# Model PM5-PH
# pH/ORP
# Panel Mount Display/Controller
# Quick Reference Guide

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# 1 Introduction

This quick reference guide contains basic information for the installation and operation of the single or dual input PM5 pH/ORP Monitor. The complete instruction manual for this instrument can be downloaded from www.aicpl.com.au.

This instrument is a general purpose pH/Redox monitor which may be configured to accept an input from a standard pH electrode (E0=7), an electronic unity gain buffer amplifier or a standard Redox (ORP) electrode. The instrument is user configurable for use as a pH or Redox monitor. A second input is provided for a temperature sensor for automatic pH temperature compensation. The PM5 can accept Pt100 or Pt1000 RTD sensors or a default temperature can be manually set.

The pH/ORP input is isolated which can reduce or remove false readings which can occur when a potential difference exists between the process solution and ground i.e. there is a voltage between the solution and ground.

Calibration, setpoint and other set up functions are easily achieved by push buttons (located at the rear panel and/or front panel depending on model). The ⏶ and ⏷ pushbuttons may be used to toggle the display between pH and solution temperature reading or default temperature if no external sensor is used. A standard inbuilt relay provides an alarm/control function, optional extra relays, retransmission (analog, serial or digital) and DC output voltage may also be provided. The PM5 is available with a 4, 5 or 6 digit display or combined bar graph/5 digit display to suit various applications. Unless otherwise specified at the time of order, your PM5 has been factory set to a standard configuration. Like all other PM5 series instruments the configuration and calibration is easily changed by the user. Initial changes may require dismantling instrument to alter PCB links, other changes are made by push button functions. Full electrical isolation between power supply, input voltage or current and retransmission output is provided by the PM5, thereby eliminating grounding and common voltage problems. This isolation feature makes the PM5 ideal for interfacing to computers, PLCs and other data acquisition devices The PM5 series of panel mount monitors are designed for high reliability in industrial applications. The high brightness LED display provides good visibility, even in areas with high ambient light levels.

**Standard outputs**

- A standard inbuilt relay provides an alarm/control function (can be set for on/off alarm/control or PI control using pulse width or frequency control)

**Output options**

- 1, 3 or 6 extra relays (first optional relay can be set for simple on/off alarm/control or PI control using pulse width or frequency control)
- Isolated analog retransmission 12 bit, 4-20mA (single or dual analog outputs). Configurable for retransmission or PI control
- Isolated analog retransmission 16 bit (single or dual analog outputs) configurable for 420mA, 01V or 010V. Configurable for retransmission or PI control
- 12VDC (24V) isolated transmitter supply/excitation voltage (25mA max.)
- Isolated RS485 or RS232 serial communications (ASCII or Modbus RTU)
- Ethernet communications
- Internal datalogger 8M Byte
- Isolated Optional outputs are available in certain combinations e.g. Extra relay plus RS232

## 1.1 Selecting and altering access levels

This subsection details the use "access levels". Access levels can be used to obtain easy access to functions which are regularly required and to limit access to functions which are not required or which restricted access is required. These access level settings can be ignored if no restrictions to access are required and no easy access to selected functions is required.

Each setup function has a default access level allocated to it, for example the relay 1 high alarm function **AL 1h, 9h** is allocated a default level of 2. There is a facility for the user to change the access levels for a limited number of functions to make them either easier to access or harder to access as required, see the **Fn. 1CodE** function.

There are different ways of accessing setup functions, these are explained in the following section. Each mode allows a selection of access levels i.e. allows some choice of which functions are accessible.

The access levels available are:

**None** - no access to functions
**1** - access to functions allocated to level 1
**2** - access to functions allocated to level 2
**3** - access to functions allocated to level 3
**4** - access to functions allocated to level 4
**5** - access to functions allocated to level 5
**6** - access to functions allocated to level 6
**CAL** - access to all normal operation functions

## 1.2 Accessing setup functions

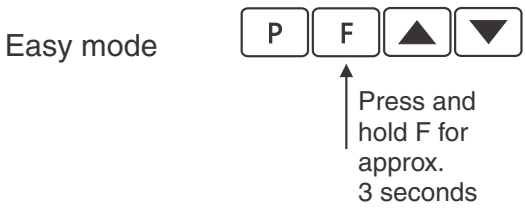
The setup functions allow adjustment of the instruments operation functions. There are five different ways of accessing setup functions. Each mode allows a selection of access levels i.e. allows some choice of which functions are accessible.

As as summary the methods available are:

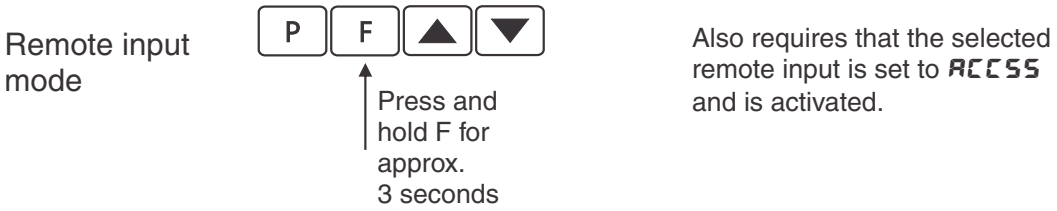
- **Easy mode** - this is the easiest access mode simply requiring the F button to be pressed for 3 seconds. This mode would normally be used to gain access to functions which require frequent adjustment.
- **Remote input mode** - this uses the Easy method of access but also requires the use of a remote input switch.
- **PIN 1 mode** - this method allows a PIN to be set with access via PIN entry.
- **PIN 2 mode** - this method also requires a PIN and would generally be use to allow a higher access level than the first PIN.
- **Super Cal mode** - this method requires a power up procedure and will allow access to all functions.

These modes are explained in more detail below.

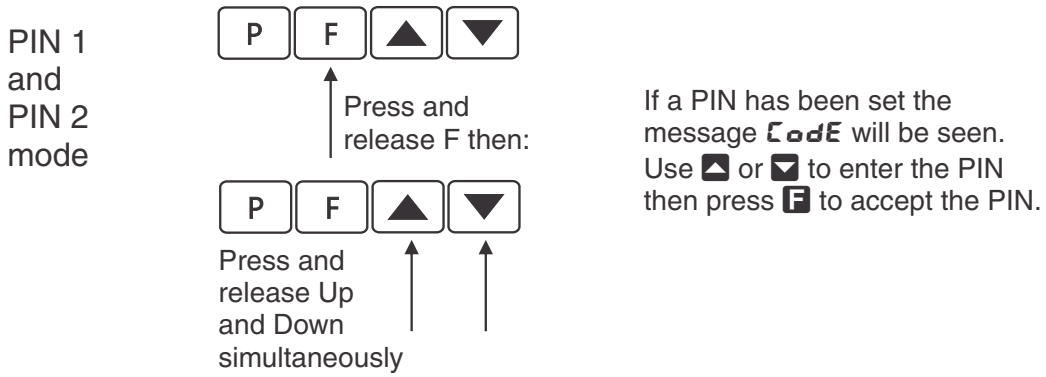
- **Easy mode** - Allows access to the level set by the **EASY LEVEL** function in the **ACCES** menu. By default the Easy access is set to **NONE** which blocks access to all setup functions. To allow access to functions using this method choose the access level required at the **EASY LEVEL** function.
  The Easy mode simply requires that the F button is held pressed until the message **FUNC** is seen followed by the first function message, this should take approximately 3 seconds. If the message **FUNC End** or no response is seen at this point it means that the access level has been set to **NONE**. The default access for this level is **NONE** so the access level will need to be changed if access via this method is required.




- **Remote input mode** - Allows access to the level set by the **r.1 InPt LEVEL** function in the **ACCES** menu. By default the Remote input access is set to **CAL** level allowing access to all setup functions.
  The remote input mode uses the same access method as the Easy mode but also requires that one of the available remote inputs is set to **ACCSS** and that the selected remote input is activated i.e. shorted to GND. The default access for this level is **NONE** so the access level will need to be changed if access via this method is required.



