

## PM4-LN2

2 Channel Input  
4-20mA, 0-1V, 0-10V or 0-100V  
Dual 30 point Lineariser/  
Arithmetic Process Monitor/  
Scanning Monitor

Operation and Instruction Manual

---

**AMALGAMATED INSTRUMENT CO** PTY LTD ACN 001 589 439

Unit 5/28 Leighton Place Telephone: (02) 9476 2244 [www.aicpl.com.au](http://www.aicpl.com.au)  
Hornsby NSW 2077 Australia Facsimile: (02) 9476 2902 E-mail: [sales@aicpl.com.au](mailto:sales@aicpl.com.au)

Quality  
Endorsed  
Company



AS/NZS  
ISO 9001  
Lic. No.  
QEC 6187  
Standards  
Australia

---

## Table of Contents

---



|   |           |
|---|-----------|
| <b>Introduction</b> . . . . .               | <b>3</b>  |
| <b>Mechanical Installation</b> . . . . .    | <b>4</b>  |
| <b>Electrical Installation</b> . . . . .    | <b>5</b>  |
| Wiring examples . . . . .                   | 6         |
| <b>Explanation of Functions</b> . . . . .   | <b>7</b>  |
| <b>Function Table</b> . . . . .             | <b>21</b> |
| <b>Calibration</b> . . . . .                | <b>23</b> |
| <b>Mathematical Functions</b> . . . . .     | <b>25</b> |
| <b>Lineariser tables</b> . . . . .          | <b>26</b> |
| <b>Input/Output Configuration</b> . . . . . | <b>27</b> |
| <b>Hardware Configuration</b> . . . . .     | <b>28</b> |
| Selecting the input range . . . . .         | 28        |
| <b>Specifications</b> . . . . .             | <b>29</b> |
| Technical Specifications . . . . .          | 29        |
| Output Options . . . . .                    | 29        |
| Physical Characteristics . . . . .          | 29        |
| <b>Guarantee and Service</b> . . . . .      | <b>30</b> |



---



# 1 Introduction

---

This manual contains information for the installation and operation of the PM4-LN2 dual input, dual lineariser monitor with arithmetic or scanning functions. The PM4 is a special purpose instrument which may be configured to accept one or two inputs of DC volts or 4 to 20 mA DC. Two 30 point lineariser tables are provided, one for each input. In addition to linear or linearised display two basic modes of operation are available, namely arithmetic and scanning modes. In arithmetic mode the instrument may be programmed to perform an arithmetic function on inputs and provide a resultant display in engineering units. In scanning mode the inputs are individually scanned and the display set to automatically scroll between channels at a user programmable rate. A standard inbuilt relay provides an alarm/control function, extra relays (up to 3 extra), serial communications, analog retransmission (single or dual channel) and excitation voltage may also be optionally provided.

In arithmetic mode the primary display (channel 0) is the result of the arithmetic function performed by the instrument. Each channel (0 to 2 if two inputs are used) may be individually displayed via the  or  pushbutton. Any arithmetic scaling of each input via **EA** etc. functions will not be seen when the individual channel is viewed but will affect the arithmetic result.

In scanning mode the display can be set to automatically scan between channels or to be manually scanned via the  or  pushbutton.

In both arithmetic and scan modes the input value can be viewed when the display is powered up in **CAL** mode (see "Explanation of functions" chapter). When powered up in **CAL** mode the  and  buttons can be used to view each channel e.g. **Ch 1** and also the input value e.g. **IN 1**. The input value is useful particularly when the lineariser for that channel is viewed since it allows the operator to view the scaled input value (set as the **P** values in the table) and the channel value (set as the **Y** values in the table). Viewing both of these and comparing the values to those set in the lineariser table can give a good indication as to what is occurring at the input if the display value is suspect e.g. if the display is calibrated in mA and the **Y** values are in litres the operator can view the litres display by viewing **Ch 1** or **Ch 2** and compare this to the mA display shown by **IN 1** or **IN 2**.

In arithmetic mode the arithmetic result displayed will assume that each input channel has the same number of decimal points as the result (**Ch 0**). For example for arithmetic addition if **Ch 0** has no decimal points but **Ch 1** & **Ch 2** are displayed with 1 decimal point then **100.0** plus **50.0** would give a result on **Ch 0** of **1500**. Likewise if the alarm relays or analog retransmission is set to operate from Ch 0 then all decimal point places will be assumed to be the same as **Ch 0** (set by the **dCPE** function).

Unless otherwise specified at the time of order, your PM4 has been factory set to a standard configuration. Like all other PM4 series instruments the configuration and calibration is easily changed by the user. Initial changes may require dismantling the instrument to alter PCB links, other changes are made by push button functions.

Note: the three input channels share a common ground. If this presents a problem, then a separate analog isolator should be used.

This versatile PM4 has various front panel options, therefore in some cases the pushbuttons may be located on the front panel as well as the standard rear panel configuration.

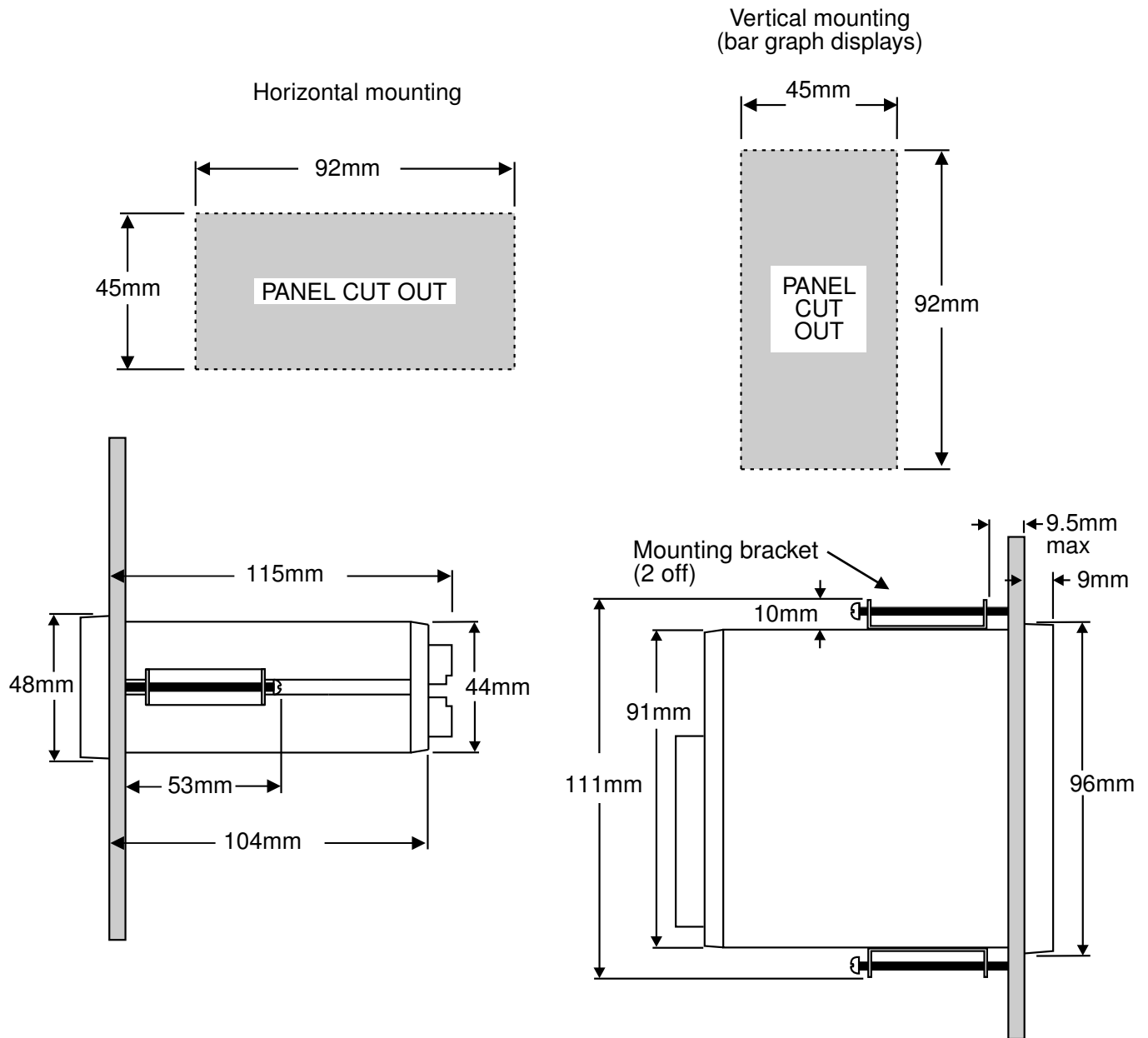
The PM4 series of Panel Mount Monitors are designed for high reliability in industrial applications. The high brightness LED display provides good visibility, even in areas with high ambient light levels. The high contrast LCD displays provide good visibility and are ideal for battery powered applications.

