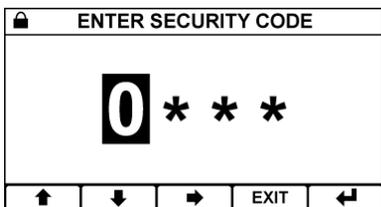
The user can select their own access code in the set access code function of the configuration menu, or alternatively they can disable the security system permanently by changing the access code to 0000.

**The default security access code is 1000**



Select the option you wish to change and press enter to bring up the Security Code menu.

- Select Option
- EXIT** – Cancel
- Chose Option



Enter the required Access Code.

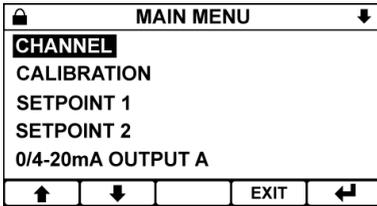
If the code is incorrect the user will be prompted to try again.

If the code is correct the padlock at the top of the screen will turn to a key and the unit will be unlocked

- Increase / Decrease Digit
- Select Next Digit
- EXIT** – Cancel
- Enter Code

# pH / Redox (ORP) Input Setup

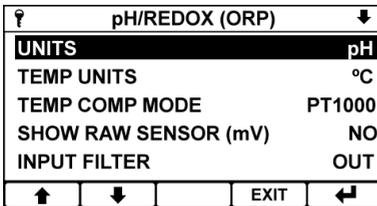
The Channels Setup menu contains the basic configurations for the sensor's input.



## Main Menu

From the front screen press the menu button to show the main menu options.

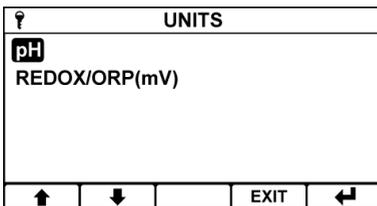
- ↑/↓ – Select Option
- EXIT – Return to Front Screen
- ↵ – Enter Option



## Channel Menu

From the main menu highlight “channel” and press the enter option button to show the channel menu options.

- ↑/↓ – Select Option
- EXIT – Return to Main Menu
- ↵ – Enter Option



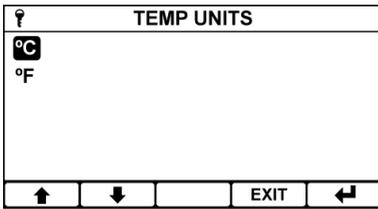
## Units

The channel can be configured as a pH or Redox input.

When “pH” is selected the channel will automatically apply the correct temperature compensation and probe type to the electrodes raw mV input to provide a display of pH. Note, the instrument can also display the raw mV as a secondary value on the front screen.

When “Redox (mV)” is selected the instrument displays the unprocessed input voltage to the electrode terminals.

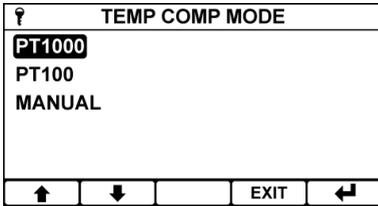
- ↑/↓ – Select Option
- EXIT – Cancel
- ↵ – Save Selection



**Temperature Units**

Sets the temperature units used.

- ↑/↓ – Select Option
- EXIT – Cancel
- ← – Save Selection

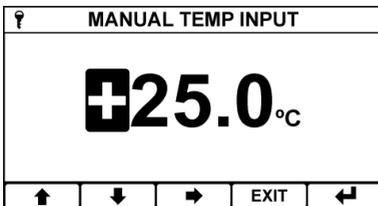


**Temperature Compensation mode**

To use temperature compensation from a measured input select either PT1000 or PT100 (depending upon temperature sensor used), else select “Manual” to enable a fixed value entry.

Only Available when units set to pH.

- ↑/↓ – Select Option
- EXIT – Cancel
- ← – Save Selection

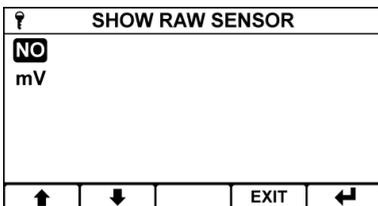


**Manual Temp Input**

The fixed temperature value used for manual temperature compensation.

Only available when temperature compensation mode is set to “manual”.

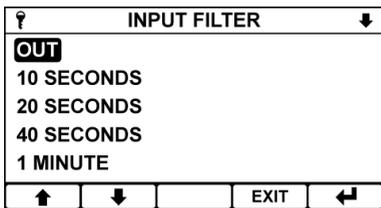
- ↑/↓ – Increase / Decrease Digit
- – Select Next Digit
- EXIT – Cancel
- ← – Save Value



**Show Raw Sensor**

When enabled will show the sensor mV reading in a secondary location on the front screen in addition to the primary reading. Only available when Units set to pH.

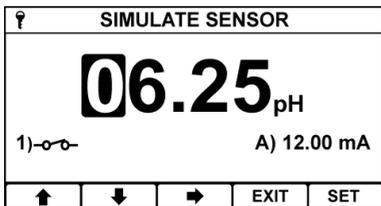
- ↑/↓ – Select Option
- EXIT – Cancel
- ← – Save Selection



**Input Filtering (Averaging)**

When very noisy environments are encountered, this function will allow the user to filter the sensor readings by taking a running average over the time period selected (from 10 seconds to 5 minutes).

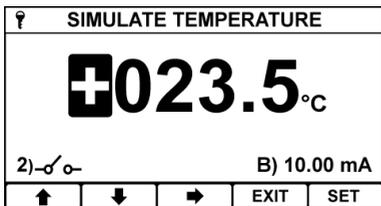
- ↑/↓ – Select Option
- EXIT – Cancel
- ←✓ – Save Selection



**Simulate Sensor**

To help in commissioning of the instrument the user can use this menu to manually set the sensor reading and so test the operation of the setpoints and current outputs. Note, only setpoints or current outputs whose source is set to sensor will be shown.

- ↑/↓ – Increase / Decrease Digit
- ➡ – Select Next Digit
- EXIT – Cancel
- SET – Use Entered Value



**Simulate Temperature**

To help in commissioning of the instrument the user can use this menu to manually set the temperature reading and so test the operation of the current output. Note, only setpoints or current outputs whose source is set to temperature will be shown.

- ↑/↓ – Increase / Decrease Digit
- ➡ – Select Next Digit
- EXIT – Cancel
- SET – Use Entered Value

# Calibration

## Calibration Procedures

Normal good practices should be observed when calibrating electrode systems against standard solutions.

- Always clean the electrode system before inserting in the standard solution to avoid contamination and to obtain the best response from the electrode system.
- Rinse the electrode system in clean (preferably demineralised) water between standard solutions.
- Allow time for the electrode system temperature to stabilise in each standard solution.
- Use standard solutions of known quality. If in doubt make up fresh solutions.
- Use clean beakers and bottles for standard solutions.
- The input channel can be taken offline, which de-energises the relays and holds the current outputs at their last values. This facility is useful when calibrating the system, however the operator must ensure the relays are in a safe state when using this feature.

## pH Buffers

LTH supplies buffer powders which are prepared from pure dry chemicals, sealed in a sachet or capsule which prevents the absorption of moisture and subsequent deterioration. Buffer solutions should be prepared in accordance with the instructions supplied with them.

The BPD17 offers two different but simple methods of calibration for pH electrode systems.

## Auto

In Auto calibration the instrument requires that the electrode is first placed in a 4pH buffer and then secondly in a 9pH buffer. These are nominal values for which the instrument carries the exact LTH buffer values due to temperature variations (other pH buffer solution values at temperature can also be entered). From these two points the instrument then calculates the Offset and Slope for the electrode.

In order for the auto calibration to work correctly, the buffer temperature must either be measured by the instrument during calibration, or if manual temperature compensation is being used the buffer temperature must be entered in the Calibration Manual Temperature Input in the calibration menu.

## Manual

In Manual calibration mode it is possible to do single or two-point calibration, using the *Buffer* and *Slope* menu items. It is important to do the calibration in the correct order.

1. Adjustment of the Buffer (Offset) value at 7.00pH
2. Adjustment of the Slope (Gain) value at any other pH (usually 4 or 9 pH).

The output from an ideal glass/reference electrode pair will normally be 0mV at 7pH, therefore the slope will have little or no effect at 7pH but increasing influence the further from 7pH the calibration point is.

If a single point calibration is required the buffer should be adjusted and no adjustment made to the slope that will remain at the previously entered value. As actual pH buffer values are used no compensation is made for the buffer solution with temperature in the instrument. It is important therefore to note the actual buffer value at the temperature of the solution.

Temperature has an effect on the output from the pH electrode as well, so it is important that the buffer temperature is entered into the Calibration Manual Temperature Input if manual temperature compensation is being employed. Alternatively, any automatic temperature compensation element should be placed in the buffer solution with the pH sensor if Auto TC is being used.

**Redox Standards**

Unlike pH electrodes, the redox electrode's slope does not change. Nevertheless, incorrect redox potentials may be occasionally measured and the cause of these errors is usually a contaminated platinum (Pt) surface, or a contaminated or plugged reference junction. Calibration of a Redox Electrode is a single point adjustment calibration only.

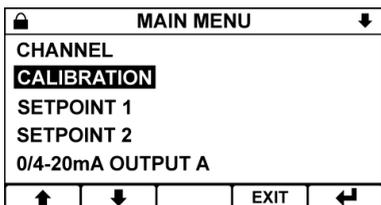
For calibration and test purposes, standard solutions at various potentials can be purchased from LTH Electronics:

Part No. 138/175	124mV Redox Solution (500ml)
Part No. 138/176	358mV Redox Solution (500ml)

## Calibration Menu

The calibration menu provides the facility to adjust the sensor inputs to the system in which it is operating.

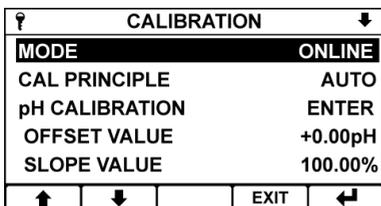
The default security access code is **1000**



### Main Menu

From the front screen press the menu button to show the main menu options.