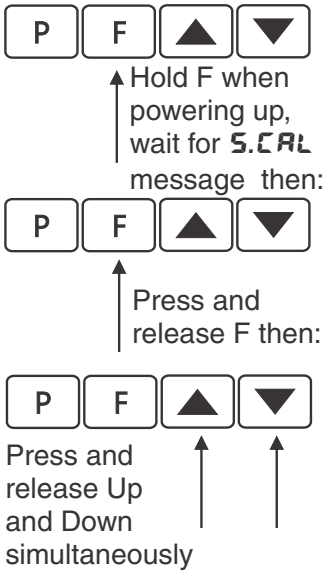

- **PIN 1 mode** - Allows access to the level set by the USr. 1 LEUEL function in the ACCES menu.
  The PIN 1 mode requires the F button is pressed and released then within 2 seconds press the ▲ and ▼ buttons at the same time. The PIN can be set via the USr. 1 P1 n function in the ACCES menu. A USr. 1 LEUEL setting of 0 disables the PIN which means that there is no need to enter the PIN. If the USr. 1 LEUEL function has been set to a number other than nonE then the first function seen when entering via PIN 1 mode will be the function CodE. When this function is seen the PIN value set at the USr. 1 P1 n function must be entered via the ▲ or ▼ pushbuttons followed by pressing F to accept the PIN before the user can progress to the setup functions.




- **PIN 2 mode** - Allows access to the level set by the USr.2 LEUEL function in the ACCES menu.
  This method uses the same access method as PIN 1 mode above. A USr.2 P1 n setting of 0 disables the PIN. If the USr. 1 LEUEL or a USr.2 P1 n function has been set to a number other than 0 then the first function seen when entering via PIN 1/PIN2 mode will be the function CodE. When this function is seen the PIN value set at the USr. 1 P1 n function can be entered for access to the level set at the USr. 1 LEUEL function or enter the USr.2 P1 n PIN to gain access to the level set at the USr.2 LEUEL function. A correct code will allow access to the functions at the selected level. An incorrect code will result in the FUNC End message being seen indicating that access to setup functions has been refused and the display will return to normal measurement mode.

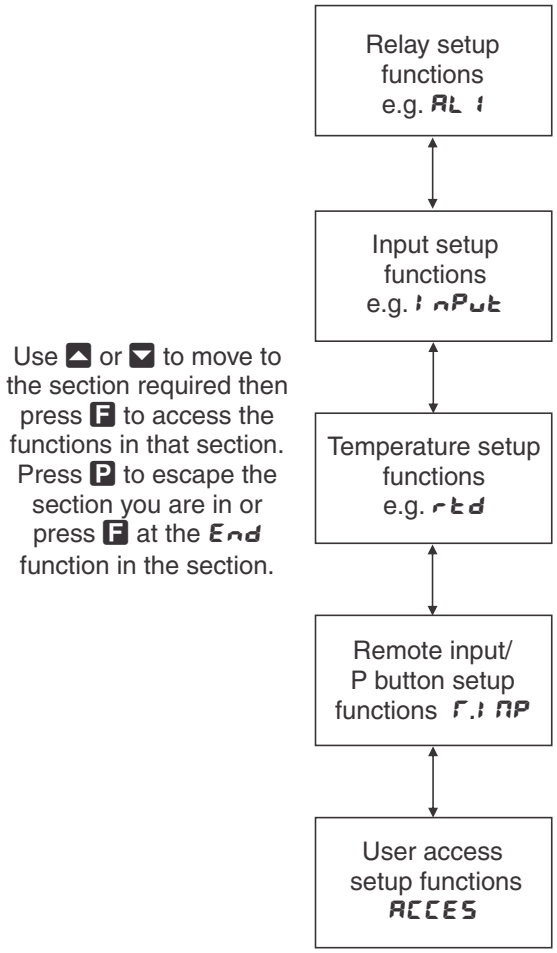
- **Super Cal mode** - This method can be used to gain access to all functions. If a PIN has been set and forgotten use this method to access the PIN functions to check the settings. To access via Super Cal mode with the instrument switched off hold in the F button whilst the instrument powers up. Keep the button pressed until the S.CAL message is seen, you can then release the F button. Next press and release F then within 2 seconds press and release the ▲ and ▼ pushbuttons simultaneously.

Super Cal mode

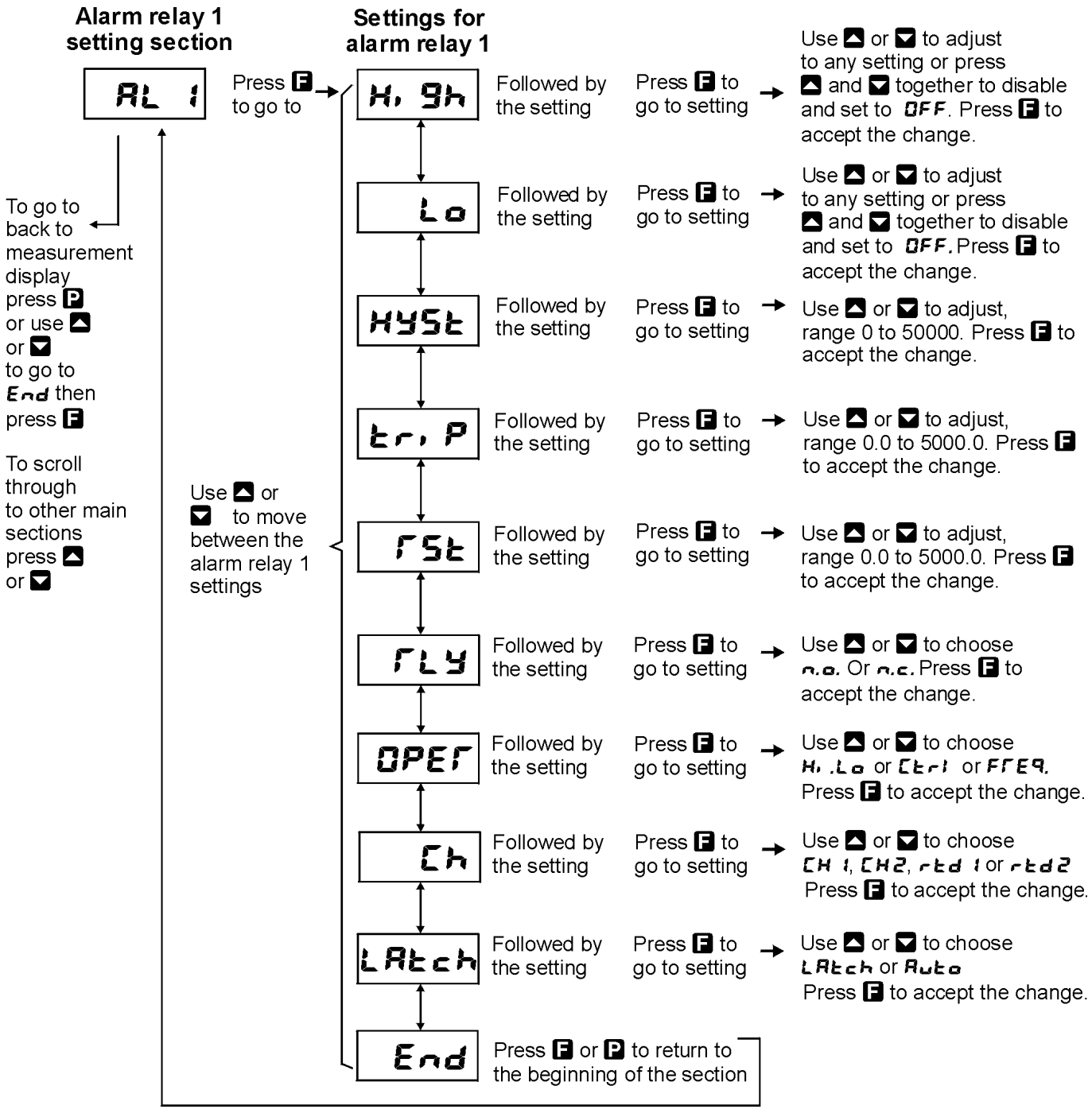


The setup functions are organised in blocks or sections e.g. all the settings for relay 1 are in the **RL 1** section. Once access to setup functions has been gained use the ▲ and ▼ buttons to select the section required then press **F** to enter this section and again us the ▲ and ▼ buttons to select the required function for alteration and press **F** to allow alteration of this function.

Typical sections for a basic instrument are illustrated below. In any particular instrument additional sections may appear depending on the part number and any optional outputs fitted.