## 2 Mechanical Installation

If a choice of mounting sites is available then choose a site as far away as possible from sources of electrical noise such as motors, generators, fluorescent lights, high voltage cables/bus bars etc. An IP65 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. Then, 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.

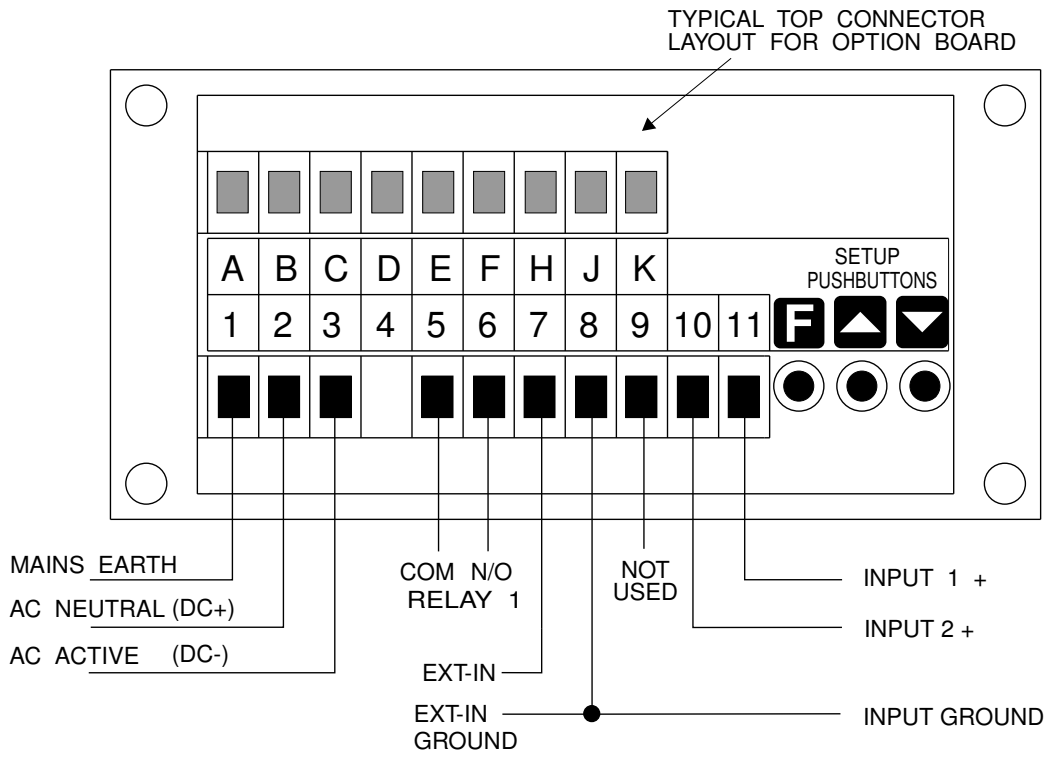


### 3 Electrical Installation

The PM4 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 terminal blocks allow for wires of up to 2.5mm<sup>2</sup> to be fitted. Connect the wires to the appropriate terminals as indicated below. Refer to other details provided in this manual to confirm proper selection of voltage, polarity and input type before applying power to the instrument. When power is applied to the instrument will cycle through a display sequence indicating the software version and other status information, this indicates that the instrument is functioning. Acknowledgment of correct operation may be obtained by applying an appropriate input to the instrument and observing the reading.

For details of optional output wiring refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted



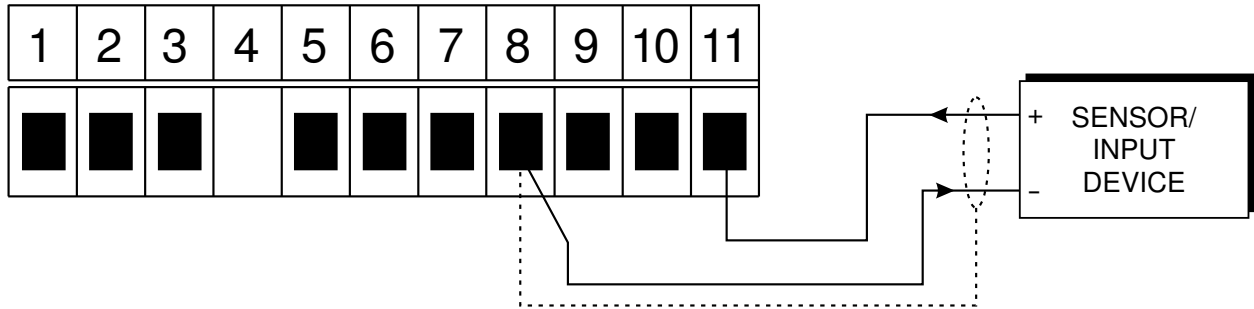
**Instrument Rear Panel**

|                |                |            |
|----------------|----------------|------------|
| 1              | MAINS EARTH    |            |
| 2              | 240VAC NEUTRAL |            |
| 3              | 240VAC ACTIVE  |            |
| 5              | RELAY 1        | COM        |
| 6              | RELAY 1        | N/O        |
| 7              | EXT IN         |            |
| 8              | GROUND         |            |
| 9              |                |            |
| 10             | INPUT 2        | +          |
| 11             | INPUT 1        | +          |
| PM4-LN2-240-5E |                | SERIAL No: |

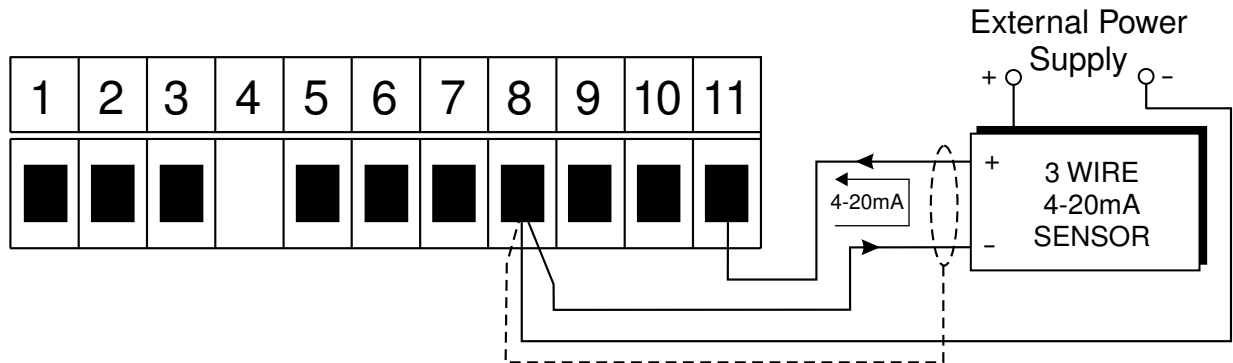
**Instrument Data Label (example)**

### 3.1 Wiring examples

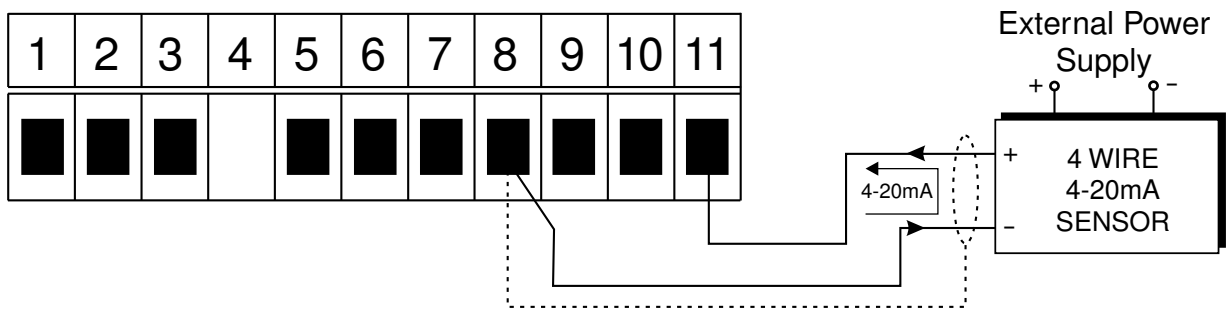
#### 1. DC volts signal input to channel 1



#### 2. 3 wire 4-20mA input to channel 1



#### 3. 4 wire 4-20mA input to channel 1



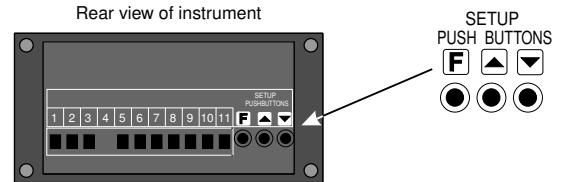
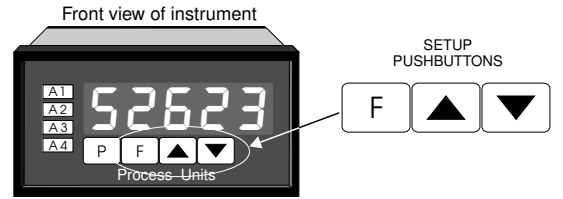
## 4 Explanation of Functions

The PM4 setup and calibration functions are configured through a push button sequence. Two levels of access are provided for setting up and calibrating:-

**FUNE** mode (simple push button sequence) allows access to commonly set up functions such as alarm setpoints.

**CAL** mode (power up sequence plus push button sequence) allows access to all functions including calibration parameters.