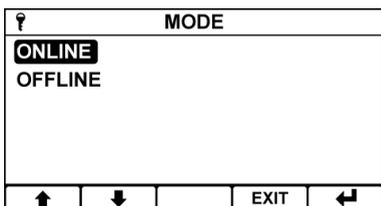
- ↑/↓ – Select Option
- EXIT – Return to Front Screen
- ← – Enter Option



### Calibration Menu

From the main menu highlight “calibration” and press the enter option button to show the channel menu options.

- ↑/↓ – Select Option
- EXIT – Return to Main Menu
- ← – Enter Option

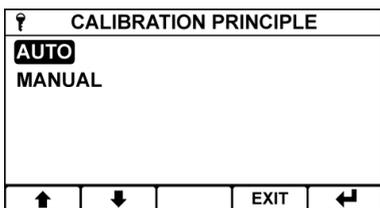


### Mode

Selecting off-line causes any setpoints to de-energise and current outputs to go to their off-line state. Useful for when commissioning or calibrating the instrument.

When the instrument is placed in an off-line state “off-line” will appear on the front screen.

- ↑/↓ – Select Option
- EXIT – Cancel
- ← – Save Selection



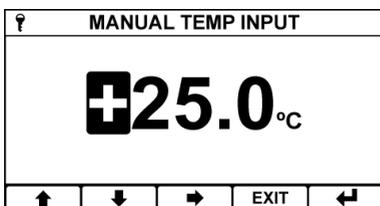
### Calibration Principle

This setting defines the operating mode of the pH Electrode calibration. In Auto mode the instrument automatically adjusts the offset and slope. In Manual mode the user manually adjusts the reading to match known values.

Only available when units set to pH in the channel setup menu.

See page 33 for more details.

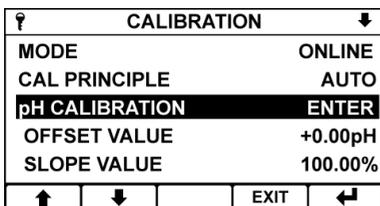
- ↑/↓ – Select Option
- EXIT – Cancel
- ← – Save Selection



### Calibration Manual Temperature Input

This setting allows a different fixed temperature value to be used when calibrating. Makes it easier to calibrate a standard solution at a different temperature to the process. Only available when the temperature compensation mode has been set to manual in the channel setup menu.

- ↑/↓ – Increase / Decrease Digit
- – Select Next Digit
- EXIT – Cancel
- ← – Save Value



### pH Calibration

Enter the pH Auto Calibration routine.

Only available when calibration principle is set to auto.

See page 42 for more details.

- ↑/↓ – Select Option
- EXIT – Return to Main Menu
- ← – Enter Option

CALIBRATION	
MODE	ONLINE
CAL PRINCIPLE	MANUAL
<b>pH BUFFER OFFSET</b>	<b>ENTER</b>
OFFSET VALUE	+0.00pH
pH SLOPE CALIBRATION	ENTER
↑	↓
	EXIT
	↩

### pH Buffer (Offset) Calibration

Enter the pH Manual Offset Calibration Routine

Only available when calibration principle is set to manual.

See page 44 for more details.

↑/↓ – Select Option

EXIT – Return to Main Menu

↩ – Enter Option

CALIBRATION	
MODE	ONLINE
CAL PRINCIPLE	AUTO
pH CALIBRATION	ENTER
OFFSET VALUE	+0.00pH
SLOPE VALUE	100.00%
↑	↓
	EXIT
	↩

### Offset Value

Displays the electrode Offset currently being used by the instrument. Only available when units set to pH in the channel setup menu.

Cannot be edited.

Changed by either using the pH manual offset calibration, or by the pH auto calibration.

CALIBRATION	
MODE	ONLINE
CAL PRINCIPLE	MANUAL
pH BUFFER OFFSET	ENTER
OFFSET VALUE	+0.00pH
<b>pH SLOPE CALIBRATION</b>	<b>ENTER</b>
↑	↓
	EXIT
	↩

### pH Slope Calibration

Enter the pH Manual Slope Calibration Routine

Only available when calibration principle is set to manual.

See page 44 for more details.

↑/↓ – Select Option

EXIT – Return to Main Menu

↩ – Enter Option

CALIBRATION	
MODE	ONLINE
CAL PRINCIPLE	AUTO
pH CALIBRATION	ENTER
OFFSET VALUE	+0.00pH
SLOPE VALUE	100.00%
↑	↓
	EXIT
	↩

### Slope Value

Displays the electrode Slope currently being used by the instrument. Only available when units set to pH in the channel setup menu.

Cannot be edited.

Changed by either using the pH manual slope calibration, or by the pH auto calibration.

CALIBRATION	
CONDITION	GOOD
TEMP OFFSET CAL	ENTER
TEMP OFFSET VALUE	+0.0°C
FRONT CAL ACCESS	NO
CALIBRATION REMINDER	NO
↑	↓
EXIT	↩

### Sensor Condition

The BPD17 is capable of analysing the result of the pH electrode offset and slope calibration and indicate to the user the condition the electrode is in.

- Good – The electrode is operating within set parameters.
- Replace Soon – The electrode is getting towards the end of its operating life.
- Replace – The electrode is exhausted and should be replaced.

Cannot be edited, only available when units set to pH in the channel setup menu.

REDOX (OFFSET) CAL	
<b>+0178</b> mV	
ADJUST READING USING ↑ AND ↓ ARROWS	
↑	↓
EXIT	↩

### Redox Offset Calibration

The Redox Offset calibration enables the user to adjust the sensor reading to match a known input.

The current Redox sensor reading can be seen in the pop-up window and is adjusted by pressing the up and down arrows. When the reading is correct press the enter button to store the calibration.

Only available when units set to Redox in the channel setup menu.

↑/↓ – Adjust the Reading Up or Down

EXIT – Cancel

↩ – Save Calibration

CALIBRATION	
MODE	ONLINE
REDOX (OFFSET) CAL	ENTER
REDOX OFFSET VALUE	+0mV
TEMP OFFSET CAL	ENTER
TEMP OFFSET VALUE	+0.0°C
↑	↓
EXIT	↩

### Redox Offset Value

The Redox offset value currently being applied. The value will change depending on the result of the Redox offset calibration.

Cannot be edited

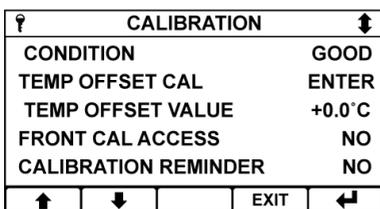


### Temperature Offset Calibration

The temperature offset calibration enables the user to adjust the temperature reading to match a known input.

The current temperature reading can be seen in the pop-up window and is adjusted by pressing the up and down arrows. When the reading is correct press the enter button to store the calibration. The calculated offset is shown in the next menu entry.

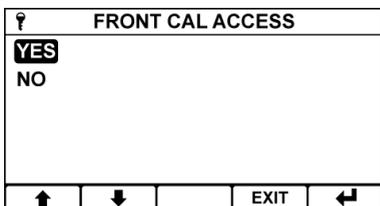
- ↑/↓ – Adjust the Reading Up or Down
- EXIT – Cancel
- ↵ – Save Calibration



### Temp Offset Value

The temperature offset value currently being used. The value will change depending on the result of the temperature offset calibration.

Cannot be edited

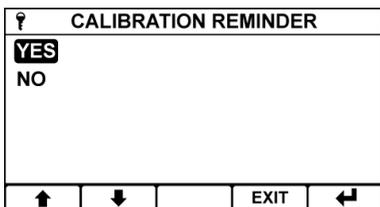


### Front Screen Calibration Access Enable

When enabled front calibration access allows direct entry into the calibration menu from the front screen by pressing the “CAL” button.

It also disables the security access system within the calibration menu enabling the calibration functions without having to enter the security access code.

- ↑/↓ – Select Option
- EXIT – Cancel
- ↵ – Save Selection

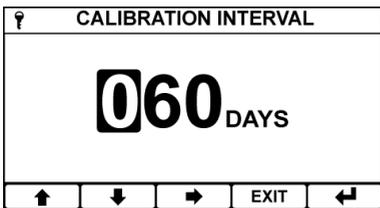


### Calibration Reminder

By enabling the calibration reminder the user can configure a calibration interval, which when expired will activate an alarm and message on the front screen.

On the completion of a successful sensor calibration the next cal date will be automatically incremented by calibration interval.

- ↑/↓ – Select Option
- EXIT – Cancel
- ↵ – Save Selection

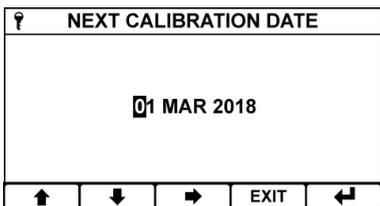


### Calibration Interval

Sets the interval time for the calibration alarm.

The Next Cal Date will update to show the date of the next calibration alarm.

- ↑/↓ – Increase / Decrease Digit
- ➡ – Select Next Digit
- EXIT – Cancel
- ↩ – Save Value

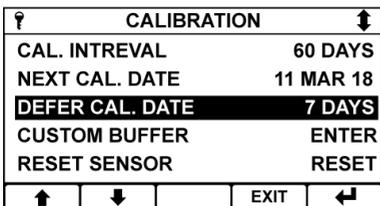


### Next Calibration Date

Sets the exact date of the next calibration alarm.

The Calibration Interval will update to show the number of days to the next calibration date.

- ↑/↓ – Increase / Decrease Digit or Text
- ➡ – Select Next Item
- EXIT – Cancel
- ↩ – Save Value

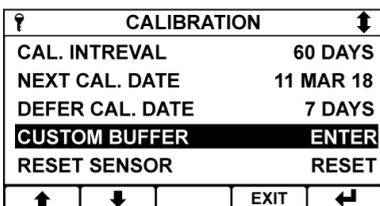


### Defer Calibration Date

Turns off the alarm and increases the calibration interval by an extra 7 days.