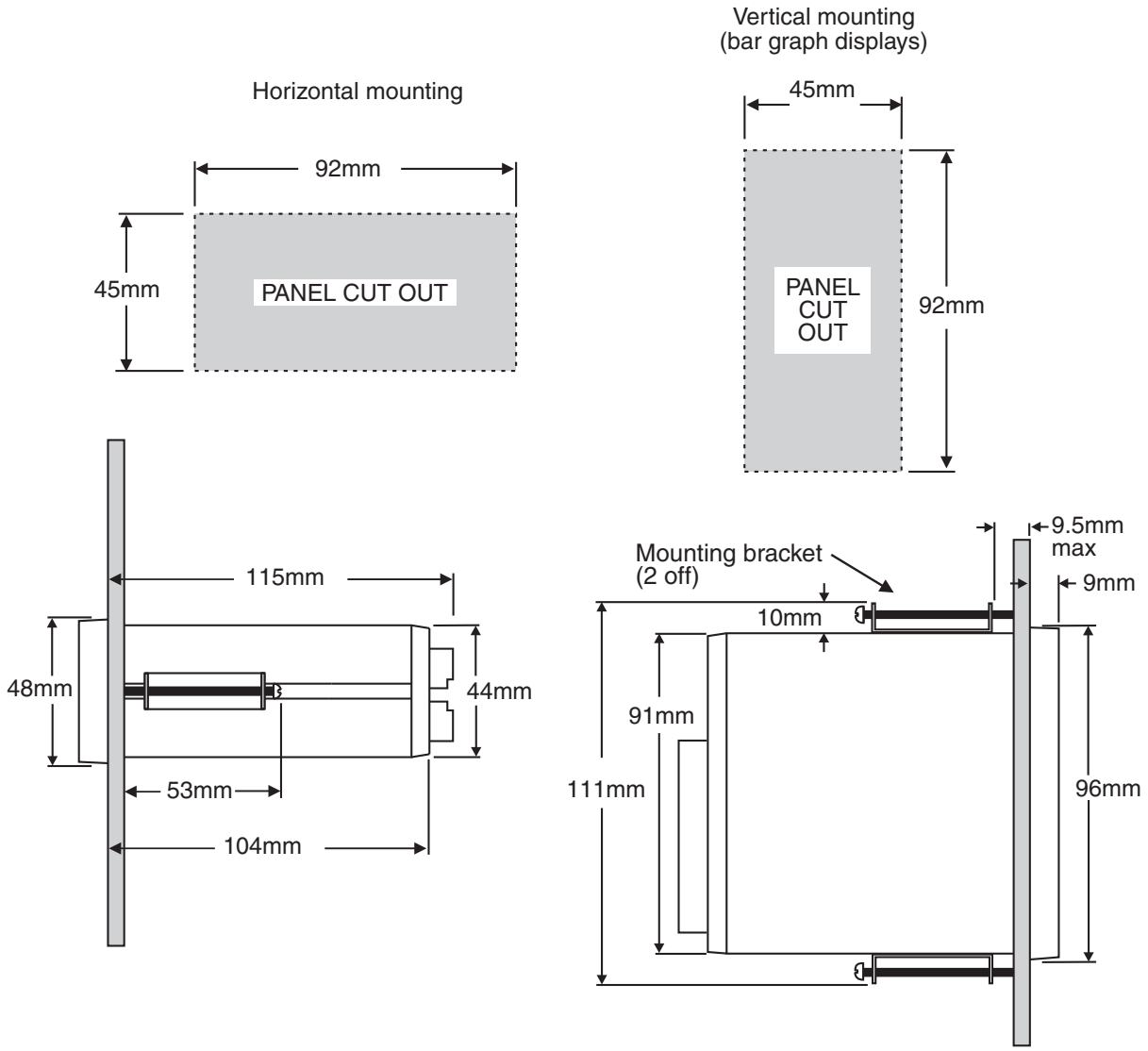
The example in the flowchart below shows the method using alarm relay 1 setup function (example only, actual functions seen may vary depending on software version).



# 2 Mechanical Installation

Choose a mounting position as far away as possible from sources of electrical noise such as motors, generators, fluorescent lights, high voltage cables/bus bars etc. An IP65 or IP67 access cover which may be installed on the panel and surrounds is available as an option to be used when mounting the instrument in damp/dusty positions. A wall mount case is available, as an option, for situations in which panel mounting is either not available or not appropriate. A portable carry case is also available, as an option, for panel mount instruments.

Prepare a panel cut out of 45mm x 92mm +1 mm / – 0 mm (see diagram below). Insert the instrument into the cut out from the front of the panel. From the rear of the instrument fit the two mounting brackets into the recess provided (see diagram below). Whilst holding the bracket in place, tighten the securing screws being careful not to over-tighten, as this may damage the instrument. Hint: use the elastic band provided to hold the mounting bracket in place whilst tightening securing screws.



# 3 Electrical installation

## 3.1 Electrical installation

The PM5 Panel Meter is designed for continuous operation and no power switch is fitted to the unit. It is recommended that an external switch and fuse be provided to allow the unit to be removed for servicing.

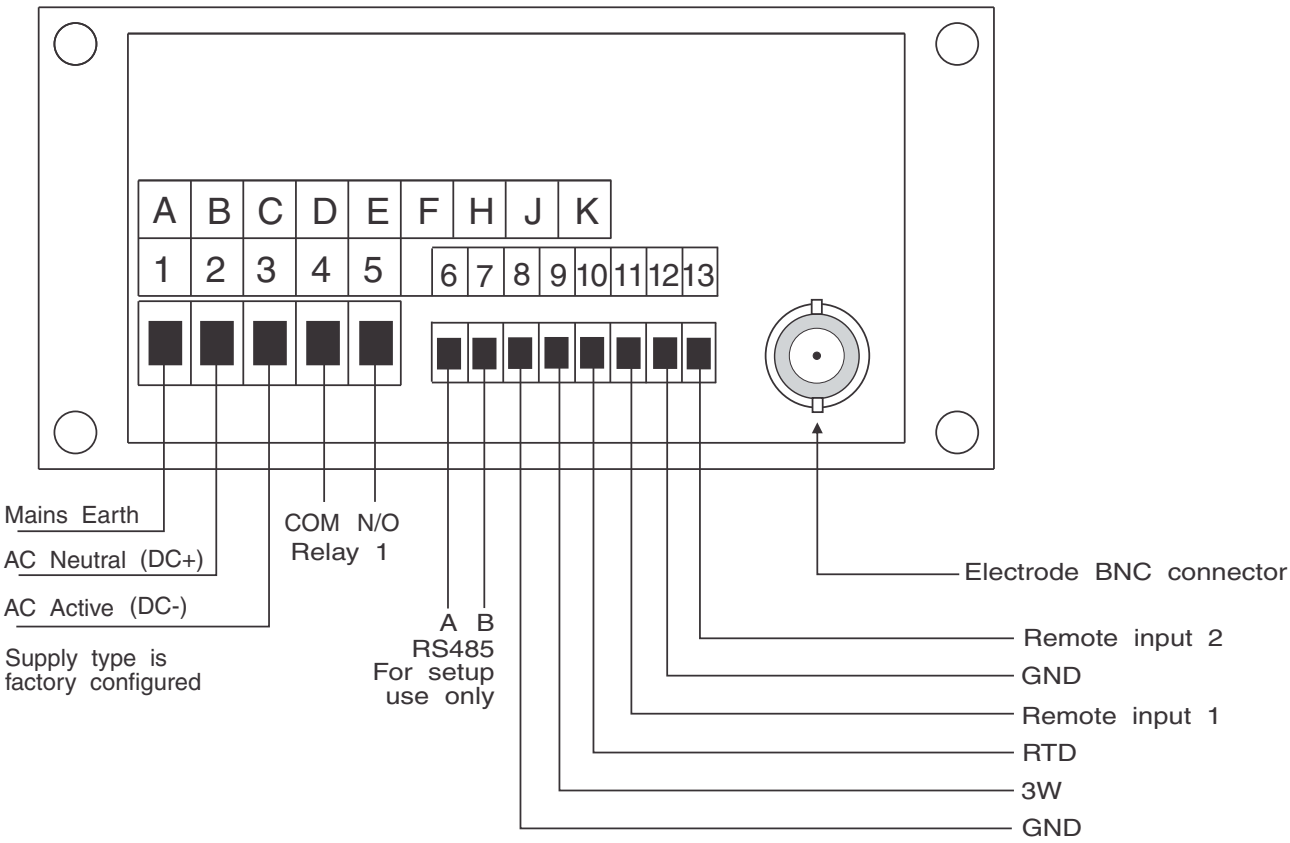
The plug in, screw type, terminal blocks allow for wires of up to 2.5mm$^2$ for power, relays and optional outputs and 1mm$^2$ for sensor and other wiring to be fitted. Connect the wires to the appropriate terminals as indicated below. Refer to connection details provided in this chapter to confirm proper selection of voltage, polarity and input type before applying power to the instrument.

When power is applied the instrument will cycle through a display sequence indicating the software version and other status information, this indicates that the instrument is functioning. Acknowledgement of correct operation may be obtained by applying an appropriate input to the instrument and observing the reading. The use of screened cable is recommended for signal inputs.