The three push buttons located at the rear of the instrument (also at the front on some display options) are used to alter settings. Once **CAL** or **FUNE** mode has been entered you can step through the functions, by pressing and releasing the **F** push button, until the required function is reached. Changes to functions are made by pressing the **▲** or **▼** push button (in some cases both simultaneously) when the required function is reached. See flowchart example on the following page.



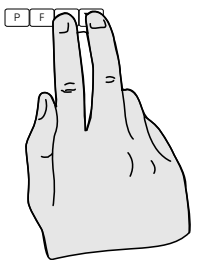
### Entering **CAL** Mode



1. Remove power from the instrument. Hold in the **F** button and reapply power. The display will briefly indicate **CAL** as part of the "wake up messages" when the **CAL** message is seen you can release the button. Move to step 2 below.



2. When the "wake up" messages have finished and the display has settled down to its normal reading press, then release the **F** button. Move to step 3 below.



3. Within 2 seconds of releasing the **F** button press, then release the **▲** and **▼** buttons together. The display will now indicate **FUNE** followed by the first function.

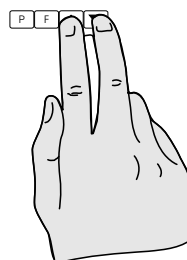
Note: If step 1 above has been completed then the instrument will remain in this **CAL** mode state until power is removed. i.e. there is no need to repeat step 1 when accessing function unless power has been removed.

### Entering **FUNE** Mode

No special power up procedure is required to enter **FUNE** mode.

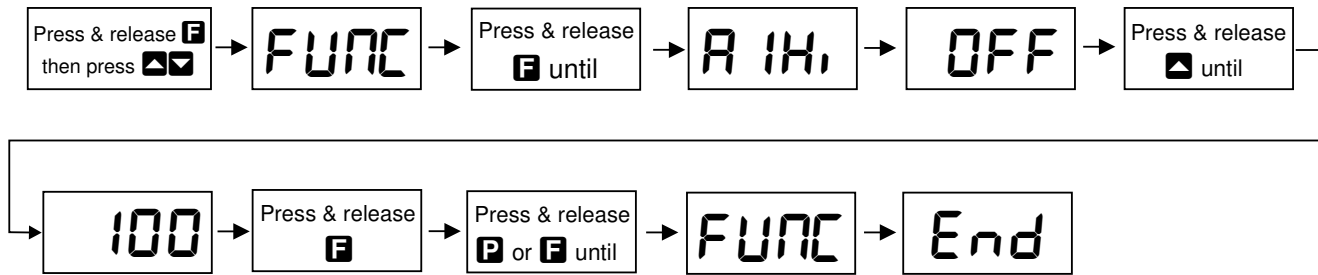


1. When the "wake up" messages have finished and the display has settled down to its normal reading press, then release the **F** button.

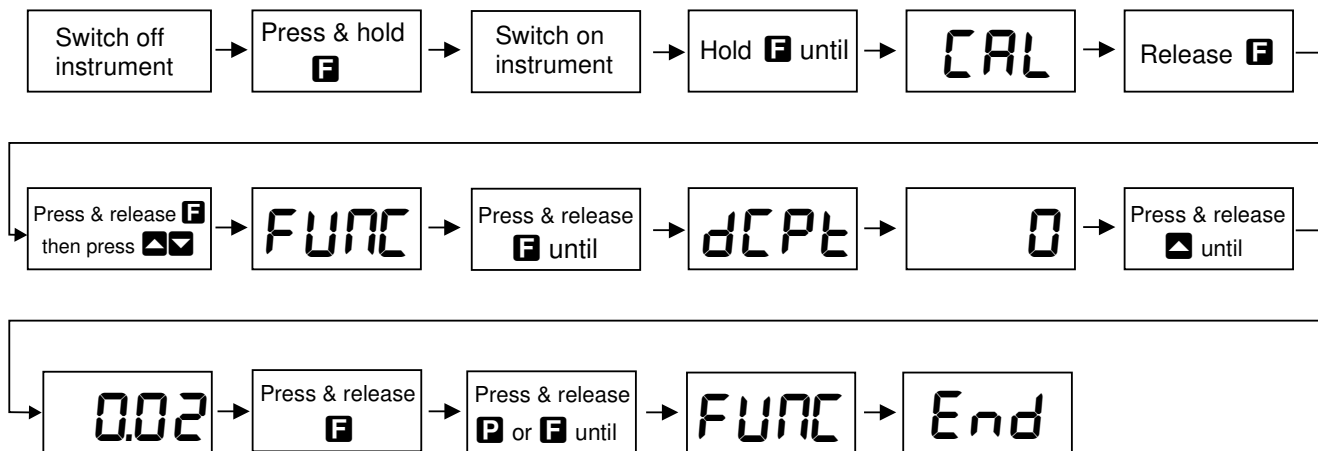


2. Within 2 seconds of releasing the **F** button press, then release the **▲** and **▼** buttons together. The display will now indicate **FUNE** followed by the first function.

Example: Entering **FUNC** mode to change alarm 1 high function **A 1H**, from **OFF** to **100**



Example: Entering **CAL** mode to change decimal point **dCPLt** function from **0** to **0.02**



Note that “x” in the alarm functions is used to indicate any alarm number e.g. if 3 setpoint alarm relays are fitted then **A 1x**, **A 2x** and **A 3x** will all be seen as functions on the display.

The PM4 has an easy alarm access facility which allows access to the alarm setpoints simply by pressing the **F** button at the front or rear of the instrument. The first setpoint will then appear and changes to this setpoint may be made to this setpoint via the **▲** or **▼** buttons. Press the **F** button to accept any changes or to move on to the next setpoint.

The instrument must be set in the manner described below to allow the easy access facility to work:

1. The **F.A.FP** function must be set to **SP.AC** or the **ACCESS** function set to **EASY**.
2. At least one alarm must have a setpoint, nothing will happen if all the alarm setpoints are set to **OFF**.
3. The **SP.AC** function must be set to allow access to the relays required e.g. if set to **A 1-2** then the easy access will work only with alarm relays 1 and 2 even if more relays are fitted.
4. The instrument must be in normal measure mode i.e. if the instrument is powered up so that it is in **CAL** mode then the easy access will not function. If in doubt then remove power from the instrument, wait for a few seconds then apply power again.
5. If the easy access facility is used then the only way to view or alter any other function settings is to power up via **CAL** mode i.e. there is no entry to **FUNC** mode unless the instrument is powered up in **CAL** mode.

### **AxLo** (alarm low setpoint)

Displays and sets the alarm low setpoint value. The low alarm setpoint may be disabled by pressing the **▲** and **▼** pushbuttons simultaneously. When the alarm is disabled the display will indicate **OFF**. The alarm relay will trip when the displayed value is equal to or lower than the **AxLo** setpoint value. The number of decimal points displayed at this function will match those of the selected channel, see **Ax** function.

**RxH. (alarm high setpoint)**

Displays and sets the alarm high setpoint value. The high alarm setpoint may be disabled by pressing the and pushbuttons simultaneously. When the alarm is disabled the display will indicate **OFF**. The alarm relay will trip when the displayed value is equal to or higher than the **RxH.** setpoint value. The number of decimal points displayed at this function will match those of the selected channel, see **Rx** function.

**RxHY (alarm hysteresis [deadband])** - this function will not be seen if both the high and low setpoints are set to **OFF**.

Displays and sets the alarm hysteresis limit and is common for both high and low setpoint values. In the high alarm mode once the alarm is tripped the input must fall below the setpoint value minus the hysteresis value to reset the alarm. In the low alarm mode once the alarm is tripped the input must rise above the setpoint value plus the hysteresis value to reset the alarm. The hysteresis units are expressed in displayed engineering units.