Only appears once the calibration interval has expired.

- ↑/↓ – Select Option
- EXIT – Return to Main Menu
- ↩ – Enter Option



### Custom Buffer Entry

Enters the custom buffer setup menu.

Only available when the pH calibration principle is set to auto.

- ↑/↓ – Select Option
- EXIT – Return to Main Menu
- ↩ – Enter Option

CUSTOM BUFFER			↓
<b>NUMBER OF POINTS</b>			<b>9</b>
NOMINAL pH	4.00pH	9.00pH	
1: +10.0°C	4.00pH	9.21pH	
2: +15.0°C	4.00pH	9.14pH	
3: +20.0°C	4.00pH	9.06pH	
↑	↓	EXIT	↩

### Custom Buffer Menu

The custom buffer menu allows the user to enter in custom buffer solution values at fixed temperatures for the nominated pH values chosen, for use with the pH automatic calibration function.

Number of Points – Define the required number of data points to be entered (Maximum 13)

Nominal pH – Set the nominal value of the two pH buffers chosen for Auto calibration

Data Points – Enter the custom buffer solution values at the entered temperature

Reset Custom Buffer – Reset the points back to the LTH standard buffer defaults.

- ↑/↓ – Select option or Increase / Decrease Digit
- ➡ – Select Next Digit
- EXIT – Cancel or Return to Calibration Menu
- ↩ – Save Entry

CALIBRATION		↑
NEXT CAL. DATE	11 MAR 18	
DEFER CAL. DATE	7 DAYS	
CUSTOM BUFFER	ENTER	
<b>RESET SENSOR</b>	<b>RESET</b>	
RESET TEMPERATURE	RESET	
↑	↓	EXIT ↩

### Reset Sensor

Reset any sensor calibration that may have been performed.

- ↑/↓ – Select Option
- EXIT – Return to Main Menu
- ↩ – Enter Option

CALIBRATION		↑
NEXT CAL. DATE	11 MAR 18	
DEFER CAL. DATE	7 DAYS	
CUSTOM BUFFER	ENTER	
RESET SENSOR	RESET	
<b>RESET TEMPERATURE</b>	<b>RESET</b>	
↑	↓	EXIT ↩

### Reset Temperature

Reset any user temperature calibration that may have been performed.

- ↑/↓ – Select Option
- EXIT – Return to Main Menu
- ↩ – Enter Option

## Auto pH Sensor Calibration

The Auto pH sensor calibration is a two-point offset and slope calibration, which requires the use of two pH buffer solutions chosen by the user. These are nominal values from which the instrument converts to exact buffer values due to temperature variations. To accomplish this, the instrument requires buffer values at different temperatures relevant to the buffer solutions chosen to be configured, refer to page 40 for the custom buffer instructions.

Alternatively, the default configuration uses 4 and 9 pH buffer solutions with the buffer table pre-configured with the following two LTH buffers:

4pH – LTH Order Number 138/199

9pH – LTH Order Number 138/201

In order for the auto calibration to work correctly, the buffer temperature must either be measured by the instrument during calibration, or if manual temperature compensation is being used the buffer temperature must be entered in the “Calibration Manual Temperature Input” in the calibration menu.

? CALIBRATION PRINCIPLE			
<b>AUTO</b>			
MANUAL			
↑	↓	EXIT	↵

### Calibration Principle

To use Auto calibration first set the calibration principle to Auto.

Note. Calibration Principle is only available when units are set to pH in the channel setup menu.

- ↑/↓ – Select Option
- EXIT – Cancel
- ↵ – Save Selection

? CALIBRATION		↓
MODE	ONLINE	
CAL PRINCIPLE	AUTO	
<b>pH CALIBRATION</b>	<b>ENTER</b>	
OFFSET VALUE	+0.00pH	
SLOPE VALUE	100.00%	
↑	↓	EXIT ↵

### pH Auto Calibration

To start the pH calibration, select the “pH Calibration” item from the calibration menu.

- ↑/↓ – Select Option
- EXIT – Return to Select Calibration Channel
- ↵ – Enter pH Auto Calibration

? AUTO pH CALIBRATION			
PLACE ELECTRODE IN 4.00pH			
ELECTRODE OUTPUT: 177.48mV			
pH MEASUREMENT: 4.00pH			
PRESS '↵' TO START			
		EXIT	↵

**Place Electrode In Nominal pH Buffer 1**

Place the electrode in the first nominated pH buffer and press enter to begin sampling.

Once the electrode has been sampled press enter when prompted to continue to the next calibration point.

- EXIT** – Exit Calibration Without Saving
- ↵ – Initiate Nominated pH Sampling

? AUTO pH CALIBRATION			
PLACE ELECTRODE IN 9.00pH			
ELECTRODE OUTPUT: -118.32mV			
pH MEASUREMENT: 9.00pH			
PRESS '↵' TO START			
		EXIT	↵

**Place Electrode In Nominal pH Buffer 2**

Place the electrode in the second nominated pH buffer and press enter to begin sampling.

Once the electrode has been sampled press enter when prompted to continue to the summary screen.

- EXIT** – Exit Calibration Without Saving
- ↵ – Initiate Nominated pH Sampling

? AUTO pH CALIBRATION			
CALIBRATION COMPLETED			
CONDITION: GOOD			
OFFSET: 0.00pH			
SLOPE: 100.00%			
PRESS '↵' TO FINISH			
		EXIT	↵

**Auto Calibration Summary**

Upon completion of the buffer sampling the instrument will calculate the offset and slope for the attached electrode and indicate its condition.

- EXIT** – Exit Calibration Without Saving
- ↵ – Save Calibration

## Manual pH Sensor Calibration

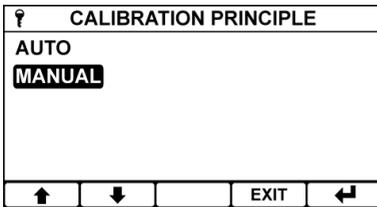
When using Manual calibration mode, it is possible to do either a single or two-point calibration. This is accomplished by using the *Buffer* and *Slope* menu items. However, it is important to do the calibration in the correct order:

1. Adjustment of the Buffer (Offset) value at 7.00 pH.
2. Adjustment of the Slope (Gain) value at any other pH (usually 4 or 9 pH).

If a single point calibration is required then only the buffer should be adjusted and no adjustment made to the slope.

As actual pH buffer values are used no compensation is made for the buffer solution with temperature in the instrument. It is important therefore to know the actual buffer value at the temperature of the solution. The standard LTH 4, 7 and 9 pH values at temperature can be seen on page 45.

It is also important that the buffer temperature is entered into the Calibration Manual Temperature Input if manual temperature compensation is being employed. Alternatively, any automatic temperature compensation element should be placed in the buffer solution with the pH sensor if Auto TC is being used.

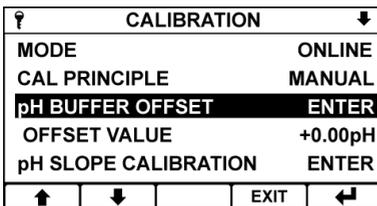


### Calibration Principle

To use Manual calibration first set the calibration principle to Manual.

Note. Calibration Principle is only available when units are set to pH in the channel setup menu.

- ↑/↓ – Select Option
- EXIT – Cancel
- ← – Save Selection



### pH Buffer (Offset) Calibration

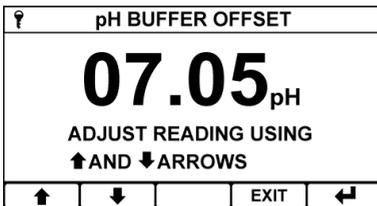
The pH buffer calibration enables the user to adjust the sensor buffer until the displayed reading matches the known input. To activate the function, select "pH Buffer Offset" and press enter.

The current sensor reading can be seen in the pop-up window and is adjusted by pressing the up and down arrows.

When the reading is correct press the enter button to store the calibration, update the sensor offset value and the sensor condition status located further down in the menu.

It is recommended that the buffer should be adjusted at 7pH.

- ↑/↓ – Adjust the Reading Up or Down
- EXIT – Cancel
- ← – Save Calibration



If only a single point calibration is required then the following does not need to be carried out.

CALIBRATION	
MODE	ONLINE
CAL PRINCIPLE	MANUAL
pH BUFFER OFFSET	ENTER
OFFSET VALUE	+0.00pH
<b>pH SLOPE CALIBRATION</b>	<b>ENTER</b>
↑	↓
EXIT	↩

**pH Slope Calibration**

The pH slope calibration enables the user to adjust the sensor slope until the displayed reading matches the known input. To activate the function, select “pH Slope Calibration” and press enter.

The current sensor reading can be seen in the pop-up window and is adjusted by pressing the up and down arrows.

When the reading is correct press the enter button to store the calibration, update the sensor offset value and the sensor condition status located further down in the menu.

The slope limits are 80% to 110%

↑/↓ – Adjust the Reading Up or Down

EXIT – Cancel

↩ – Save Calibration

pH SLOPE CALIBRATION	
<b>04.03</b> pH	
ADJUST READING USING ↑ AND ↓ ARROWS	
↑	↓
EXIT	↩

**Buffer Solutions**

The following table gives the LTH buffer solution values. **NB.** Buffer solutions should be prepared and used in accordance with the instructions supplied with them.

pH variation against temperature			
Temperature (°C)	LTH 4pH Buffer	LTH 7pH Buffer	LTH 9pH Buffer
10	4.00	7.07	9.21
15	4.00	7.04	9.14
20	4.00	7.02	9.06
25	4.00	7.00	9.00
30	4.01	6.99	8.96
35	4.02	6.98	8.92
40	4.03	6.97	8.88
50	4.05	6.96	8.83
60	4.08	6.96	8.81

LTH Buffer Solutions Ordering Information

Type No	Part No	Description
SB-052-1610	138/199	4pH Buffer standard colour coded Red, 500ml.
SB-168-1610	138/200	7pH Buffer standard colour coded Clear, 500ml.
SB-054-1610	138/201	9pH Buffer standard colour coded Blue, 500ml.
SR-009-1610	138/175	124mV Redox solution. 500ml
SR-022-1610	138/176	358mV Redox solution. 500ml

# Setpoints

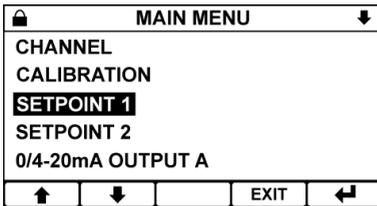
The BPD17 is fitted with two “Normally Open” setpoint relays designated Setpoint 1 and Setpoint 2. The Setpoint menu contains all of the necessary setup functions to configure the setpoint. The instrument indicates the status of the relay by means of a symbol on the front screen.