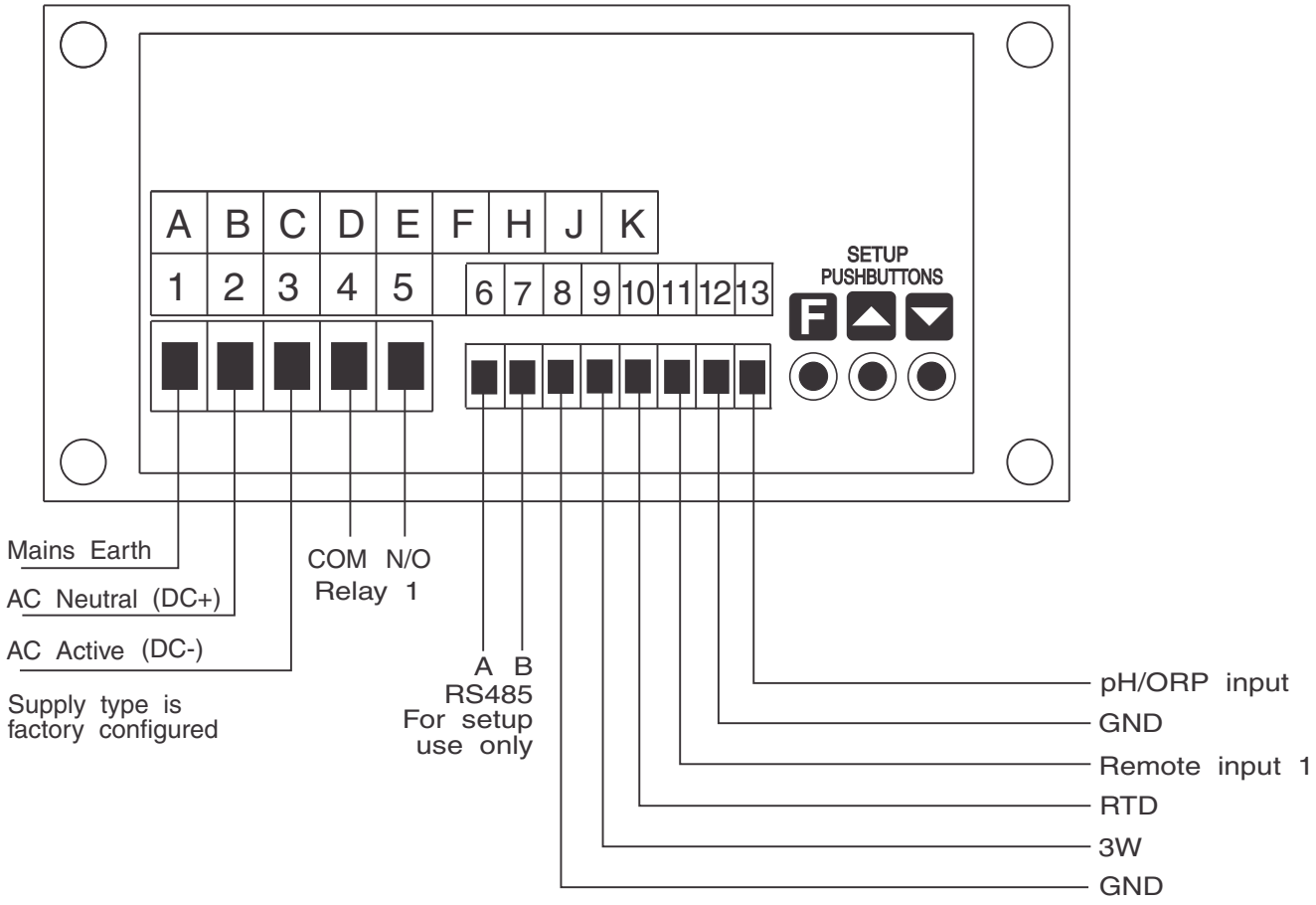
For connection details of optional outputs refer to the separate "PM5 Panel Meter Optional Output Addendum" booklet supplied when options are fitted.

**Rear panel connections**

**Displays with BNC connector fitted (displays with front pushbuttons)**

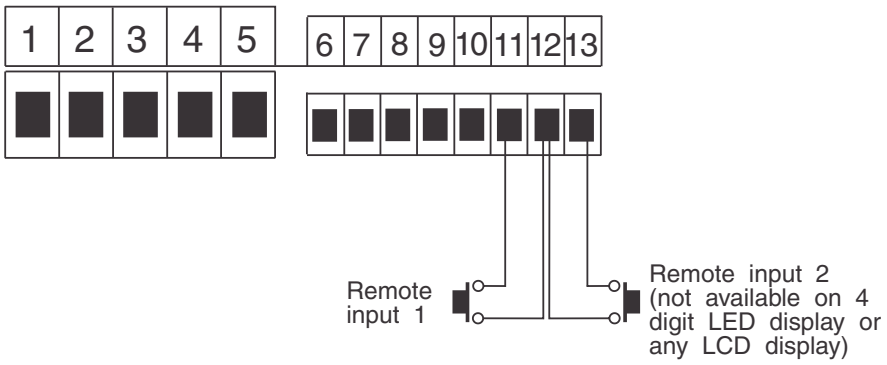


**Displays without BNC connector (displays without front pushbuttons)**




## 3.2 Remote/Digital input connections

Use latching or momentary switches/relays depending on remote input function requirements. Input is not isolated and can be configured for voltage free or up to 24V input (e.g. see **d.i n. 1** **P.UP** function).

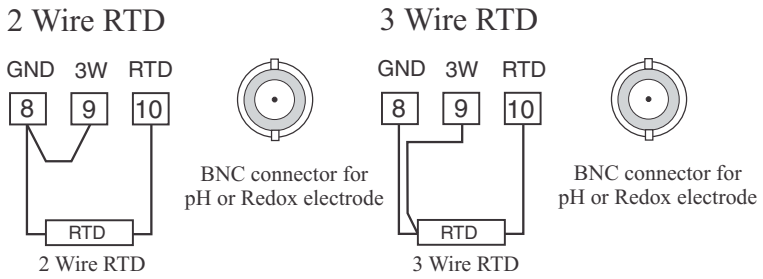



## 3.3 Optional output connections

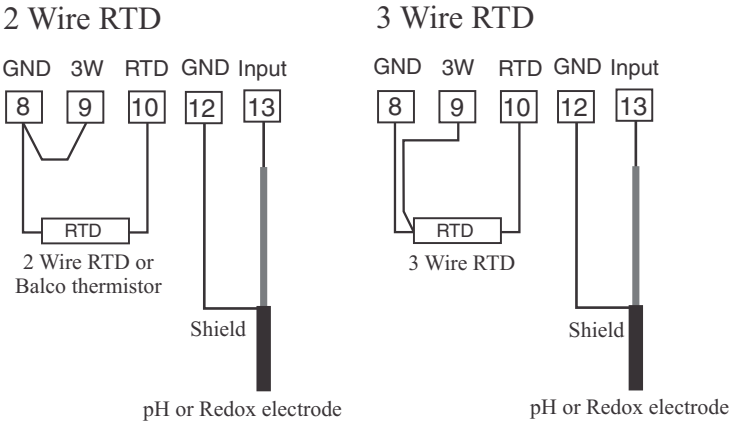
If output options are fitted refer to the "PM5 Panel Meter Optional Output Addendum" booklet for connection details.

## 3.4 Sensor connection examples

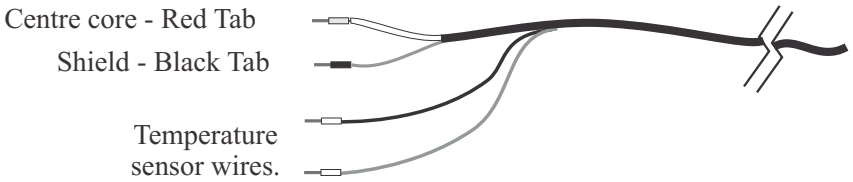
Rear sensor connection for panel meter fitted with BNC connector (any model with front pushbuttons)




Rear sensor connection for panel meter without BNC connector (4 digit LED or 4 or 6 digit LCD display)



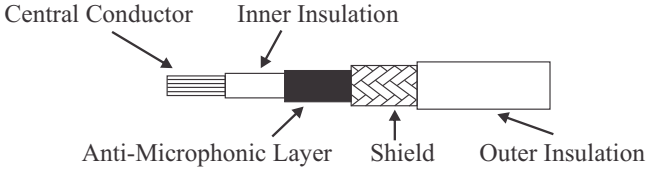

Termination of a typical pH electrode with temperature compensation for screw terminal connection




If dual temperature sensors are fitted then the colour code is:
Red & Black Pt100, Green & White Pt1000.