**Rxtt (alarm trip time)** - this function will not be seen if both the high and low setpoints are set to **OFF**.

Displays and sets the alarm trip time and is common for both alarm high and low setpoint values. The trip time is the delay before the alarm will trip. The alarm condition must be present continuously for the trip time period before the alarm will trip. This function is useful for preventing an alarm trip due to short non critical deviations from setpoint. The trip time is selectable over 0 to 60 seconds.

**Rxrt (alarm reset time)** - this function will not be seen if both the high and low setpoints are set to **OFF**.

Displays and sets the alarm reset time and is common for both alarm high and low setpoint values. The reset time is the delay before the alarm will reset after the alarm condition is cleared. The reset time is selectable over 0 to 60 seconds.

**Rxno or Rxc (alarm normally open or normally closed)** - this function will not be seen if both the high and low setpoints are set to **OFF**.

Displays and sets the alarm relay action to normally open (de-energised) or normally closed (energised), when no alarm condition is present.

**Rx.SP or Rx.t:** (relay operation independent setpoint of trailing) - this function will not be seen if both the high and low setpoints are set to **OFF**.

Each alarm may be programmed to operate with an independent setpoint setting or may be linked (or trailing) to operate at a fixed difference to another relay setpoint. The operation is as follows: Alarm 1 (**R1**) is always independent. Alarm 2 (**R2**) may be independent or may be linked to Alarm 1. Alarm 3 (**R3**) may be independent or may be linked to Alarm 1 or Alarm 2. Alarm 4 (**R4**) may be independent or may be linked to Alarm 1, Alarm 2 or Alarm 3. The operation of each alarm is selectable within the Function Setup Mode by selecting, for example, (Alarm 4) **R4.SP** = Alarm 4 normal setpoint or **R4.t 1** = Alarm 4 trailing Alarm 1 or **R4.t 2** = Alarm 4 trailing Alarm 2 or **R4.t 3** = Alarm 4 trailing Alarm 3. For trailing set points the setpoint value is entered as the difference from the setpoint being trailed. If the trailing setpoint is to operate ahead of the prime setpoint then the value is entered as a positive number and if operating behind the prime setpoint then the value is entered as a negative number. For example, with Alarm 2 set to trail alarm 1, if **R1H.** is set to 1000 and **R2H.** is set to 50 then Alarm 1 will trip at 1000 and alarm 2 will trip at 1050 (i.e. 1000 + 50). If Alarm 2 had been set at -50 then alarm 2 would trip at 950 (i.e. 1000 - 50).

See the trailing alarm tables which follow.

| <b>Trailing Alarm Table<br/>Showing Possible Alarm Assignments</b> |               |               |               |
|--|---------------|---------------|---------------|
|  | <b>R2</b>     | <b>R3</b>     | <b>R4</b>     |
| <b>R1</b>  | <b>R2.t 1</b> | <b>R3.t 1</b> | <b>R4.t 1</b> |
| <b>R2</b>  |               | <b>R3.t 2</b> | <b>R4.t 2</b> |
| <b>R3</b>  |               |               | <b>R4.t 3</b> |

**br 9t (display brightness)**

Displays and sets the digital display (brightness). The display brightness is selectable from **0** to **15**, where **0** = lowest intensity and **15** = highest intensity. This function is useful for improving the display readability in dark areas or to reduce the power consumption of the instrument.

**dULL (remote display brightness)** - seen only when **F.I NP** set to **dULL**.

Displays and sets the level for remote input brightness switching, see **F.I NP** function. When the remote input is set to **dULL** the remote input can be used to switch between the display brightness level set by the **br 9t** function and the display brightness set by the **dULL** function. The display brightness is selectable from **0** to **15**, where **0** = lowest intensity and **15** = highest intensity. This function is useful in reducing glare when the display needs to be viewed in both light and dark ambient light levels.

**bAr - (bar graph display low value)**

Displays and sets the bar graph low value. May be independently set anywhere within the display range of the instrument.

Note: The **bAr -** and **bAr +** settings are referenced from the 7 segment display readings for channel 0 i.e. the result of the arithmetic operation, not the bargraph scale values. The bargraph scale may scaled independently of the 7 segment display, as shown on the right where bargraph scale is 0 to 100 yet the display is showing **675.3**.

The bargraph is available as a 20 segment straight bar or 16 segment circular bargraph. See the **bAr tYPE** function which follows for bargraph operation modes, use **r.dot** mode for wind direction circular bargraph.

**bAr + (bar graph high value)**

Displays and sets the bar graph high value. May be independently set anywhere within the display range of the instrument.

**rEE - (recorder/retransmission output low value)**

Seen only when analog retransmission option fitted. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted. Displays and sets the analog retransmission (4-20mA, 0-1V or 0-10V, link selectable) output low value (4mA or 0V) in displayed engineering units. e.g. if it is required to retransmit 4mA when the display indicates **0** then select **0** in this function via the **▲** or **▼** button. In arithmetic mode the retransmission will operate from the result of the arithmetic operation i.e. channel 0. In scanning operation mode the retransmission operation can be set via the **FEC OPE r** and **FEC PLSE** functions. The number of decimal points displayed at this function will match those of the selected channel, see **FEC OPE r** function.

**rEE + (recorder/retransmission output high value)**

Seen only when analog retransmission option fitted. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted. Displays and sets the analog retransmission (4-20mA, 0-1V or 0-10V, link selectable) output high value (20mA, 1V or 10V) in displayed engineering units. e.g. if it is required to retransmit 20mA when the display indicates **500** then select **500** in this function via the **▲** or **▼** button. In arithmetic mode the retransmission will operate from the result of the arithmetic operation i.e. channel 0. In scanning operation mode the retransmission operation can be set via the **FEC OPE r** and **FEC PLSE** functions. The number of decimal points displayed at this function will match those of the selected channel, see **FEC OPE r** function.

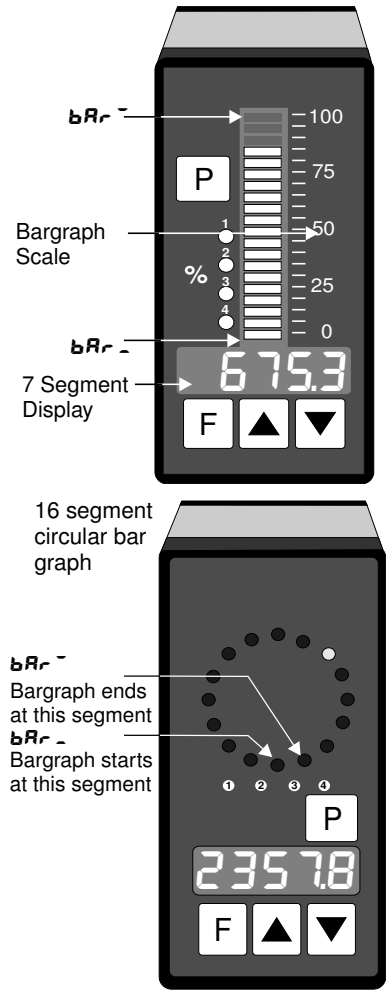
**rEE - Ch 2 (second analog retransmission output low value)**

Seen only in instruments with the dual analog retransmission option. See **rEE -** function above, also see **FEE 2** function which sets the value to be retransmitted e.g. **Ch 2** (channel 2). The number of decimal points displayed at this function will match those of the selected channel, see **FEE 2 OPE r** function.

**rEE + Ch 2 (second analog retransmission output high value)**

Seen only in instruments with the dual analog retransmission option. See **rEE -** function above, also see **FEE 2** function which sets the value to be retransmitted e.g. **Ch 2** (channel 2). The number of decimal points displayed at this function will match those of the selected channel, see **FEE 2 OPE r** function.

The following functions may only be accessed via **CAL** mode only.



## **bAR TYPE (bar graph display operation mode)**

Seen only in bargraph display instruments. Allows selection of bargraph operation mode choices are:

**bAR** - conventional solid bargraph display i.e. all LED's illuminated when at full scale.

When scaling the display use the **bAR<sub>min</sub>** and **bAR<sub>max</sub>** functions e.g. **bAR<sub>min</sub> = 0** and **bAR<sub>max</sub> = 100** will give a bargraph with no segments lit at a 7 segment display reading of **0** and all segments lit with a 7 segment display reading of **100**.