Indicates that the relay contact is open



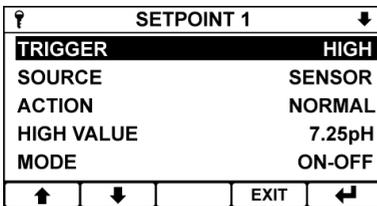
Indicates that the relay contact is closed (if flashing indicates that a dose alarm has occurred).



## Main Menu

From the front screen press the menu button to show the main menu options and select the setpoint you wish to configure.

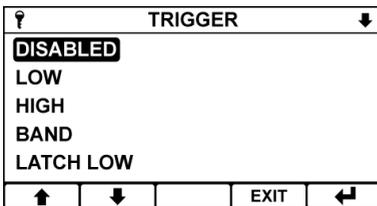
- ↑/↓ – Select Option
- EXIT – Return to Front Screen
- ↵ – Enter Option



## Setpoint Menu

Select the Setpoint function you wish to configure.

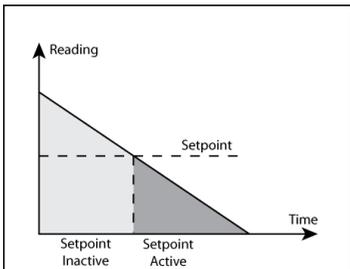
- ↑/↓ – Select Option
- EXIT – Return to Main Menu
- ↵ – Enter Option



## Trigger

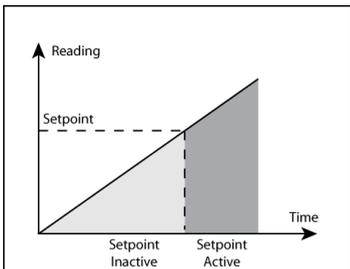
The setpoints can be configured to trigger in the following ways:

- Low
  - High
  - Band
  - Latch Low
  - Latch High
  - Cleaning
  - Alarm
- ↑/↓ – Select Option
  - EXIT – Cancel
  - ↵ – Save Selection



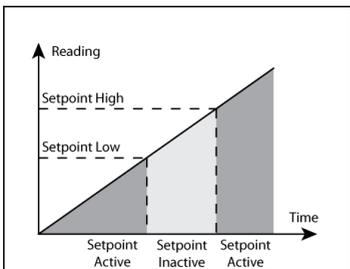
**Low**

The setpoint will activate when the sensor reading becomes less than the setpoint level.



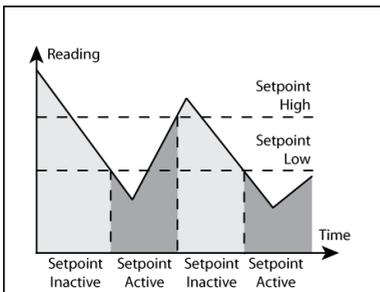
**High**

The setpoint will activate when the sensor reading becomes greater than the setpoint level.



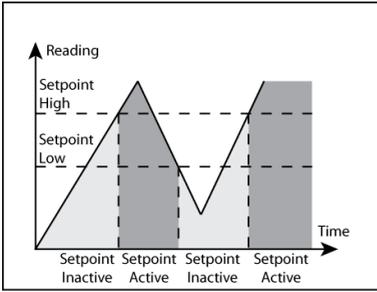
**Band**

The setpoint will activate when the sensor reading is either greater than the setpoint high level or less than the setpoint low level.



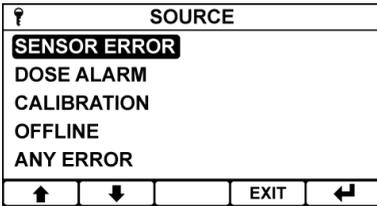
**Latch Low**

The setpoint will activate when the sensor reading is less than the setpoint low level and will remain active until the reading rises above the setpoint high level. It will then remain inactive until the reading level falls below the setpoint low level.



**Latch High**

The setpoint will activate when the sensor reading is greater than the setpoint high level and will remain active until the reading falls below the setpoint low level. It will then remain inactive until the reading rises above the setpoint high level.



**Alarm**

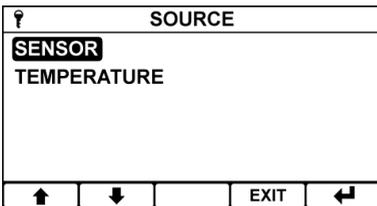
The setpoint will activate by one of the following sources.

- Sensor Error – When a sensor related error is detected.
- Dose Alarm – When the dose alarm activates.
- Calibration – When a calibration is in progress.
- Offline – When the instrument is taken offline.
- Any Error – When any error is detected.

↑/↓ – Select Option

EXIT – Cancel

← – Save Selection



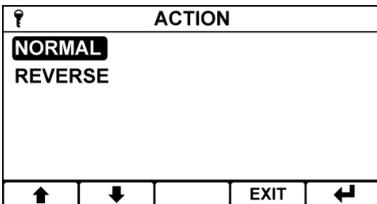
**Source**

Select the source for the setpoint. Note the Temperature option is only available when the temperature compensation mode has been set to PT1000 or PT100 in the channel setup menu.

↑/↓ – Select Option

EXIT – Cancel

← – Save Selection



**Action**

Set the setpoint to work in the normal mode or reverse mode - which is akin to a normally closed relay except it will fall open if the power to the instrument is removed.

↑/↓ – Select Option

EXIT – Cancel

← – Save Selection

**Low Value**

The Setpoint Low value.

↑/↓ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↩ – Save Value

**High Value**

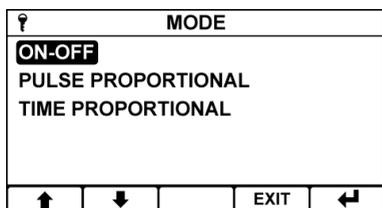
The Setpoint High value.

↑/↓ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↩ – Save Value

**Mode**

The Setpoints can operate in one of three modes.

On-Off Mode – The setpoint energises when the setpoint is activated and de-energises when the setpoint is de-activated.

Pulse Proportional – See Setpoint proportional Mode Section.

Time Proportional – See Setpoint proportional Mode Section.

Menu only available when trigger is set to either high or low

↑/↓ – Select Option

EXIT – Cancel

↩ – Save Selection

**Delay**

In order to prevent short duration changes at the input affecting the setpoint operation a delay can be set before the setpoint is energised. If the input is still the same after the delay, then the setpoint will be energised.

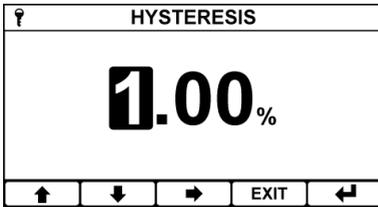
Note. Only available when Trigger is set to High, Low or Band and Mode is set to On-Off.

↑/↓ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↩ – Save Value



**Hysteresis**

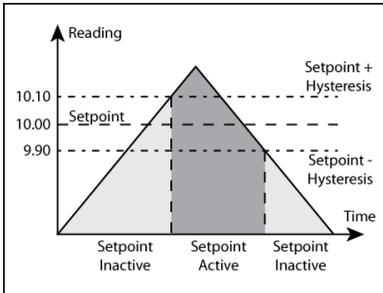
A facility to apply hysteresis to the setpoint level allows the user to avoid setpoint “Chatter” when the reading level approaches the setpoint level.

“Chatter” is caused when the reading is sufficiently close to the set point value and noise on the signal repeatedly crosses the set point level, thus causing the relay to switch on and off rapidly.

The hysteresis level should therefore be set to be greater than the input noise level.

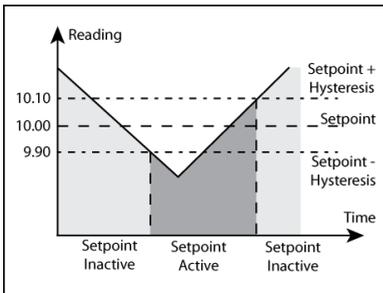
The Hysteresis value is a percentage of the setpoint value applied both + and - to the setpoint. For example, if the setpoint was 10.00 and the Hysteresis was 1% then the hysteresis band would operate from 9.90 to 10.10.

Hysteresis operates as follows:



**Setpoint Trigger: High – Hysteresis**

**Trigger High** – The setpoint is inactive until the reading is greater than the Setpoint High + (Setpoint High X Hysteresis %). It remains active until it goes below Setpoint High – (Setpoint High X Hysteresis %).



**Setpoint Trigger: Low – Hysteresis**

**Trigger Low** – The setpoint is inactive until the reading is less than the Setpoint Low – (Setpoint Low X Hysteresis %). It remains active until it goes above Setpoint Low + (Setpoint Low X Hysteresis %).

**Trigger Band** – The setpoint uses both high and low.

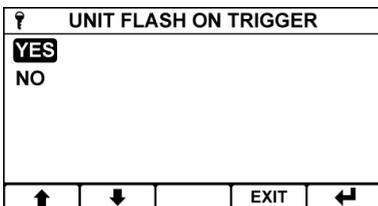
Note. Only available when Trigger is set to High, Low or Band and Mode is set to On-Off.

↑/↓ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

⬅ – Save Value



**Unit Flash on Trigger**

When enabled the backlight of the unit will flash when the setpoint has been triggered.