RTD temperature sensors are not polarised and therefore the wires may be placed either way around at the temperature input.

**Note:** If using low noise pH/Redox coaxial cable with an anti-microphonic layer ensure that this layer is removed from the exposed wiring. This layer is conductive and may cause a short circuit between the centre conductor and the cable shield resulting in an incorrect indication, usually this fault would be seen as a constant 7.00 pH or 0mV indication.



# 4 Function tables - summary of setup functions

Note: the order in which the functions appear on the display may not be exactly as shown below. The availability and order of functions is determined by choice of function settings and options fitted.

## 4.1 Alarm relay function table

| Display | Function | Range | Default | Your record | Access level |
|---|---|---|---|---|---|
| AL 1 to AL 7 HI SP | High setpoint value for designated alarm | Any display value or OFF | OFF | See 4.11 | 2 |
| AL 1 to AL 7 LO | Low setpoint value for designated alarm | Any display value or OFF | OFF | See 4.11 | 2 |
| AL 1 to AL 7 HYST | Hysteresis value for the designated alarm | 0 to 50000 | 10 | See 4.11 | 3 |
| AL 1 to AL 7 TR1 P | Trip time delay for the designated alarm relay $x$. | 0.0 to 5000.0 | 0.0 | See 4.11 | 3 |
| AL 1 to AL 7 RST | Reset time delay for the designated alarm relay $x$. | 0.0 to 5000.0 | 0.0 | See 4.11 | 3 |
| AL $x$ SPAN | Relay PI control span | Any display value | 100 | See 4.11 | 4 |
| AL $x$ SETP | Relay PI control setpoint | Any display value | 1000 | See 4.11 | 4 |
| AL $x$ P.G | Relay PI control proportional gain value | -32.768 to 32.767 | 0.0 10 | See 4.11 | 4 |
| AL $x$ I.G | Relay PI control integral gain value | -32.768 to 32.767 | 0.000 | See 4.11 | 4 |
| AL $x$ I.H | Relay PI control integral high limit value | 0.0 to 100.0 | 100.0 | See 4.11 | 4 |
| AL $x$ I.L | Relay PI control integral low limit value | 0.0 to 100.0 | 100.0 | See 4.11 | 4 |
| AL $x$ BIAS | Relay PI control bias | 0.0 to 100.0 | 50.0 | See 4.11 | 4 |
| AL $x$ DUTY SECS | Relay PI control duty cycle | 0.0 to 5000.0 | 0.0 | See 4.11 | 4 |
| AL $x$ ON SECS | Relay PI frequency control "on" time | 0.0 to 5000.0 | 0.0 | See 4.11 | 4 |

(*__Optional__)—this function will only be accessible if the relevant option is fitted

| | | | | | |
|---|---|---|---|---|---|
| AL *x* rLY | Alarm relay *x* action to normally open (de-energised) or normally closed (energised) | n.o, n.c | n.o | See 4.11 | 4 |
| AL 1 to AL 7 trAIL | Alarm trailing or setpoint mode | SEt.P, tL 1, tL 2, tL 3, tL 4, tL 5, tL 6 | SEt.P | See 4.11 | 4 |
| AL *x* OPEr | Alarm relay operating mode | Hi .Lo, Ctrl , FrEq | Hi .Lo | See 4.11 | 4 |
| AL *x* Ch | Alarm relay operation input selection | PH, rtd | LIVE | See 4.11 | 4 |
| AL *x* LAtch | Alarm relay latching operation | Auto, LAtch | Auto | See 4.11 | 4 |

(*__Optional__)—this function will only be accessible if the relevant option is fitted

## 4.2 Analog output 1 function table

| Display | Function | Range | Default | Your record | Access level |
|---|---|---|---|---|---|
| rO 1 OutPt | Output selection for analog output 1. Not seen if output is fixed at 4-20mA (*__Optional__) | 4-20, 0-1.0, 0-10 | 4-20 | | 4 |
| rO 1 inPut | Input selection for analog output 1 (*__Optional__) | PH, ORP or rtd | PH | | 4 |
| rO 1 P.Ctl | Analog output 1 PI control on or off (*__Optional__) | no or YES | no | | 4 |
| rO 1 SEtP | Analog output 1 PI control setpoint (*__Optional__) | Any display value | 0 | | 4 |
| rO 1 SPAn | Analog output 1 PI control span (*__Optional__) | Any display value | 1000 | | 4 |
| rO 1 P.G | Analog output 1 PI control proportional gain (*__Optional__) | -32.768 to 32.767 | 1.000 | | 4 |
| rO 1 I.G | Analog output 1 PI control integral gain (*__Optional__) | -32.768 to 32.767 | 0.000 | | 4 |
| rO 1 I.H | Analog output 1 PI control integral high limit (*__Optional__) | 0.0 to 100.0 | 1.000 | | 4 |
| rO 1 I.L | Analog output 1 PI control integral low limit (*__Optional__) | 0.0 to 100.0 | 1.000 | | 4 |
| rO 1 bIAS | Analog output 1 PI control bias (*__Optional__) | 0.0 to 100.0 | 50.0 | | 4 |
| rO 1 Lo | Analog output 1 option low display value (*__Optional__) | Any display value | 0 | | 4 |
| rO 1 Hi gh | Analog output option high display value (*__Optional__) | Any display value | 1000 | | 4 |

(*__Optional__)—this function will only be accessible if the relevant option is fitted

## 4.3 Analog output 2 function table

| Display | Function | Range | Default | Your record | Access level |
|---|---|---|---|---|---|
| r02 OutPt | Output selection for analog output 2 (*Optional) | 4-20, 0- 1.0 or 0- 10 | 4-20 | | 4 |
| r02 InPut | Input selection for analog output 2 (*Optional) | PH, ORP or rtd | PH | | 4 |
| r02 P.Ctl | Analog output 2 PI control on or off (*Optional) | no or YES | no | | 4 |
| r02 SEtP | Analog output 2 PI control setpoint (*Optional) | Any display value | 0 | | 4 |
| r02 SPAn | Analog output 2 PI control span (*Optional) | Any display value | 1000 | | 4 |
| r02 P.G | Analog output 2 PI control proportional gain (*Optional) | -32.768 to 32.767 | 1.000 | | 4 |
| r02 I .G | Analog output 2 PI control integral gain (*Optional) | -32.768 to 32.767 | 0.000 | | 4 |
| r02 I .H | Analog output 2 PI control integral high limit (*Optional) | 0.0 to 100.0 | 1.000 | | I .H |
| r02 I .L | Analog output 2 PI control integral low limit (*Optional) | 0.0 to 100.0 | 1.000 | | 4 |
| r02 bIAS | Analog output 2 PI control bias (*Optional) | 0.0 to 100.0 | 50.0 | | 4 |
| r02 Lo | Analog output 2 option low display value (*Optional) | Any display value | 0 | | 4 |
| r02 HIGh | Analog output option high display value (*Optional) | Any display value | 1000 | | 4 |

(*Optional)—this function will only be accessible if the relevant option is fitted

## 4.4 Input function table

| Display | Function | Range | Default | Your record | Access level |
|---|---|---|---|---|---|
| InPut InPut tYPE | Input type | PH or ORP | PH | | CAL |
| InPut dCPt | Decimal point selection | 0 to 0.003 | 0 | | CAL |
| InPut drnd | Display rounding selection | 0.01 to 50.00 | 0 | | 4 |
| InPut FLtr | Digital filter | 0, 1, 2, 3, 4, 5, 6, 7, 8 | 2 | | 4 |

(*Optional)—this function will only be accessible if the relevant option is fitted

| | | | | | |
|---|---|---|---|---|---|
| inPut inPut POL | Input polarity | POS or NEG | POS | | CAL |
| inPut OFSt CAL | pH/ORP offset calibration | n/a | n/a | | CAL |
| inPut CAL 1 | pH/ORP calibration point 1 | n/a | n/a | | CAL |
| inPut CAL2 | pH/ORP offset calibration point 2 | n/a | n/a | | CAL |
| inPut U.CAL | pH/ORP uncalibration | n/a | n/a | | CAL |
| inPut GrAb CAL | pH/ORP grab calibration sample | n/a | n/a | | 2 |
| inPut GrAb SCALE | pH/ORP grab calibration sample scaling value | Any display value | n/a | | 2 |
| inPut GrAb | pH/ORP grab calibration on/off | OFF or ON | n/a | | CAL |

(*__Optional__)—this function will only be accessible if the relevant option is fitted