**S.dot** - single dot display. A single segment will be lit to indicate the input readings position on the scale.

When scaling the display use the **bAR<sub>min</sub>** and **bAR<sub>max</sub>** functions e.g. **bAR<sub>min</sub> = 0** and **bAR<sub>max</sub> = 100** will give a bargraph with the bottom segment lit at a 7 segment display reading of **0** and the top segment lit with a 7 segment display reading of **100**.

Note: this could also be set up as a centre zero single dot display by entering a negative value and positive value. e.g. **bAR<sub>min</sub> = -100**. **bAR<sub>max</sub> = 100**.

**d.dot** - double dot display. Two segments will be lit to indicate the input reading position on the scale. The reading should be taken from the middle of the two segments.

When scaling the display use the **bAR<sub>min</sub>** and **bAR<sub>max</sub>** functions e.g. **bAR<sub>min</sub> = 0** and **bAR<sub>max</sub> = 100** will give a bargraph with the bottom two segments lit at a 7 segment display reading of **0** and the top two segments lit with a 7 segment display reading of **100**.

Note: this could also be set up as a centre zero single dot display by entering a negative value and positive value. e.g. **bAR<sub>min</sub> = -100**. **bAR<sub>max</sub> = 100**.

**C.bAR** - centre bar display. The display will be a solid bargraph but will have its zero point in the middle of the display. If the seven segment display value is positive the bargraph will rise. If the seven segment display value is negative then the bargraph will fall. When scaling the display use the **bAR<sub>min</sub>** and **bAR<sub>max</sub>** functions e.g. **bAR<sub>min</sub> = 0** and **bAR<sub>max</sub> = 100** will give a bargraph with all the bottom half segments lit at a 7 segment display reading of **-100** and all the top segments lit with a 7 segment display reading of **100**.

**r.dot** - modulus or wrap around single dot bargraph. This mode of operation allows the bargraph to wrap around the limits set by the **bAR<sub>min</sub>** and **bAR<sub>max</sub>** functions by dividing the 7 segment display by the modulus (the modulus is the difference between 0 and **bAR<sub>max</sub>**) and displaying the remainder. For example if **bAR<sub>min</sub>** is set to **0** and **bAR<sub>max</sub>** is set to **10** then in other bargraph modes when the 7 segment display reads a value such as **25** the bargraph would be stuck at the high limit of its travel since it cannot go beyond 10. In **r.dot** mode the display will wrap around at **10** then continue up the bar again and will be at the midpoint of the bargraph when the 7 segment display shows **25** (as it would for a 7 segment display of **15**, **35**, etc.). In this example for a 7 segment display of **25** the value of 25 is divided by the modulus value of 10 in this example and the remainder displayed i.e. 10 goes into 25 twice with the remainder of 5 and so a bargraph position of 5 is displayed.

As another example if a circular bargraph is used to indicate wind direction then the North (zero degrees) is located at the center of the circular bargraph, not at the beginning. The start of the bargraph is actually South. Therefore when the bargraph points North the 7 segment display will show 180 degrees instead of the required 0 degrees. To overcome this the **r.dot** mode can be used and the **bAR<sub>min</sub>** function set to **-180** with the **bAR<sub>max</sub>** function set to **180**. This will give the required 360° bargraph travel with a North indication at zero degrees. e.g. if the 7 segment display shows **225** then the modulus of 180 goes into 225 once with the remainder of 45 so the circular bargraph will indicate exactly mid South West i.e. 45° from the start of the bargraph which is South.

## **bAR OPER (bargraph operation mode)**

Displays and sets the bargraph operation mode from the following choices:

**ARth** - bargraph operates from the arithmetic result when in arithmetic mode.

**CH1** - bargraph operates from channel 1 display value.

**CH2** - bargraph operates from channel 2 display value.

### **d r n d (display rounding)**

Displays and sets the display rounding value. This value may be set to 0 - 5000 displayed units. Display rounding is useful for reducing the instrument resolution without loss of accuracy, in applications where it is undesirable to display to a fine tolerance e.g. if set to **10** the instrument will display in multiples of 10).

### **d C P t (decimal point selection, channel 0)**

Displays and sets the decimal point for the arithmetic result channel **C h 0**. By pressing the **▲** or **▼** pushbuttons the decimal point position may be set. The display will indicate as follows: **0** (no decimal point), **0. 1** (1 decimal place), **0.02** (2 decimal places), **0.003** (3 decimal places) etc. (number of decimal places depends on number of display digits).

### **F L t r (digital filter)**

Displays and sets the digital filter value. Digital filtering is used for reducing susceptibility to short term interference. The digital filter range is selectable from **0** to **8**, where 0 = none and 8 = most filtering. A typical value for the digital filter would be 3.

### **C h n o (number of channels)**

Displays and selects the number of input channels used i.e. **1** or **2**. Some display messages are not shown for unused channels.

### **C h 1 d C P t (channel 1 decimal point)**

Displays and sets the decimal point for input channel 1. By pressing the **▲** or **▼** pushbuttons the decimal point position may be set. The display will indicate as follows: **0** (no decimal point), **0. 1** (1 decimal place), **0.02** (2 decimal places), **0.003** (3 decimal places) or **.0004** (4 decimal places). If the linearising table is turned on for channel 1 then the **C h 1 d C P t** function sets the decimal points for the **Y** values in the table.

### **C h 2 d C P t (channel 2 decimal point)**

Displays and sets the decimal point for input channel 2 (as above). If the linearising table is turned on for channel 2 then the **C h 2 d C P t** function sets the decimal points for the **Y** values in the table.

## **Lineariser functions**

The following nine functions are used to set up the lineariser tables. The lineariser is of the X,Y type with space for up to 30 points to be programmed and stored in each table. All points are stored in battery backed memory and will be retained when power is removed. Chapter 8 contains a table in which you can make a permanent written record of the points entered for each table.

The X values for each point will actually be indicated as **P** (e.g. **P 1.P2** etc.) since the seven segment display cannot show an X. The **P** values are normally entered either as a percentage of full scale input or as a direct representation of the input signal e.g. for a 4-20mA input you could either enter 4mA = **0.00** and 20mA = **100.00** or 4mA = **4.00** and 20mA = **20.00**. The value entered into the table must correspond with the initial calibration values **CAL 1** & **CAL 2**. For example if a 4-20mA input is initially scaled to read from **0.00** to **100.00** then you cannot enter these values as **4.00** to **20.00** in the table (without causing errors in the reading). The number of decimal points available for entering **P** values is 1 decimal place for 4 digit displays or 2 decimal places for 5, 6 or 8 digit displays.

The Y values are indicated as **Y** (e.g. **Y 1.Y2** etc.) . These **Y** values represent the display required for the given **P** value entered. For example if **P3 = 25.00** and **Y3 = 1500** then **1500** will be displayed whenever the **25.00** input level is present.

**Y** values to be entered into the lineariser table must be either calculated or measured via a live input. Refer to the "Example" later in this chapter for an example of creating a lineariser table using live inputs.

### **t R b 1 (lineariser table 1 on or off)**

Allows the lineariser table 1 to be switched on (**o n**) or off (**O F F**). If it is switched off then none of the other lineariser 1 functions will be seen on the display and the instrument will either operate as a linear display using the **C h 1 CAL 1** & **C h 1 CAL 2** scaling values.

### **t R b 2 (lineariser table 2 on or off)**

Allows the lineariser table 2 to be switched on (**o n**) or off (**O F F**). If it is switched off then none of the other lineariser 2 functions will be seen on the display and the instrument will either operate as a linear

display using the **CH2CAL 1** & **CH2CAL 2** scaling values.