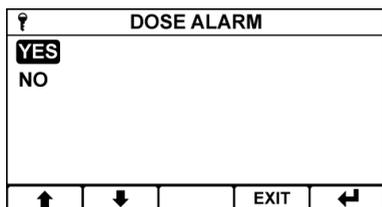
↑/↓ – Select Option

EXIT – Cancel

⬅ – Save Selection

## Setpoint Dose Alarm

The dose alarm timer can be used to prevent overdosing under many different fault conditions, such as sensor failure or application problems.



### Dose Alarm

Enable the dose alarm for the selected setpoint.

- ↑/↓ – Select Option
- EXIT – Cancel
- ← – Save Selection

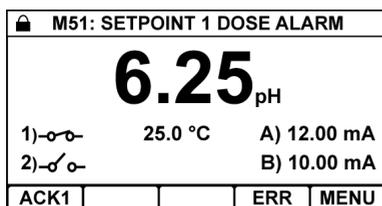


### Alarm Time

Sets the time which if the setpoint is active for longer than causes the dose alarm to activate.

Note, when using Pulse or Time proportional mode the dose timer will only count once the reading is outside the proportional band.

- ↑/↓ – Increase / Decrease Digit
- – Select Next Digit
- EXIT – Cancel
- ← – Save Value



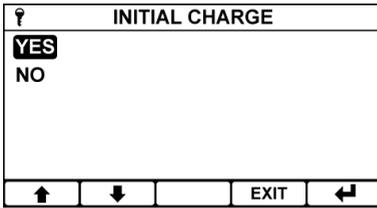
### Dose Alarm Active

When the dose alarm activates the following happens:-

- The setpoint will de-energise.
- The associated front screen setpoint symbol will flash.
- The Dose Alarm error message will appear at the top of the front screen.
- ACK will appear as a function to acknowledge the setpoint on the front screen – press to clear the alarm.

Note – If, once cleared, the setpoint again remains energised for the length of the dose alarm timer then the dose alarm will once again activate. If this problem persists then a dosing problem will need to be investigated.

- ACK 1 – Clear Setpoint 1 Dose Alarm
- ACK 2 – Clear Setpoint 2 Dose Alarm
- Menu – Access Main Menu



**Initial Charge**

This allows the user to have a onetime over-ride of the Dose Alarm to use for example when filling a tank for the first time.

The user enters a charge time and then initiates the charge time. The instrument will then disable the dose alarm until either the relay becomes inactive because the setpoint has been reached or the charge timer reaches zero in which event the instrument will automatically display enter a Dose Alarm state.

↑/↓ – Select Option

EXIT – Cancel

← – Save Selection



**Charge Time**

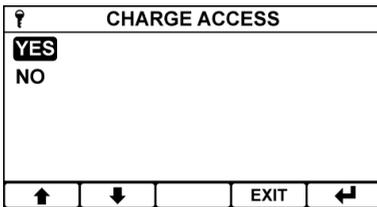
Sets the initial charge time.

↑/↓ – Increase / Decrease Digit

→ – Select Next Digit

EXIT – Cancel

← – Save Value



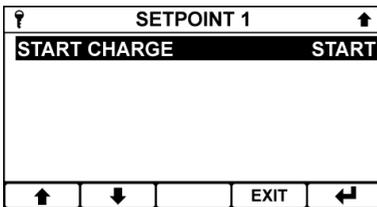
**Charge Access**

Enabling this allows the user to initialise the initial charge by means of a button on the front screen.

↑/↓ – Select Option

EXIT – Cancel

← – Save Selection



**Start Initial Charge**

The user can also start the initial charge via this option in the setpoint menu.

↑/↓ – Select Option

EXIT – Cancel

← – Save Selection

## Setpoint Cleaning Mode

The Setpoints can be configured to operate a jet spray wash or rotary electrode cleaning system on a timed cycle. Its purpose is to prevent accumulation of particulate matter on the active surfaces of the sensor. Note when cleaning is active the input will be taken offline, this will prevent any undesired control actions resulting from spraying cleaning solution onto the sensor.

? TRIGGER				
DISABLED				
LOW				
HIGH				
BAND				
<b>CLEANING</b>				
↑	↓		EXIT	↵

### Trigger

If available select cleaning from the list of options.

↑/↓ – Select Option

EXIT – Cancel

↵ – Save Selection

? CLEAN DURATION				
<b>10.00</b> mm:ss				
↑	↓	→	EXIT	↵

### Clean Duration

Enter the duration of the cleaning operation.

↑/↓ – Increase / Decrease Digit

→ – Select Next Digit

EXIT – Cancel

↵ – Save Value

? CLEAN INTERVAL				
<b>12.00</b> hh:mm				
↑	↓	→	EXIT	↵

### Clean Interval

Enter the time between cleaning operations.

↑/↓ – Increase / Decrease Digit

→ – Select Next Digit

EXIT – Cancel

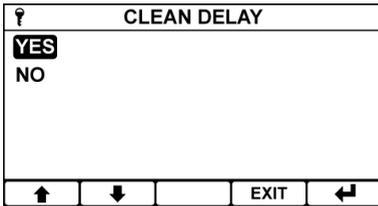
↵ – Save Value



**Clean Recovery**

The user can introduce an additional post cleaning delay before coming back "On-line", this provides the sensor a period to stabilise after the cleaning has finished.

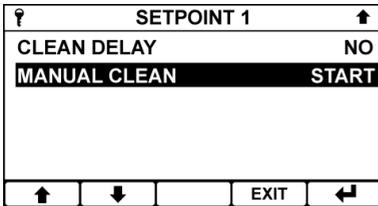
- ↑/↓ – Increase / Decrease Digit
- ➡ – Select Next Digit
- EXIT – Cancel
- ⬅ – Save Value



**Clean Delay**

If enabled this causes the clean cycle to wait if any other control setpoints are active. This is shown by a clean delayed message on the front screen.

- ↑/↓ – Select Option
- EXIT – Cancel
- ⬅ – Save Selection



**Manual Clean**

This manually starts a clean cycle.

- ↑/↓ – Select Option
- EXIT – Cancel
- ⬅ – Save Selection

## Setpoint Proportional Mode

In addition to On/Off mode the instrument also provides two forms of pseudo proportional control, which can be used to control the levels to a defined value when used in conjunction with a pump or valve. When the reading deviates from the programmed set point level the relay pulses at a rate proportional to that deviation. Note – Only available when Setpoint Trigger is set to either High or Low.

### Pulse Proportional Mode

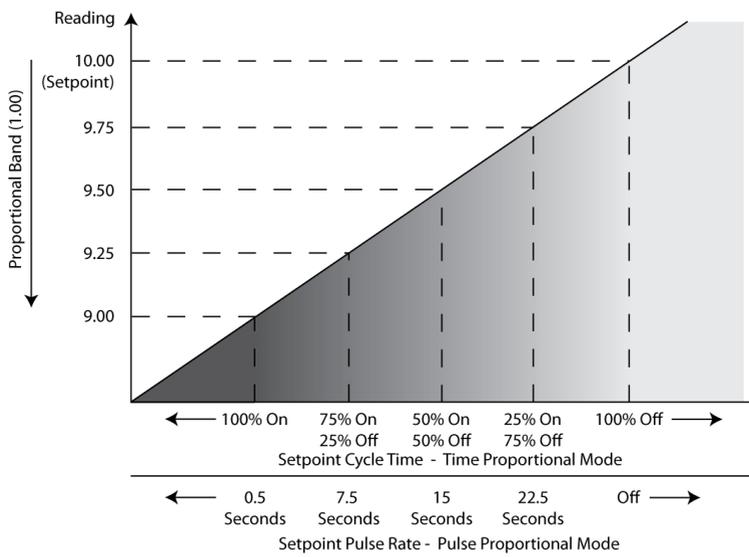
The Pulse Proportional mode is intended to drive solenoid type dosing pumps which have the facility to accept an external pulse input. The setpoint relay operates by producing a pulse of 0.25 seconds in duration and with a maximum period of one pulse per 30 seconds. The pulse rate increases as the measurement moves further from the set point, until it reaches the minimum period of one pulse per 0.5 seconds at the limit of the proportional band.

For example if the user sets a proportional band of 1.00, the setpoint trigger to LOW, and a setpoint value of 10.00. When the reading falls just below 10.00 the setpoint will begin to pulse at its longest period of once per 30 seconds. As the reading falls further from the setpoint the period will decrease until it reaches its minimum of one pulse every 0.5 seconds at the limit of the proportional band. (See Setpoint Pulse Rate – Pulse Proportional Mode section on the diagram below.)

### Time Proportional Mode

Time Proportional Mode allows a user defined cycle time to control any on/off device such as a solenoid valve or dosing pump over a user set proportional band.

For example if the user sets a proportional band of 1.00, the setpoint trigger to LOW, and a setpoint value of 10.00. When the reading falls below 9.00 the setpoint would be energised 100% of the cycle time. As the input rises and approaches the set point the setpoint starts to cycle on and off with the on time reducing and the off time increasing, respectively until it reached the setpoint and would be off for 100% of the cycle time. The cycle time is adjustable and is the sum of the on and off times. (See Setpoint Cycle Time – Time Proportional Mode section on the diagram below.)





**Cycle Time**

Sets the cycle time (sum of both On and Off periods)

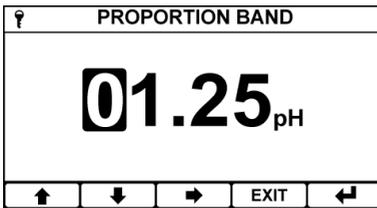
Only available when Mode is set to Time Proportional.

↑/↓ – Increase / Decrease Digit

➡ – Select Next Digit

**EXIT** – Cancel

⬅️ – Save Value



**Proportion Band**

Enter the size of the Proportion Band.

Only available when Mode is set to Pulse or Time Proportion.

↑/↓ – Increase / Decrease Digit

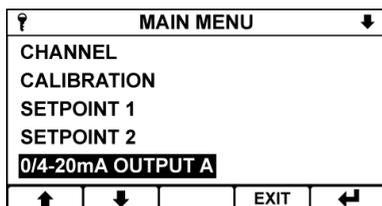
➡ – Select Next Digit

**EXIT** – Cancel

⬅️ – Save Value

## 0/4-20mA Output

The BPD17 is fitted with two current outputs, either which can be used for the transmission of the primary variable or temperature. The current output menu contains all of the necessary setup functions to configure the current output sources. The instrument will display the status of the current output on the front screen, where --mA indicates that the output is disabled.