## 4.5 Bargraph display function table

| Display | Function | Range | Default | Your record | Access level |
|---|---|---|---|---|---|
| bArG Ch | Bargraph channel | PH or rtd | PH | | 4 |
| bArG tYPE | Bargraph type | bAr, S.dot, d.dot. c.bAr or r.dot | bAr | | 4 |
| bArG Lo | Bargraph low value | Any display value | 0 | | 4 |
| bArG Hi | Bargraph high value | Any display value | 1000 | | 4 |

(*__Optional__)—this function will only be accessible if the relevant option is fitted

## 4.6 Temperature sensor function table

| Display | Function | Range | Default | Your record | Access level |
|---|---|---|---|---|---|
| rtd tYPE | Temperature sensor type | NONE, 100, 1000 | 1000 | | CAL |

(*__Optional__)—this function will only be accessible if the relevant option is fitted

| | | | | | |
|---|---|---|---|---|---|
| rtd dEF °C | Manual temperature setting | -40.0 to 160.0 | 25.0 | | CAL |
| rtd U.CAL | Temperature uncalibration | no or YES | no | | CAL |
| rtd CAL 1 | First calibration point for temperature input | n/a | n/a | | CAL |
| rtd CAL2 | Second calibration point for temperature input 1 | n/a | n/a | | CAL |

(*__Optional__)—this function will only be accessible if the relevant option is fitted

## 4.7 P button and remote input function table

| Display | Function | Range | Default | Your record | Access level |
|---|---|---|---|---|---|
| F.I nP P.but | Front P button operation mode | NONE .P.Hi . P.Lo .Hi .Lo or AL.Ac | NONE | | 4 |
| F.I nP F.I n. 1 | Remote input 1 operation mode | NONE . P.Hold . d.Hold . P.Hi .P.Lo . Hi .Lo . AL.Ac . ACCSS or dual | NONE | | 4 |
| F.I nP F.I n.2 | Remote input 2 operation mode | NONE . P.Hold . d.Hold . P.Hi .P.Lo . Hi .Lo .AL.Ac or ACCSS | NONE | | 4 |

(*__Optional__)—this function will only be accessible if the relevant option is fitted

## 4.8 Remote signal level (digital inputs)

| Display | Function | Range | Default | Your record | Access level |
|---|---|---|---|---|---|
| d.I n d.I n. 1 P.UP | Remote input (digital inputs) 1 pull up/down operation | OPEn, Hi 9h, Lo | Hi 9h | | 4 |
| d.I n d.I n. 1 LuI | Remote input (digital inputs) 1 input level | Hi 9h, Lo | Hi 9h | | 4 |

(*__Optional__)—this function will only be accessible if the relevant option is fitted

| | | | | | |
|---|---|---|---|---|---|
| d.i n<br>d.i n.2<br>P.UP | Remote input (digital inputs) 2 pull up/down operation | OPEn, Hi 9h, Lo | Hi 9h | | 4 |
| d.i n<br>d.i n.2<br>Lui | Remote input (digital inputs) 2 input level | Hi 9h, Lo | Hi 9h | | 4 |

(*__Optional__)—this function will only be accessible if the relevant option is fitted

## 4.9 Access modes function table

| Display | Function | Range | Default | Your record | Access level |
|---|---|---|---|---|---|
| ACCES<br>EASY<br>LEVEL | Easy access mode | nONE, 1, 2, 3, 4, 5, 6, CAL | nONE | | S.CAL |
| ACCES<br>r.i nPt<br>LEVEL | Remote input access mode | nONE, 1, 2, 3, 4, 5, 6, CAL | nONE | | S.CAL |
| ACCES<br>USr. 1<br>Pi n | PIN code 1 | 0 to 50000 | 0 | | S.CAL |
| ACCES<br>USr. 1<br>LEVEL | PIN code 1 access level | nONE, 1, 2, 3, 4, 5, 6, CAL | nONE | | S.CAL |
| ACCES<br>USr.2<br>Pi n | PIN code 2 | 0 to 50000 | 0 | | S.CAL |
| ACCES<br>USr.2<br>LEVEL | PIN code 2 access level | nONE, 1, 2, 3, 4, 5, 6, CAL | nONE | | S.CAL |
| ACCES<br>Fn. 1<br>CodE | User assignable access function 1 | 0000 to FFFF hex. | 0000 | | S.CAL |
| ACCES<br>Fn. 1<br>LEVEL | User assignable access 1 level value | dFLt, 1, 2, 3, 4, 5, 6, CAL, S.CAL | dFLt | | S.CAL |
| ACCES<br>Fn.2<br>CodE | User assignable access function 2 | 0000 to FFFF hex. | 0000 | | S.CAL |
| ACCES<br>Fn.2<br>LEVEL | User assignable access 2 level value | dFLt, 1, 2, 3, 4, 5, 6, CAL, S.CAL | dFLt | | S.CAL |
| ACCES<br>Fn.3<br>CodE | User assignable access function 3 | 0000 to FFFF hex. | 0000 | | S.CAL |

(*__Optional__)—this function will only be accessible if the relevant option is fitted

| | | | | | |
|---|---|---|---|---|---|
| ACCES Fn.3 LEVEL | User assignable access 3 level value | dFlt, 1, 2, 3, 4, 5, 6, CAL, S.CAL | dFlt | | S.CAL |
| ACCES Fn.4 CodE | User assignable access function 4 | 0000 to FFFF hex. | 0000 | | S.CAL |
| ACCES Fn.4 LEVEL | User assignable access 4 level value | dFlt, 1, 2, 3, 4, 5, 6, CAL, S.CAL | dFlt | | S.CAL |

(*__Optional__)—this function will only be accessible if the relevant option is fitted

## 4.10 Serial output function table

| Display | Function | Range | Default | Your record | Access level |
|---|---|---|---|---|---|
| SEri OPEr | Serial operation mode (*__Optional__) | nonE.Cont. Poll .A.buS or dISP | nonE | | 4 |
| SEri bAud | Serial baud rate (*__Optional__) | 1200, 2400, 4800, 9600, 19.2, 38.4, 57.6, 115.2 | 9600 | | 4 |
| SEri PrtY | Serial parity (*__Optional__) | 8n, 8E, 8O, 7E, 7O | 8n | | 4 |
| SEri Unit Addr | Serial address (*__Optional__) | 1 to 127 | 1 | | 4 |

(*__Optional__)—this function will only be accessible if the relevant option is fitted

## 4.11 Relay table

Record your relay settings in the table below

| Display | Relay 1 | Relay 2 | Relay 3 | Relay 4 | Relay 5 | Relay 6 | Relay 7 |
|---|---|---|---|---|---|---|---|
| HI SP | | | | | | | |
| LO | | | | | | | |
| HYST | | | | | | | |
| TR IP | | | | | | | |
| FST | | | | | | | |
| FLY | | | | | | | |
| TRAIL | | | | | | | |
| OPER | | | n/a | n/a | n/a | n/a | n/a |
| CH | | | | | | | |
| LATCH | | | | | | | |
| SPAN | | | n/a | n/a | n/a | n/a | n/a |
| SETP | | | n/a | n/a | n/a | n/a | n/a |
| P.9 | | | n/a | n/a | n/a | n/a | n/a |
| I.9 | | | n/a | n/a | n/a | n/a | n/a |
| I.H | | | n/a | n/a | n/a | n/a | n/a |
| I.L | | | n/a | n/a | n/a | n/a | n/a |
| BIAS | | | n/a | n/a | n/a | n/a | n/a |
| DUTY SECS | | | n/a | n/a | n/a | n/a | n/a |
| ON SECS | | | n/a | n/a | n/a | n/a | n/a |

# 5 Calibration

## 5.1 Introduction

The calibration of the display is necessary to match the pH or ORP sensor to the instrument. Since the output from pH and ORP sensors changes over time regular calibration will be necessary. The period between calibration checks and recalibration will depend on the process being measured and the quality requirements of the application.

If calibration problems occur a basic check of the electrode and display the instrument can be uncalibrated using the **INPUT U.CAL** function. Once uncalibrated place the electrode in a known pH or ORP solution. If the reading is not close to the known value then there is no point in attempting calibration, the electrode, wiring and display should be examined separately.

If a temperature compensation sensor is used it is essential that the temperature input is reading correctly before performing a pH calibration. If necessary calibrate the temperature input before the pH input.

Various methods of pH and ORP calibration methods are available in the PM5-PH, a brief outline is given below:

- Two point calibration using the **CAL 1** function together with the **CAL2** function sets the calibration slope.
- A single point offset calibration can be carried out using the **OFST CAL** function. An offset calibration will adjust values across the calibration slope.
- A "grab sample" single point calibration can carried out using the **GRAB CAL**. The grab sample method allows a measurement to be taken and stored in memory whilst the sample in analysed. The value of the sample can then be entered some time later.
- The calibration memory can be cleared using the **U.CAL**. The clearing of the calibration memory can be useful prior to a two point calibration to ensure that spurious values in memory entered by previous failed calibrations are cleared before the new two point calibration is attempted.