### **SCALE EB: E (table rounding value - common for table 1 & 2)**

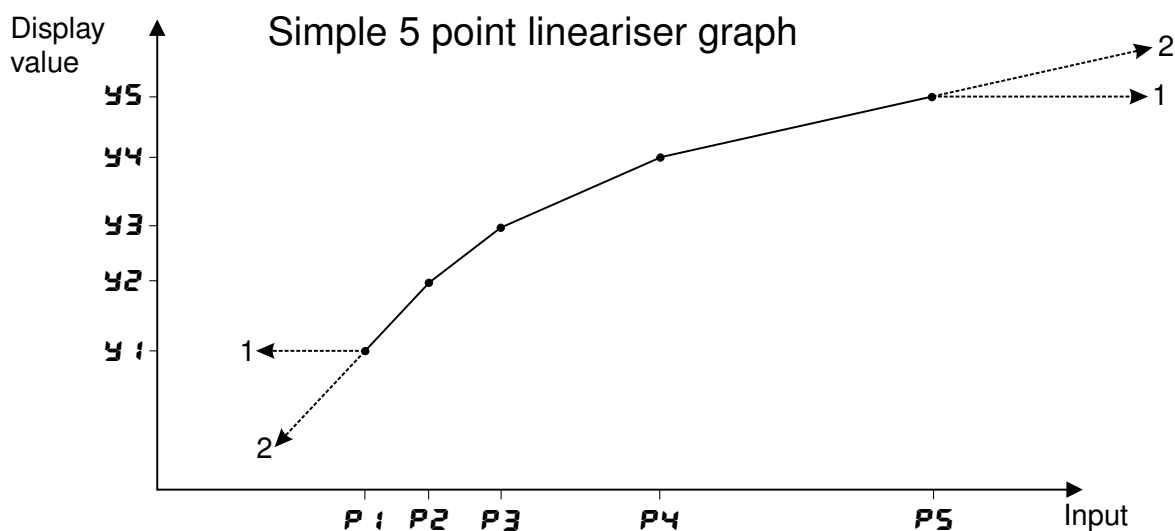
This function allows a rounding value to be set for **Y** entries. Options provided are 1, 2, 5, 10, 20, 25, 50, 100, 250, 500 or 1000. For example if the rounding value is set to 25 then the **Y** entries will jump in steps of 25 i.e. 0, 25, 50, 75 etc. (or 0.00, 0.25 etc. depending on decimal place setting). This rounding factor is useful in that it allows the speeding up of entries into the table, it does not cause the final display value to jump in steps. Use the **drnd** function if you wish to cause the final display value to also jump in these steps.

### **TABLE STOP (mode of operation at points outside the table 1 range)**

This function sets the mode in which the instrument will behave when a value is input which is higher than the largest value entered in the table or lower than the smallest value entered in the table. Refer to the graph above.

If set to **on** then the display value will remain equal to the nearest table entry value. For example if the lowest table entry is made at 8mA and the display indicates **500** at this value then any input lower than 8mA will also cause the display to indicate **500**.

If set to **OFF** then the display value will continue to change when an input outside the table limits in encountered. The instrument will extrapolate the reading using the slope of the previous pair of points.



Arrows labelled "1" show the effect of **TABLE STOP** function = **on**

Arrows labelled "2" show the effect of **TABLE STOP** function = **OFF**

### **TABLE POINTS (number of table points for table 1)**

Displays and sets the number of points in lineariser table 1. Select the number you require and enter that number of points. If you wish to increase or decrease the number of points then the **TABLE POINTS** value can be changed at a later stage.

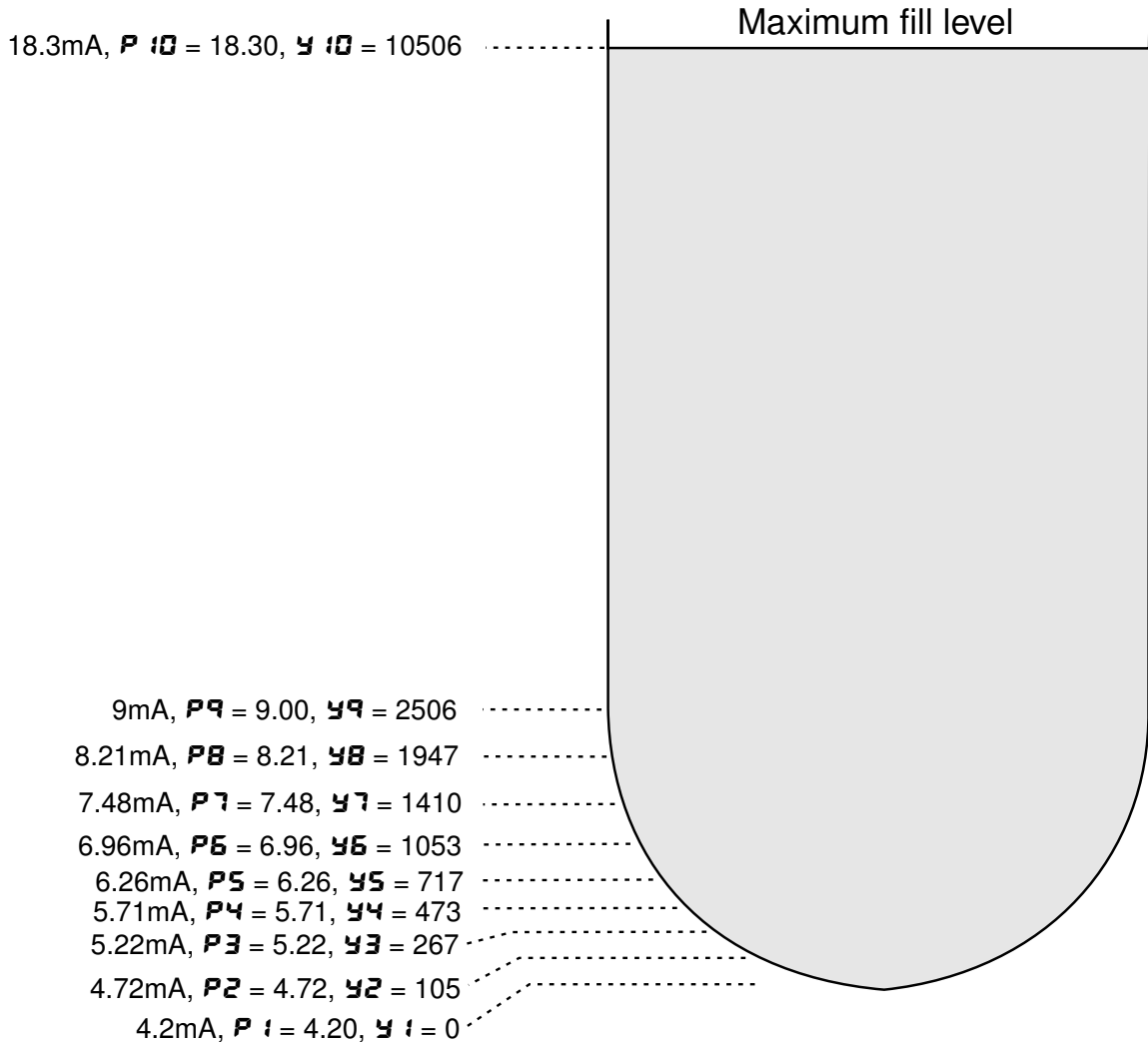
### **SEE TABLE (enter values into table 1)**

This function allows values to be entered into lineariser table 1. Entries to the table do not need to be in any ascending or descending order since the instrument will automatically arrange the points in order at the end of the entry sequence. The procedure for entering points is:

1. Ensure that the correct number of points required has been set in the **TABLE POINTS** function.
2. Complete the lineariser table given in Chapter 8 by calculation or measurement of values.
3. At the **SEE TABLE** function press the **▲** and **▼** buttons simultaneously.
4. The display will show **P 1** indicating the first linearising point followed by the first **P** value in memory, use the **▲** or **▼** button to adjust this to the required first input point value.
5. Press the **▢** button, the display will indicate **Y 1** followed by the first **Y** value in memory, again use the **▲** or **▼** to make any changes to the value required.
6. Press the **▢** button, the display will indicate **P 2** followed by the second **P** value in memory. Repeat the process described in steps 4 and 5 until all points have been entered.

**Example**

A pressure transmitter with a 4-20mA output is installed near the base of an irregularly shaped tank, see diagram below, which contains a liquid. The transmitter is connected to a PM4-LN2 and 10 linearising points are required to measure the number of litres in the tank. The output from the transmitter will be linear between P9 and P10 since the sides of the tank are straight. Most of the lineariser points are concentrated on the non linear (curved) parts of the tank i.e. the parts of the tank in which the output from the transducer will not be linear.



The procedure used is as follows, steps a. to n.:

- a. All general functions are set as required i.e. display rounding etc.
- b. Set the **LRBL** function to **on**.
- c. Use **CH1CAL1** & **CH1CAL2** to scale the PM4 to show 4mA= **4.00**, 20mA= **20.00**.
- d. The tank is emptied and the transmitter is connected to the display, the tank will need to be gradually filled whilst the lineariser table (Chapter 8) record is completed. Note that the reverse process is equally valid i.e. starting with a full tank and gradually emptying it.
- e. The first reading is taken from the display (4.20 in this case) with the tank virtually empty this represents a reading of zero litres. The lineariser table is filled in for the first point, **P1** = 4.20, **Y1** = 0.
- f. The tank is now gradually filled and a flowmeter is used to measure the number of litres entering the tank. The panel meter reading will change as the tank is filled.
- g. The second reading is taken from the display (4.72 in this case), at this point 105 litres had been added to the tank. The lineariser table is filled in for the second point, **P2** = 4.72, **Y2** = 105.
- h. Repeat the filling procedure until all 10 points are recorded, the results in this example are shown in the example diagram and table.
- j. The figures from the written table record now need to be transferred to the instruments lineariser table memory. Set the **LRBL** function to **on** and the **LRBL PntS** function to **10**.