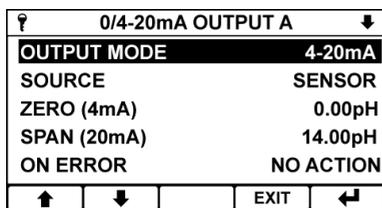
### Main Menu

From the front screen press the menu button to show the main menu options and select 4-20mA Output.

↑/↓ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



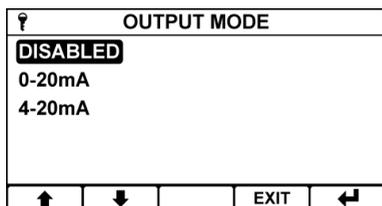
### 0/4-20mA Output Menu

Select the 0/4-20mA function you wish to configure.

↑/↓ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



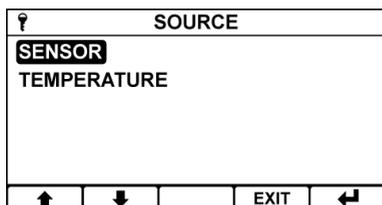
### Output Mode

Enable the current output by selecting its output mode, either 0 – 20mA or 4 – 20mA.

↑/↓ – Select Option

EXIT – Cancel

↵ – Save Selection



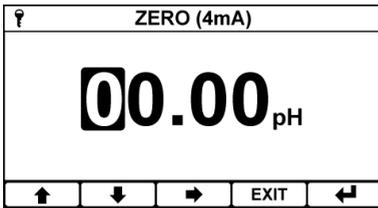
### Source

Select the source for the current output. Note, the Temperature option is only available when the temperature compensation mode has been set to PT1000 or PT100 in the channel setup menu.

↑/↓ – Select Option

EXIT – Cancel

↵ – Save Selection

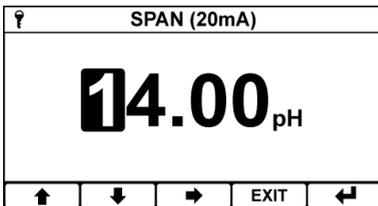


**Zero (0mA) / Zero (4mA)**

Enter the desired sensor value to be represented by 0mA or 4mA (depends on current output mode). An inverse relationship can be achieved by setting the Zero greater than the Span.

If the sensor reading falls outside this or the span value an error will be activated.

- ↑/↓ – Increase / Decrease Digit
- – Select Next Digit
- EXIT** – Cancel
- ↩ – Save Value

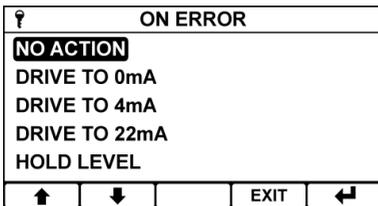


**Span (20mA)**

Enter the desired sensor value to be represented by 20mA. An inverse relationship can be achieved by setting the Span less than the Zero.

If the sensor reading falls outside this or the zero value an error will be activated.

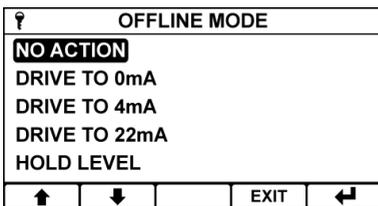
- ↑/↓ – Increase / Decrease Digit
- – Select Next Digit
- EXIT** – Cancel
- ↩ – Save Value



**On Error**

The current outputs can be programmed to output 0mA, 4mA, 22mA or Hold their value when an error is detected on the input source (i.e. Sensor Fault, Temperature Fault), to provide remote warning of error conditions or to ensure fail safe operation.

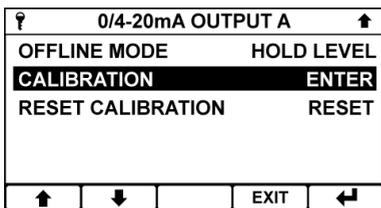
- ↑/↓ – Select Option
- EXIT** – Cancel
- ↩ – Save Selection



**Offline Mode**

The current outputs can be programmed to output 0mA, 4mA, 22mA or Hold their value when the instrument is put in an offline state.

- ↑/↓ – Select Option
- EXIT** – Cancel
- ↩ – Save Selection



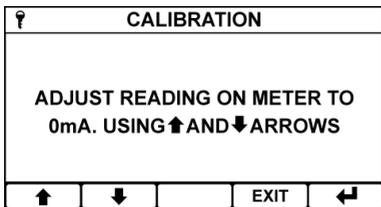
**Calibration**

Enter Menu to calibrate the 0/4-20mA

↑/↓ – Select Option

EXIT – Return to Main Menu

← – Enter Option



**Adjust 0mA Output**

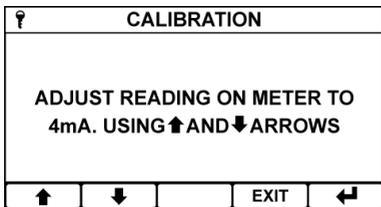
Using the ↓ and ↑ buttons adjust the current output until it reads the desired value on your current meter. Please keep in mind that the current output cannot go below 0mA.

Only used when the mode is set to 0-20mA

↑/↓ – Adjust Output

EXIT – Cancel

← – Save Adjustment



**Adjust 4mA Output**

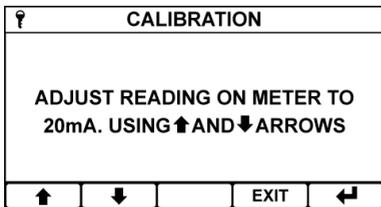
Using the ↓ and ↑ buttons adjust the current output until it reads the desired value on your current meter.

Only used when the mode is set to 4-20mA

↑/↓ – Adjust Output

EXIT – Cancel

← – Save Adjustment



**Adjust 20mA Output**

Using the ↓ and ↑ buttons adjust the current output until it reads the desired value on your current meter.

↑/↓ – Adjust Output

EXIT – Cancel

← – Save Adjustment

0/4-20mA OUTPUT A		↑	
OFFLINE MODE	HOLD LEVEL		
CALIBRATION	ENTER		
<b>RESET CALIBRATION</b>	<b>RESET</b>		
↑	↓	EXIT	↵

**Reset Calibration**

Used to reset any user calibration applied to the 0/4-20mA Output

- ↑/↓ – Select Option
- EXIT** – Return to Calibration
- ↵ – Enter Option

# Digital Inputs

The BPD17 is fitted with a single digital input. The digital input menu contains all of the necessary setup functions to configure the digital input sources. This input is intended to be switched using a volt free link, switch or relay. The user can select whether closing or opening the contact initiates the configured action.

MAIN MENU			
0/4-20mA OUTPUT B			
<b>DIGITAL INPUT</b>			
ERRORS			
CONFIGURATION			
SAVE/RESTORE			
↑	↓	EXIT	↩

## Main Menu

From the front screen press the menu button to show the main menu options and select the digital input you wish to configure.

- ↑/↓ – Select Option
- EXIT – Return to Front Screen
- ↩ – Enter Option

DIGITAL INPUT	
CURRENT STATUS	INACTIVE
<b>FUNCTION</b>	<b>OFFLINE</b>
POLARITY	NORMAL
↑	↓
EXIT	↩

## Digital Input Menu

Select the digital input function you wish to configure.

- ↑/↓ – Select Option
- EXIT – Return to Main Menu
- ↩ – Enter Option

DIGITAL INPUT	
CURRENT STATUS	INACTIVE
<b>FUNCTION</b>	<b>OFFLINE</b>
POLARITY	NORMAL
↑	↓
EXIT	↩

## Current Status

Shows the current status of the digital input. (Non-selectable)

FUNCTION	
<b>DISABLED</b>	
OFFLINE	
SWITCH SETUP	
INTERLOCK	
FLOW SWITCH	
↑	↓
EXIT	↩

**Function**

The digital input can be configured to operate in the following ways:

- ❖ Offline
- ❖ Switch Setup
- ❖ Interlock
- ❖ Flow Switch
- ❖ Tank Level

Offline, Interlock, Flow Switch and Tank Level – when active will take the instrument “offline”. This causes any active setpoints to de-energise, the 0/4-20mA output to change to its set offline state and the selected function message to appear on the front screen.

Switch Setup – when active the instrument will load an alternative Sensor Setup, Setpoint Setup and Current Output Setup that have been stored in one of the two internal save stores.

Whilst the digital input is active the instrument configuration cannot be changed.

The original configuration is restored upon the digital input going inactive.

↑/↓ – Select Option

EXIT – Cancel

↩ – Save Selection

STORE	
<b>STORE A</b>	
STORE B	
↑	↓
EXIT	↩

**Store**

Select which store the Switch Stores loads when active.

↑/↓ – Select Option

EXIT – Cancel

↩ – Save Selection

POLARITY	
<b>NORMAL</b>	
REVERSE	
↑	↓
EXIT	↩

**Polarity**

Configure whether the digital input activates on the closing of circuit (normal) or the opening of the circuit (reverse).

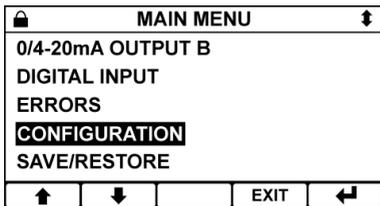
↑/↓ – Select Option

EXIT – Cancel

↩ – Save Selection

# Configuration

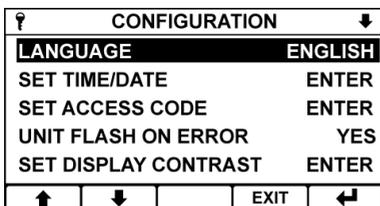
The configuration menu enables the user to configure the basic operating parameters of the instrument.



### Main Menu

From the front screen press the menu button to show the main menu options and select Configuration.