## 5.2 pH or ORP Calibration

### 5.2.1 Two point calibration

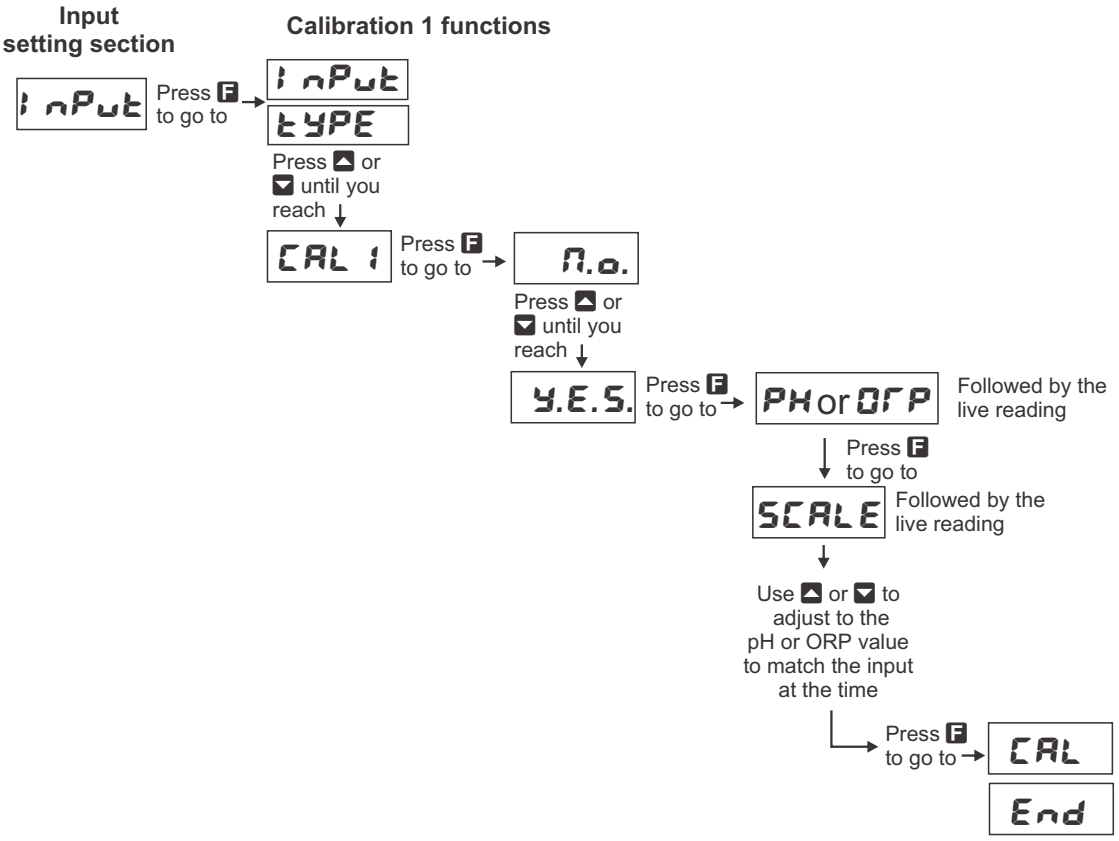
**CAL 1** and **CAL2** functions are used together to scale the instruments display for pH or Redox. Two calibration buffer solutions will be required e.g. 4.00 and 7.00 pH buffers. The **CAL 1** function sets the first calibration point. The procedure for entering the first scaling point is:

1. If a temperature sensor is used check that the temperature reading is correct. If it is not correct perform a temperature calibration using function **CAL 1** and **CAL2** before proceeding. If a temperature sensor is not used then check that the default temperature setting (function **DEF °C**) is set correctly before proceeding.
2. Place a cleaned and dabbed dry probe into the first buffer solution e.g. 4.00 pH (use distilled water for cleaning the probe).
3. Enter the setup functions and go to the **INPUT** section. Press **F** to enter the input function section then press and release ⏏ until the **CAL 1** function is reached.

4. At the CAL 1 function press F. The display will indicate NO, press the ▲ button to change this to YES then press the F button. The display will show PH or ORP depending on the input type followed the live input value. Do not be concerned at this stage if the live input display value is not the pH or ORP value required. Allow time for the reading to stabilise. It is important that the live input value seen is a steady value. If the reading does not stabilise then the input needs to be investigated before proceeding with the scaling.

5. Press, then release the F button. The display will indicate SCALE followed by a value. Use the ▲ or ▼ button to change this value to the buffer value at this input. e.g. 4.00 for a 4.00 pH buffer. Press the F button to accept changes.

### pH/ORP calibration point 1 flow chart




### CAL 2 Second scaling point for 2 point scaling method

The second point scaling is performed in exactly the same manner as CAL 1. It is essential that the second buffer is different in value to the one used for the CAL 1 input. Start at the CAL 2 function and follow the same procedure as above.

### 5.2.2 Offset calibration

The offset calibration offers a single point adjustment across the whole pH or Redox calibration slope. The offset procedure can be used to adjust the reading when the same error exists at all readings e.g. reading 0.5 pH high.

1. Place a cleaned and dabbed dry into the sample or buffer of known value.

2. Enter the setup functions and go to the **InPut** section. Press **F** to enter the input function section then press and release ▲ until the **OFSt CAL** function is reached.

3. The display will indicate **nO**, press the **F** button to to enter the offset function then use the ▲ button to change the **nO** to **YES** then press the **F** button. The display will show **PH** or **ORP** depending on the input type followed the live input value.

4. Press the **F** button. The display will show **OFSt CAL** followed by a value. Use the ▲ or ▼ pushbutton to enter the display value required for this sample. Press the **F** button to accept this new value, the display should show the message **OFSt End** to indicate that the offset has been accepted.

### 5.2.3 Grab sample calibration

The grab sample calibration method can be used to provide a single point offset calibration. This method allows a sample to be taken and the input at that time stored in memory. The sample can then be analysed and the value for this sample entered at a later time. The grab sample offset calibration method operates as follows:

1. Set the **GrAb** function to **On**. Press the **F** button to accept the change.

2. When ready to perform a grab sample calibration ensure that the electrode is in the solution to be measured. Go to the **GrAb CAL** function and press **F** pushbutton then the ▲ pushbutton to select **YES** then press the **F** button to accept the change.

3. A live pH or ORP reading will now be displayed. When the reading has settled to a steady value press the **F** button. The pH or ORP value for that sample will now be stored in memory. The message **GrAb End** will be seen and the display will move to the **GrAb SCLE** function.

4. When the sample has been analysed or checked with a reference meter if any adjustment to the display reading is needed the true value for the sample can be entered at the **GrAb SCLE** function.

5. At the **GrAb SCLE** function press the **F** to allow the value to be adjusted. A value will be seen. Adjust this value to the required value for the sample using the ▲ or ▼ button.

6. When the required value is displayed press the **F** button to accept the new value, the message **GrAb dONE** will be displayed and the calibration will now be adjusted to the new value.

## 5.3 pH or ORP Uncalibration

This function sets the instrument calibration back to the factory calibrated value. Uncalibration is used as a reset when an error exists due to incorrect calibration. The uncalibration procedure is as follows:

1. Enter the setup functions and step through the functions until the **InPut** section is reached. Press **F** enter this section and then press and release the ▲ pushbutton until **U.CAL** is displayed.

2. Press **F** the display will show the message **no**. Use the ▲ or ▼ pushbutton to toggle this to **YES** then press **F** to accept this. The display will show the message **UCAL End** to indicate that the uncalibration is complete.