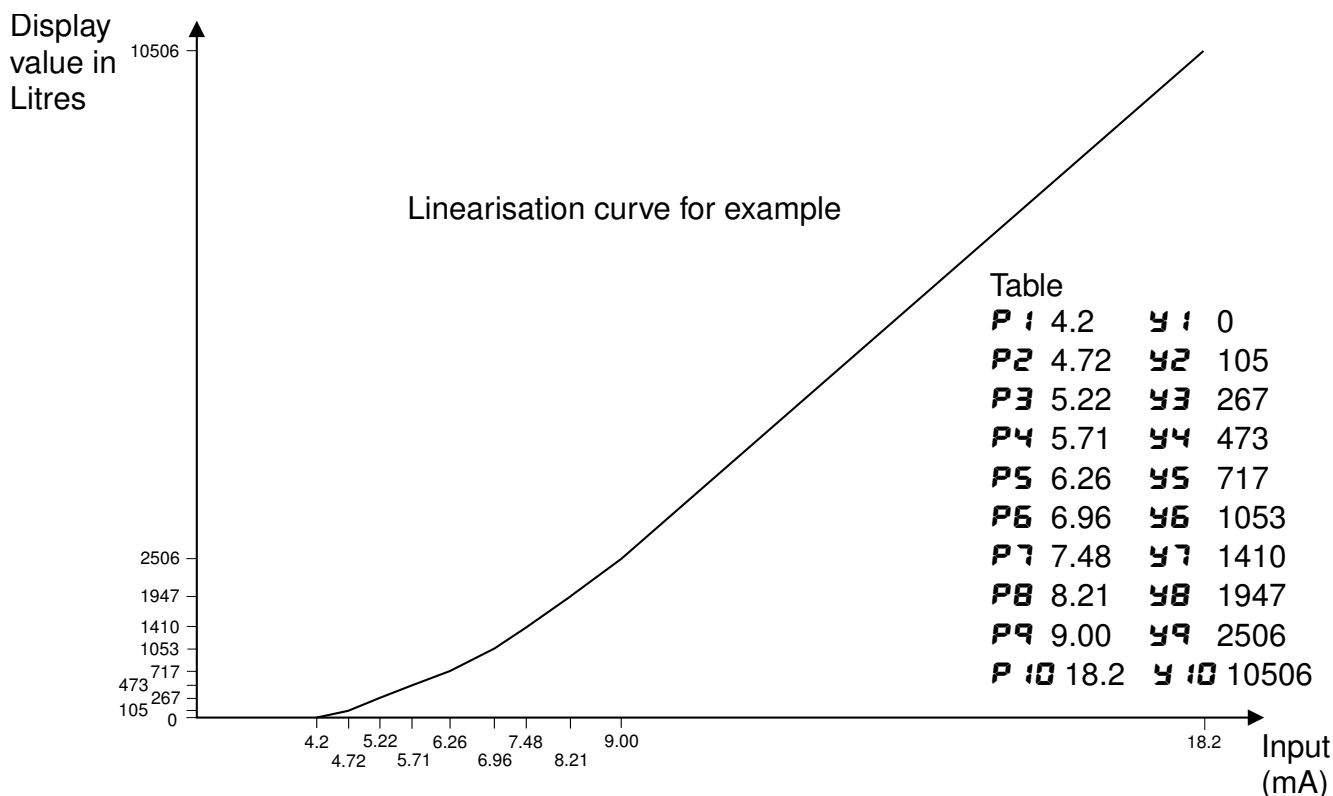
k. At the **SEt TABL** function press the  $\blacktriangle$  and  $\blacktriangledown$  button simultaneously. The display will show **P 1** followed by a number, use the  $\blacktriangle$  or  $\blacktriangledown$  button to change this number to **4.20**.

l. Press, then release, the **F** button. The display will indicate **Y 1** followed by a number. Use the  $\blacktriangle$  or  $\blacktriangledown$  button to change this to **0**.

m. Press, then release, the **F** button. The display will indicate **P 2** followed by a number. Use the  $\blacktriangle$  or  $\blacktriangledown$  button to change this to **4.72**.

n. Repeat the process until all the **P** and **Y** values have been entered.

Continue pressing then releasing the **F** button until the **End** message is seen and the display returns to measurement mode.



### **TABLE STOP (mode of operation at points outside the table 2 range)**

Table stop for table 2 - see **TABLE STOP** function for description of operation.

### **TABLE POINTS (number of table points for table 2)**

Table points for table 2 - see **TABLE POINTS** function for description of operation.

### **SET TABLE (enter values into table 2)**

Set table 2 - see **SET TABLE** function for description of operation.

### **EA 1, EB 1 etc. (arithmetical values) - seen only in ARITH operation mode.**

The PM4-LN2 may be set up to perform a variety of mathematical functions according the equation:

$$\frac{A1 \times (Ch1 + B1)}{C1} \left\{ \begin{array}{l} \text{add} \\ \text{sub} \\ \text{prod} \\ \text{div} \\ \text{high} \\ \text{low} \\ \text{sine} \\ \text{cos} \end{array} \right\} \frac{A2 \times (Ch2 + B2)}{C2}$$

Note that scaling using EA1 etc. only affects the arithmetic result displayed (**CHO**) and does not affect the values displayed for the individual input channels.

The A, B & C value for each channel may be individually entered over the range of - 9999 to 9999 for a 4 digit display, - 99999 to 99999 for a 5 digit display or - 999999 to 999999 for a 6 digit display (note: A & C are whole numbers, B has the same decimal place as its associated channel).

The display for each parameter is as follows:

|            |            |
|------------|------------|
| <b>ER1</b> | <b>ER2</b> |
| <b>EB1</b> | <b>EB2</b> |
| <b>EC1</b> | <b>EC2</b> |

The operation of each channel may be set up as follows:

**OP 1 (channel 1 and channel 2)** - seen only in **ARtH** operation mode.

|              |  |
|--------------|--|
| <b>Add</b>   | channel 1 plus channel 2                                       |
| <b>Sub</b>   | channel 1 minus channel 2                                      |
| <b>Prod</b>  | channel 1 times channel 2                                      |
| <b>d, U</b>  | channel 1 divided by channel 2                                 |
| <b>H, Gh</b> | highest of channel 1 or 2                                      |
| <b>Lo</b>    | lowest of channel 1 or 2                                       |
| <b>SINE</b>  | channel 1 times the sine of the angle displayed at channel 2   |
| <b>COS</b>   | channel 1 times the cosine of the angle displayed at channel 2 |

**Ch0 (display polarity - channel 0)** - seen only in **ARtH** operation mode.

Displays and sets the polarity selection for the display of the engineering value for channel 0, the output channel. If set to **b0tH** then the display will indicate both positive and negative values. If set to **POS** the display will allow only positive values with any values below zero being rounded to zero. If set to **NEG** then the display will allow only negative values with any value above zero being rounded to zero. If set to **ABS** then the absolute value will be displayed i.e. negative numbers will be displayed as positive numbers.

**Ch1 (display polarity - channel 1)**

As per **Ch0** but applies to channel 1 i.e. **b0tH** - allows positive and negative values for channel 1, **POS** - allows only positive values, **NEG** - allows only negative values, **ABS** gives the absolute value.

**Ch2 (display polarity - channel 2)**

As per **Ch0** but applies to channel 2 i.e. **b0tH** - allows positive and negative values for channel 2, **POS** - allows only positive values, **NEG** - allows only negative values, **ABS** gives the absolute value.

**Ch1CAL1 (channel 1 calibration point 1)**

This function displays and allows the first calibration/scaling point for channel 1 to be entered. See calibration chapter for full details of setting up.



**Ch1CAL2 (channel 1 calibration point 2)**

This function displays and allows the second calibration/scaling point for channel 1 to be entered. See calibration chapter for full details of setting up.

**Ch2CAL1 & Ch2CAL2 (channel 2, two point calibration)**

As per channel 1.

**UCAL Ch1 & UCAL Ch2 (uncalibrate)**

The uncalibrate function allows the calibration values of the chosen channel to be cleared and set back to the factory default settings. This will only be necessary if difficulty has been experienced with calibration. The uncalibrate operation will only clear the calibration scaling values and will not affect other function settings. To uncalibrate step to the required uncalibrate function display, e.g. **UCAL Ch1**, and press the  and  buttons simultaneously. The display will show **CAL CLR** to indicate that the scaling values have been cleared.