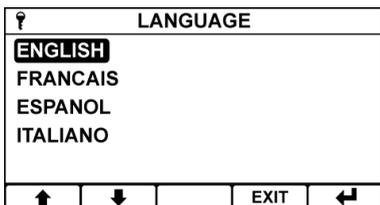
- ↑/↓ – Select Option
- EXIT – Return to Front Screen
- ↵ – Enter Option



### Configuration Menu

Select the function you wish to configure.

- ↑/↓ – Select Option
- EXIT – Return to Main Menu
- ↵ – Enter Option



### Language

The BXD17 Series has the ability to support multilingual menus. The language of choice can be selected from this menu.

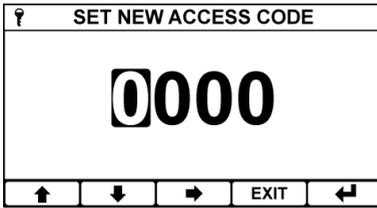
- ↑/↓ – Select Option
- EXIT – Cancel
- ↵ – Save Selection



### Set Time/Date

Sets the instruments time and date.

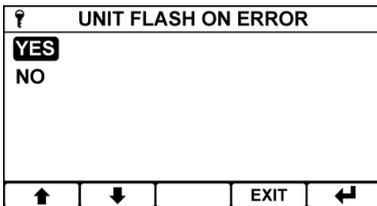
- ↑/↓ – Increase / Decrease Digit / Item
- ➡ – Select Next Digit / Item
- EXIT – Cancel
- ↵ – Save Time



**Set Access Code**

Sets the access code used by the instrument to prohibit changes to configuration by unauthorised personnel.

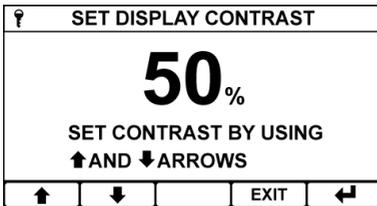
- ↑/↓ – Increase / Decrease Digit / Item
- ➡ – Select Next Digit / Item
- EXIT** – Cancel
- ↩ – Save Time



**Unit Flash On Error**

Enables the flashing of the display backlight in the event of an instrument error.

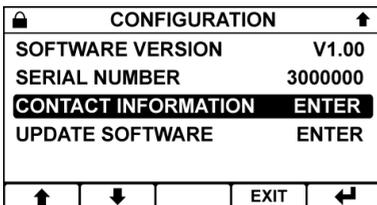
- ↑/↓ – Select Option
- EXIT** – Return to Main Menu
- ↩ – Enter Option



**Set Display Contrast**

This allows the user to adjust the contrast of the display to compensate for environmental conditions that may affect the readability of the display.

- ↑/↓ – Adjust Contrast
- EXIT** – Return to Configuration Menu
- ↩ – Enter Option



**Software Version**

Displays the instrument's current software version number (Non-selectable).

- ↑/↓ – Select Option
- EXIT** – Return to Main Menu
- ↩ – Enter Option

CONFIGURATION	
SOFTWARE VERSION	V1.00
SERIAL NUMBER	3000000
<b>CONTACT INFORMATION</b>	<b>ENTER</b>
UPDATE SOFTWARE	ENTER

↑ ↓ EXIT ↩

**Serial Number**

Displays the instrument's serial number (Non-selectable).

- ↑/↓ – Select Option
- EXIT** – Return to Main Menu
- ↩ – Enter Option

CONFIGURATION	
SOFTWARE VERSION	V1.00
SERIAL NUMBER	3000000
<b>CONTACT INFORMATION</b>	<b>ENTER</b>
UPDATE SOFTWARE	ENTER

↑ ↓ EXIT ↩

**Contact Information**

Display the contact information.

- ↑/↓ – Select Option
- EXIT** – Return to Main Menu
- ↩ – Enter Option

# Update Software

The BPD17 operating software can be upgraded by saving the latest version from LTH onto a micro SD card, inserting it into the instrument and following the instructions below. All three files must be present on the SD card for the update to work. The instrument supports SDHC and SDXC cards; however, they must be formatted to fat32 which can be accomplished using a personal computer.

CONFIGURATION	
SOFTWARE VERSION	V1.00
SERIAL NUMBER	3000000
CONTACT INFORMATION	ENTER
<b>UPDATE SOFTWARE</b>	<b>ENTER</b>
↑	↓
EXIT	↵

## Update Software

Select the update software option from within the configuration menu.

↑/↓ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option

UPDATE SOFTWARE	
ENSURE THE SD CARD REMAINS INSERTED & POWER TO THE UNIT IS NOT INTERRUPTED DURING THIS PROCESS.	
PRESS ENTER TO START	
EXIT	↵

## Update Software

If the instrument has verified that all of the required software is present on the micro SD card press enter to begin the update.

During the update the display will indicate the progress of the update.

Once finished the instrument will restart automatically.

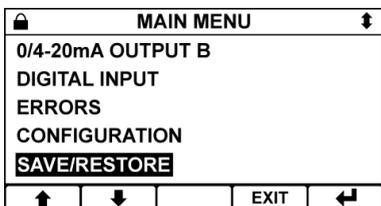
EXIT – Return to Update Software Menu

↵ – Begin Update

# Save, Restore & Reset

The BPD17 features the ability to save and restore the current configuration of the channel, setpoints, current outputs, and digital inputs to one of two stores "A and B".

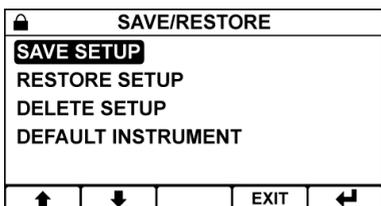
The save and restore menu also features the ability to reset the whole instrument back to its factory settings.



## Main Menu

From the front screen press the menu button to show the main menu options and select Save/Restore.

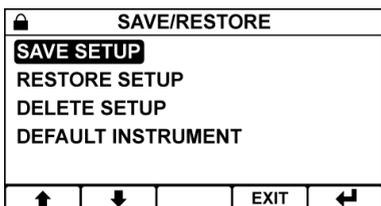
- ↑/↓ – Select Option
- EXIT – Return to Front Screen
- ← – Enter Option



## Save / Restore Menu

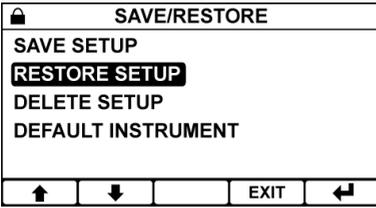
Select the operation you wish to carry out.

- ↑/↓ – Select Option
- EXIT – Return to Main Menu
- ← – Enter Option



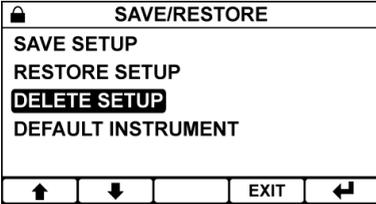
## Save Setup

Save the current instrument setup to either of the two stores.



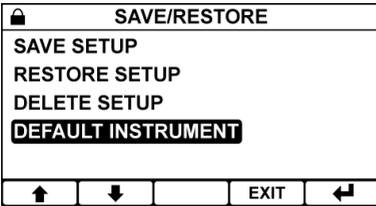
**Restore Setup**

Restore either of the previously saved setups.



**Delete Setup**

Delete the either of the previously saved setups.



**Default Instrument**

Reset the whole instrument back to its factory settings.

## Service

The BPD17 features a service reminder system that will inform the user when the instrument is due its service.

SERVICE	
<b>SERVICE REMINDER</b>	<b>YES</b>
<b>SERVICE INTERVAL</b>	<b>365 DAYS</b>
<b>NEXT SERVICE DATE</b>	<b>01 JAN 19</b>
<b>DEFER SERVICE DATE</b>	<b>7 DAYS</b>
↑	↓
	EXIT
	↵

### Service Alarm

Service alarm configuration:

- Service Reminder – Turn the service alarm on or off. Requires service security code prior to use.
- Service Interval – Set the Service Interval. Requires service security code prior to use.
- Next Service Date – Sets the exact service date. Requires service security code prior to use.
- Defer Service Date – Only appears once the service interval has expired. Increases the service interval by an extra 7 days. Requires standard security code prior to use.

↑/↓ – Select Option

EXIT – Return to Main Menu

↵ – Edit Option

## Appendix A - Temperature Data

The table below lists approximate resistance values of temperature sensors that may be used with the BPD17.

Temperature (°C)	PT1000 RTD	PT100 RTD
0	1000.0Ω	100.00Ω
10	1039.0Ω	103.90Ω
20	1077.9Ω	107.79Ω
25	1097.3Ω	109.73Ω
30	1116.7Ω	111.67Ω
40	1155.4Ω	115.54Ω
50	1194.0Ω	119.40Ω
60	1232.4Ω	123.24Ω
70	1270.7Ω	127.07Ω
80	1308.9Ω	130.89Ω
90	1347.0Ω	134.70Ω
100	1385.0Ω	138.50Ω

## Appendix B - Error Messages

### Switch On Diagnostic Errors

<b>E01</b>	<b>Read/Write Error</b> Try switching the unit off and then on again. If the message persists, consult with your supplier, as this unit may require to be returned for repair.
<b>E02</b>	<b>Data Error</b> The instrument configuration has for some reason become corrupted. Try switching the unit off and then on again. If the message persists use the Default Instrument function in the Save/Restore menu or consult with your supplier, as this unit may require a repair.
<b>E03</b>	<b>Storage Error</b> The save setup configuration has for some reason become corrupted. Try switching the unit off and then on again. If the message persists use the delete setup function in the Save/Restore menu or consult with your supplier, as this unit may require a repair.
<b>E04</b>	<b>Factory Error</b> The factory configuration has for some reason become corrupted. Try switching the unit off and then on again. If the message persists, consult with your supplier, as this unit may require to be returned for repair.
<b>E05</b>	<b>User Cal Error</b> The instrument user calibration has for some reason become corrupted. Try switching the unit off and then on again. If the message persists use the Default Instrument function in the Save/Restore menu or consult with your supplier, as this unit may require a repair.