## 5.4 Temperature Calibration

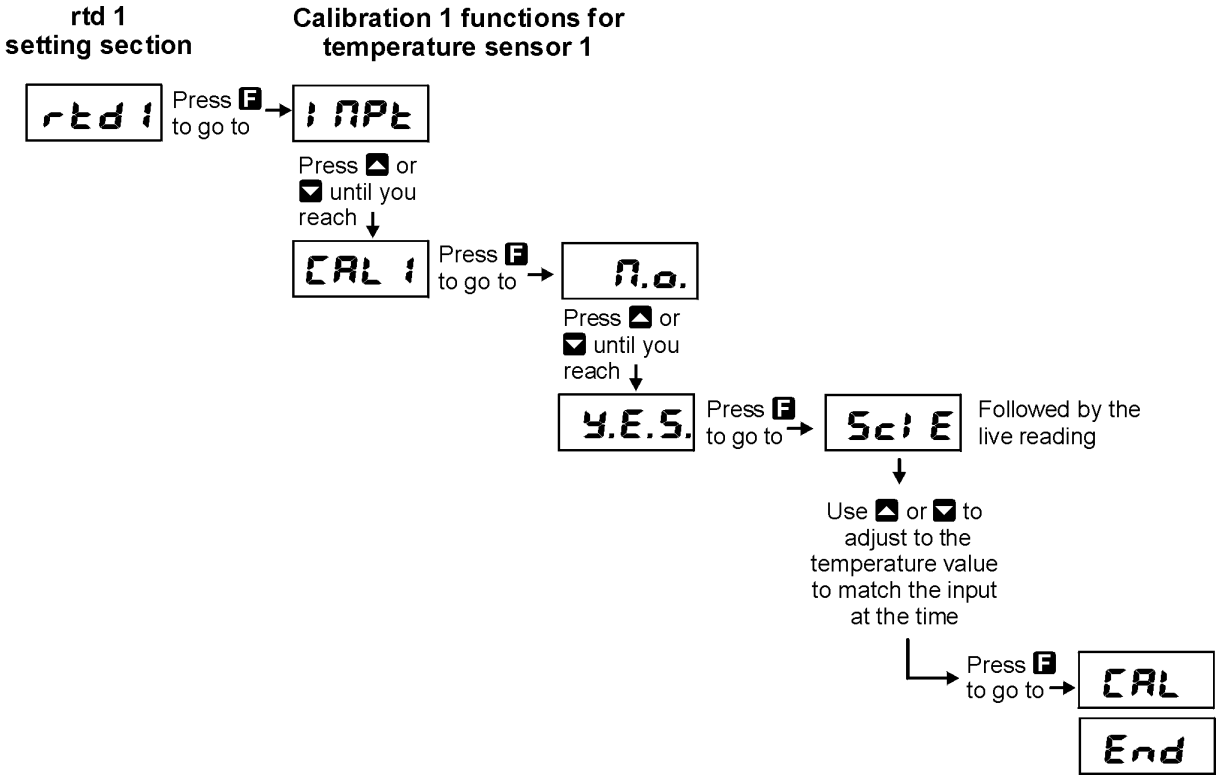
A two point calibration is provided for temperature sensors. The two point calibration requires that the sensor is allowed to stabilise at two known temperatures. Ideally the temperatures chosen should span the normal temperature measurement range of the process being measured. A minimum difference of 25 degrees C between temperature calibration points is recommended.

The calibration procedure is as follows:

**First calibration point**

1. Place the sensor to be calibrated at a known low temperature and allow 5 minutes to stabilise.
2. Enter the setup functions and step through the functions until the temperature section is reached i.e. rtd. Press F to access the channel setup and then press and release the ▲ pushbutton until CAL 1 is displayed.
3. Press F the display will show the message no. Use the ▲ or ▼ pushbutton to toggle this to YES then press F to accept this. The display will show the temperature. When the temperature is stable press F.
4. The display will show the message SCALE followed by a value. Use the ▲ or ▼ pushbuttons to adjust the value to the known low temperature value. Then press F to accept this.
5. The display will show the message CAL End to indicate that the first calibration point has been accepted.

**Channel 1 temperature calibration point 1 flow chart**




**Second calibration point**

1. Once the first calibration point has been completed place the sensor in a second temperature environment and allow 5 minutes for the temperature to stabilise.

2. Enter the setup functions and step through the functions until the temperature section is reached i.e. rtd. Press F to access the channel setup and then press and release the ▲ pushbutton until  is displayed.

3. Press F the display will show the message no. Use the ▲ or ▼ pushbutton to toggle this to YES then press F to accept this. The display will show the temperature. When the temperature is stable press F.

4. The display will show the message SCALE followed by a value. Use the ▲ or ▼ pushbuttons to adjust the value to the known low temperature value. Then press F to accept this.

5. The display will show the message CAL End to indicate that the second calibration point has been accepted.

## 5.5 Temperature Uncalibration

This function sets the instrument calibration back to the factory calibrated value. Uncalibration is used as a reset when an error exists due to incorrect calibration. The uncalibration procedure is as follows:

1. Enter the setup functions and step through the functions until the emperature section is reached i.e. rtd.. Press F to access the channel setup and then press and release the ▲ pushbutton until  is displayed.

2. Press F the display will show the message no. Use the ▲ or ▼ pushbutton to toggle this to YES then press F to accept this. The display will show the message UCAL End to indicate that the uncalibration is complete.

# 6 Specifications

## 6.1 Technical Specifications

| | |
|---|---|
| Input: | pH - any electrode where Eo=7<br>Redox - any standard Redox (ORP) electrode<br>(-1100mV to 1100mV nominal standard,<br>extended range -2000mV to 2000mV to special order) |
| Temperature input: | 100Ω RTD, 1000Ω RTD or manually set |
| Impedance: | Greater than $10^{10}\Omega$ |
| Measuring range: | 0.00 to 14.00pH,±1100mV for Redox and-40 to 160$^o$C for temperature. |
| Accuracy: | pH ±0.03 pH , Redox ±5mV standard or ±10mV for extended range,<br>temperature ±1$^o$C |
| Sample Rate: | 8 samples per second. |
| Ambient Temperature: | LED -10 to 60$^o$C,<br>LCD -10 to 50$^o$C |
| Humidity: | 5 to 95% non condensing |
| Display: | LED Models 4 digit 20mm,<br>5 digit 14.2mm + status LEDs + 4 way keypad.<br>6 digit 14.2mm + 4 way keypad.<br>LED Bar Graph 20 segment bar + 5 digit 7.6mm LED<br>plus relay status LEDs<br>LCD and 4 digit LED displays are available for computer or remote<br>keypad only setup and calibration |
| Power Supply: | AC 240V, 110V, 48V, 32V or 24V 50/60Hz or<br>DC isolated wide range 12 to 48V.<br>Note: supply type is factory configured |
| Power Consumption: | AC supply 4 VA max, DC supply typically 160mA at 12V,<br>80mA at 24V (basic model with no output options) |
| Output (standard): | 1 x relay, Form A rated 5A at 240VAC resistive load |
| Relay Action: | Programmable N.O. or N.C. On/off alarm/control or PI control<br>(pulse width or frequency) |

## 6.2 Output Options

| | |
|---|---|
| Extra Relays: | 1, 2, or 3 extra relays (form A, 3A @ 240VAC)<br>First extra relay configurable as On/off alarm/control or PI control<br>6 extra relays (form A, 2A @ 240VAC)<br>5 extra relays (form A, 2A @ 240VAC) available only with serial retransmission |
| Analog Retransmission: | Isolated 12 bit 4-20mA output only single or dual channel or<br>16 bit single or dual channel 4-20mA, 0 to 1V or 0 to 10V analog output options<br>4 to 20mA output can drive into 800Ω load maximum<br>Analog output 1 can be set for retransmission or PI control<br>Analog output 2 retransmission or PI control |
| Serial Communications: | RS232 or RS485 or Ethernet |

Output options are available in certain combinations e.g. Analog output plus extra relay, contact supplier for details.

## 6.3 Physical Characteristics

| | |
|---|---|
| Bezel Size: | DIN 48mm x 96mm x 10mm Case Size: 44mm x 91mm x 120mm behind face of panel |
| Panel Cut Out: | 45mm x 92mm +1mm and -0mm |
| Connections: | Plug in screw terminals (max 1.5mm wire) |
| Weight: | 400 gms Basic model, 450 gms with option card |

# 7 Guarantee and service

The product supplied with this manual is guaranteed against faulty workmanship for a period of two years from the date of dispatch.

Our obligation assumed under this guarantee is limited to the replacement of parts which, by our examination, are proved to be defective and have not been misused, carelessly handled, defaced or damaged due to incorrect installation. This guarantee is VOID where the unit has been opened, tampered with or if repairs have been made or attempted by anyone except an authorised representative of the manufacturing company.

Products for attention under guarantee (unless otherwise agreed) must be returned to the manufacturer freight paid and, if accepted for free repair, will be returned to the customers address in Australia free of charge.

When returning the product for service or repair a full description of the fault and the mode of operation used when the product failed must be given. In any event the manufacturer has no other obligation or liability beyond replacement or repair of this product.

Modifications may be made to any existing or future models of the unit as it may deem necessary without incurring any obligation to incorporate such modifications in units previously sold or to which this guarantee may relate.



This product is designed and manufactured in Australia.