### Sensor Input Errors

<b>E23</b>	<b>Sensor Over Range</b> The sensor reading is greater than the specified upper limit, check channel settings, Sensor condition and connections. If the message persists please consult with your supplier.
<b>E24</b>	<b>Sensor Under Range</b> The sensor reading is less than the specified lower limit, check channel settings, Sensor condition and connections. If the message persists please consult with your supplier.
<b>E31</b>	<b>Temperature Over Range</b> The temperature reading is greater than the specified upper limit, check channel settings, Sensor condition and connections. If the message persists please consult with your supplier.
<b>E32</b>	<b>Temperature Under Range</b> The temperature reading is less than the specified lower limit, check channel settings, Sensor condition and connections. If the message persists please consult with your supplier.

### Setpoint Status

<b>M51</b>	<b>Setpoint 1 Dose Alarm</b>
<b>M52</b>	<b>Setpoint 2 Dose Alarm</b>
	The dose alarm for the setpoint is active.
<b>M90</b>	<b>Setpoint 1 Triggered</b>
<b>M91</b>	<b>Setpoint 2 Triggered</b>
	The setpoint has been triggered. (Only shows when setpoint flash on trigger is enabled.)

### Current Output Errors

<b>E61</b>	<b>Output A Hardware</b>
<b>E71</b>	<b>Output B Hardware</b>
	The current output circuit has detected an error in the current output loop; this is most commonly due to either a broken loop or too large a load resistor.
<b>E62</b>	<b>Sensor &lt; OP A Zero</b>
<b>E72</b>	<b>Sensor &lt; OP B Zero</b>
	The sensor input level is below that set for the current output zero.
<b>E63</b>	<b>Sensor &gt; OP A Span</b>
<b>E73</b>	<b>Sensor &gt; OP B Span</b>
	The sensor input level is greater than that set for the current output span.
<b>E64</b>	<b>Sensor &gt; OP A Zero</b>
<b>E74</b>	<b>Sensor &gt; OP B Zero</b>
	The sensor input level is greater than that set for the current output zero.
<b>E65</b>	<b>Sensor &lt; OP A Span</b>
<b>E66</b>	<b>Sensor &lt; OP B Span</b>
	The sensor input level is below that set for the current output span.

### Service Messages

<b>M80</b>	<b>Service Due</b>
	The Planned Service interval for this unit has expired. Please contact LTH Electronics at the details below:  LTH Electronics Ltd Chaul End Lane Luton Beds LU4 8EZ Tel. 0044 (0) 1582 593693 Fax 0044 (0) 1582 598036 Email sales@lth.co.uk  NB. LTH overseas users should contact their LTH distributor – See <a href="http://www.lth.co.uk">www.lth.co.uk</a> for details.
<b>M81</b>	<b>Calibration Due</b>
	The user entered calibration interval has expired.

**M82 Service Mode Active**

The unit is currently in service mode, the setpoints and current outputs may not respond as configured. Please contact LTH Electronics at the details below:

LTH Electronics Ltd  
Chaul End Lane  
Luton  
Beds  
LU4 8EZ  
Tel. 0044 (0) 1582 593693  
Fax 0044 (0) 1582 598036  
Email sales@lth.co.uk

NB. LTH overseas users should contact their LTH distributor – See [www.lth.co.uk](http://www.lth.co.uk) for details.

# Fault Finding

## **NOTE: THERE ARE NO USER SERVICEABLE PARTS INSIDE THE UNIT**

The BPD17 has been designed to include a wide range of self-diagnostic test, some of which are performed at switch on, and some on a continuous basis. This guide aims to provide a route to diagnosing and correcting any faults that may occur during normal operation. The table shown previously in this section gives a list that the BPD17 generates, along with their probable causes. If after these checks the fault has not been cleared contact LTH. Please have as much of the following information available as possible in any communication with LTH, to enable quick diagnosis and correction of the problem.

- Serial number of the instrument.
- The approximate date of purchase.
- Details of the program settings and application.
- Electrical environment and supply details.
- Circumstances under which the fault occurred.
- The nature of the fault or faults.
- Any error messages that are displayed.
- The sensor type, cable length and type.
- Current output configuration.
- Relay connection configuration.
- Digital Input Configuration.

It is often worthwhile to check the measurement by an independent method, for example using a handheld meter.

### **The Instrument Appears Dead**

Check that power is available to the unit. Using a voltmeter, set to AC or DC, check the power supply voltage at the connector. The design of the BPD17 allows the unit to accept from 90 to 265V AC, an alternative option allows operation from 12 to 30V DC, check the connection label for voltage specification. Check that the power cable is securely and correctly attached. There are no user serviceable fuses fitted within this unit.

### **The Access Code Does Not Work**

It is probable that the access code has either been changed or the operator does not recall the code correctly. Contact LTH or your local distributor should this problem arise.

### **The Sensor Reading Is Constantly Over-range or Under-range**

- Ensure that the sensor and temperature input is correctly connected (see Installation and Choice of pH / Redox Electrodes page 20) and that the sensor is not faulty or damaged.
- If the units are set to pH, check the temperature compensation state (see Channel Setup Section page 31). If the compensation is set to "Manual" check that the fixed temperature is at the correct level. If the compensation is "PT1000 or PT100" check that the temperature reading on the main display is correct.

## The Sensor Reading Is Incorrect

- Check that no error messages are being displayed. Check that the sensor cable has been correctly connected (see Installation Section, Page 20).
- Check that the Temperature reading is correct.
- Check the instrument calibration using a pH simulator, Adjust the channel calibration if necessary (see Calibration Section).
- Use another instrument to check the sensor.

## The Sensor Is Not Functioning Correctly

- Check that the sensor glass is not broken or cracked.
- Check the reference probe KCl (where applicable) for leakage or contamination.
- Ensure all probe protective caps have been removed.
- Check that any junction boxes used are correctly connected.
- Check that a suitable high impedance, low noise cable has been used.
- Check for damaged or broken cables.
- Check for damp, grease, or liquids near connectors, junction boxes, or terminations.
- Where extension cables have been used, try connecting the sensor directly to the instrument.

## The Temperature Reading Is Incorrect

- Check that the temperature sensor is correctly attached. (Installation Section, page 25).
- Check that the temperature sensor type is correctly selected in the Channel Setup menu (See page 31)
- Where practical check the temperature sensor resistance against the table on page 70.

## Current Output is Incorrect or Noisy

- Check that the maximum load for the current loop has not been exceeded. (750Ω).
- Check that the terminals have been wired correctly.
- Check that the cable screen is attached to Earth at one end and that the cable does not pass too close to a power cable.
- Check that the current output has been configured properly.

## Relays Appear to Malfunction

- Check that the unit is “On-Line” (Page 27)
- Check that the set point has been configured properly.
- If the relays are vibrating or “chattering” as they pass the set point, check the hysteresis setting and increase if necessary.
- Ensure that the relays are connected properly and that the voltage/current levels are not exceeding 5A @ 30V DC or 5A @ 250V AC.
- Check that the instrument input cables are not picking up excessive noise.

## Problems with Cables and Connectors

The cable connecting the pH probe to the instrument is the most common cause of problems in pH measurement systems. The importance of the following recommendations cannot be over stressed.

### Input Resistance

The high input resistance, required for the optimum performance from a pH electrode system, will be seriously degraded if any grease, dirt, or dampness is allowed to collect around any of the connections between the probe and the instrument. This includes any connectors or junction boxes which may be used. Particular attention must be paid to the method of extending the pH electrode cable. A general rule would be the fewer connections there are, the less problems are likely to occur.

**Input Cable**

The choice of cable is important. Only polythene or PTFE cables are acceptable. Secondly, any vibration or cable movement on a standard co-axial cable will give rise to fluctuations in the readings. To prevent this a low noise cable must be employed. This type of cable can be identified as having a black impregnated polythene layer which is exposed when the outer braid is separated for connection. This must be completely removed at the terminations to avoid a possible short circuit between the electrode and reference pair.

In all cases the screening braid must not be separated from the core conductor by more than 5mm in order to avoid "hum" pickup.

Cables should be kept as short as possible and must be run separately (100mm separation typically) from any power carrying cable.

**Cable Length**

The response of the instrument to a sudden change in the sensor input will be determined mainly by the source resistance of the electrode and the length of the connection cable. For a typical pH electrode of 1000M $\Omega$  resistance, in combination with a typical cable, the time taken to settle to its new value is about 0.5 seconds per metre of cable (depending on the cable capacitance).

**Problems with Electrodes**

The combination electrodes supplied by LTH are of low resistance and will be less affected by humidity than other, high resistance systems. In any case, the connecting leads and cable connectors must be kept dry, and the cable screen must not be allowed to come into contact with any earthed metal parts. The glass bulb must be kept in a moist condition for correct operation. If the electrode is allowed to dry out, it may be recovered by immersing in a saturated KCl solution or dilute acid for at least 24 hours before use.

Electrodes can be expected to last for at least one year under normal operating conditions before replacement becomes necessary. However, operation at elevated temperatures or pressures, and the presence of sulphides or ionic metals, will shorten the electrode life. If the electrode cannot be set up against solutions or shows a sluggish response to changes in pH, it should be replaced.

## Guarantee and Service

Products manufactured by LTH Electronics Ltd are guaranteed against faulty workmanship and materials for a period of three years from the date of despatch, except for finished goods not of LTH manufacture, which are subject to a separate agreement.

All sensors made by LTH Electronics Ltd are thoroughly tested to their published specification before despatch. As LTH have no control over the conditions in which their sensors are used, no further guarantee is given, although any complaints concerning their operation will be carefully investigated.

Goods for attention under guarantee (unless otherwise agreed) must be returned to the factory carriage paid and, if accepted for free repair, will be returned to the customer's address free of charge. Arrangements can also be made for repair on site, in which case a charge may be made for the engineer's time and expenses.

If any services other than those covered by the guarantee are required, please contact LTH direct.

N.B. Overseas users should contact their LTH nominated representative. Special arrangements will be made in individual cases for goods returned from overseas.



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