**P.but (P button function)**

The front panel **P** button may be set to operate some of the remote input functions (see **F.1 NP** below for a full description). If the remote input and **P** button functions are operated simultaneously the **P** button will override the remote input. With the functions set to **H**, **Lo** or **H, Lo** the high and/or low memory can be reset by holding the **P** button pressed for approximately 2 seconds. The **H**, **Lo** and **H, Lo** will show the peak/valley memory for whichever channel is selected at that time. The **ZER0** operation will zero the

channel being viewed at the time. Only the individual input channels can be zeroed, not the arithmetic result. To zero the channel required hold in the **P** button until the display shows the message **ZERO**, the value for the channel being viewed should now be zero. The display will flash the channel number once every 8 seconds as an indication of which channel is selected. Functions available are:

**NONE**, **H**, **L**, **H**, **L** or **ZERO**

### **F.I RP (remote input function)**

A remote input switch (keyswitch, momentary or latching switch depending on required operation) may be fitted across terminals 7 and 8 at the rear of the PM4. Closure of this input will cause the selected function to operate. The remote input functions available are:

**NONE** - no remote function required

**P.Hld** - peak hold. The display will show the peak hold value whilst the remote input pins are short circuited.

**d.Hld** - display hold. The display will hold its value whilst the remote input pins are short circuited.

**H** - peak memory. The value stored in memory for the channel selected will be displayed if the remote input pins are short circuited, if the short circuit is held for 2 seconds approx then the memory will be cleared. If the short circuit is momentary then the display will return to normal measurement after 20 seconds. **PH** followed by the channel number will flash before each peak memory value.

**L** - valley memory. The minimum value stored in memory will be displayed. Otherwise operates in the same manner as the **H** function. **PL** followed by the channel number will flash before each valley memory value.

**H, L** - toggle between **H** and **L** displays. This function allows the remote input to be used to toggle between peak and valley memory displays. The first operation of the remote input will cause the peak memory value to be displayed, the next operation will give a valley memory display. **PH** or **PL** will flash before each display to give an indication of the display type.

**ZERO** - zero channel displayed. The **ZERO** operation will zero the channel being viewed at the time. Only the individual input channels can be zeroed, not the arithmetic result.

**SP.AC** - setpoint access only. When selected this function will put the display into "easy access" setpoint mode (see "Explanation of Functions" chapter). To exit "easy access" mode and gain access to other functions either the remote input terminals need to be short circuited (this will allow access to **FUNC** mode functions) or entry made via **CAL** mode.

**No.AC** - no access. This blocks access to all functions unless the remote input pins are short circuited or entry is made via **CAL** mode.

### **ACCESS (access mode)**

The access mode function **ACCESS** has four possible settings namely **OFF**, **EASY**, **NONE** and **ALL**. If set to **OFF** the mode function has no effect on alarm relay operation. If set to **EASY** the easy alarm access mode will be activated, see details at the beginning of this chapter preceding the **AIL** function. If set to **NONE** there will be no access to any functions via **FUNC** mode, entry via **CAL** mode must be made to gain access to alarm and calibration functions. If set to **ALL** then access to all functions, including calibration functions, can be gained via **FUNC** mode.

**SPAC (setpoint access)** - Seen only if more than 1 relay fitted.

Sets the access to the alarm relay set points. The following choices are available:

**R 1** - Allows setpoint access to alarm 1 only.

**R 1-2** - Allows access to alarms 1 and 2 only.



**R 1-3** allows access to alarms 1,2 and 3.

The remote input function (**F.I RP**) must be set to **SP.AC** for this function to operate. Note: Only the setpoints which have been given a value will be accessible e.g. if **R 1H** is set to **OFF** then there will be no access to the **R 1H** function when **SPAC** is used.

### **Rx OPER (alarm relay operation mode)**

In scanning mode the selected alarm relay can be set to operate from either channel 1 or channel 2. Select **CH 1** or **CH 2** for the required operation. In arithmetic mode the selected alarm relay can be set to operate from any of these channels but can alternatively be set to operate from the result of the arithmetic operation by selecting **Arth** at this function.

### **SCAN PERd (select scan period)** - seen only in **SCAN** operation mode.

Selects the scan rate in seconds when **SCAN** is selected in the **SEt OPER** mode. The scan rate between channels is selectable between 0 and 240 seconds, this affects the display only, not retransmission scan rates. If 0 seconds is selected then the instrument will not scan i.e. the display will show one channel. To alter the displayed channel, when the scan rate is set to 0, use the  or  push button. The display will flash **CH 1** or **CH 2** before the reading (and periodically every 5 seconds) to indicate which channel is selected.

**FEC OPER (analog output 1 operation mode)** - Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted.

Displays and sets the operation of the analog retransmission output. The **FEC -** and **FEC ^** functions also need to be set as required for the analog output to operate correctly. Note that with **SEt OPER** set to **SCAN** when the retransmission mode is set to **HIGH**, **Lo**, **AUSE**, **S.PLS** or **S.FLY** the retransmission scaling will use the decimal point selection from channel 1 for all active channels e.g. with **FEC -** set to **0.0** and **FEC ^** set to **100.0**, 20mA will be retransmitted for a channel 1 display of **100.0** and channel 2 display of **10.00** and a channel 3 display of **1.000** i.e. all three are treated as the same number as far as any of the retransmission output modes are concerned since they are all taken as having the decimal point in the same place as channel 1. With the retransmission mode **SEt OPER** set to **Arth**, **CH 1** or **CH 2** the **FEC -** and **FEC ^** settings will take on the same number of decimal points as the channel selected. Allow 200mS, for each channel change, for the retransmission output to settle down if scanning. The selections available are as follows.

**Arth** - causes the recorder output to retransmit the channel 0 value only (arithmetic result - valid only in arithmetic (**Arth**) mode).

**CH 1** - causes the recorder output to retransmit the channel 1 value only.

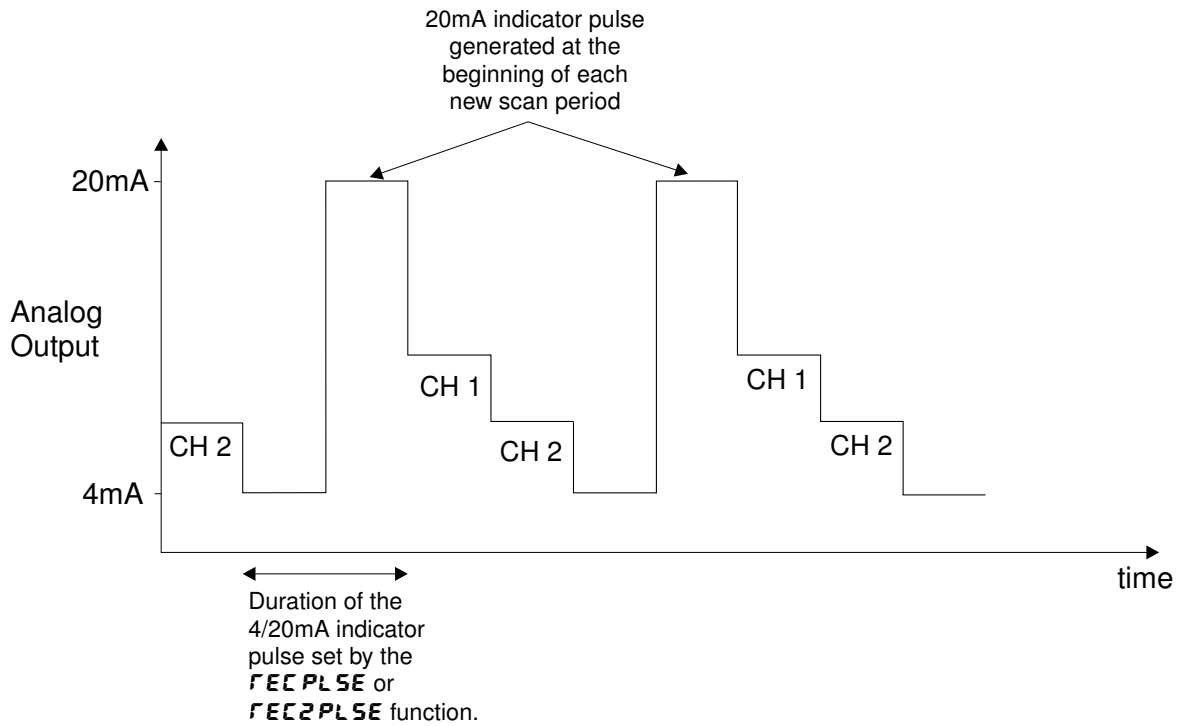
**CH 2** - causes the recorder output to retransmit the channel 2 value only.

**HIGH** - causes the recorder output to retransmit whichever input channel is giving the highest reading at that time.

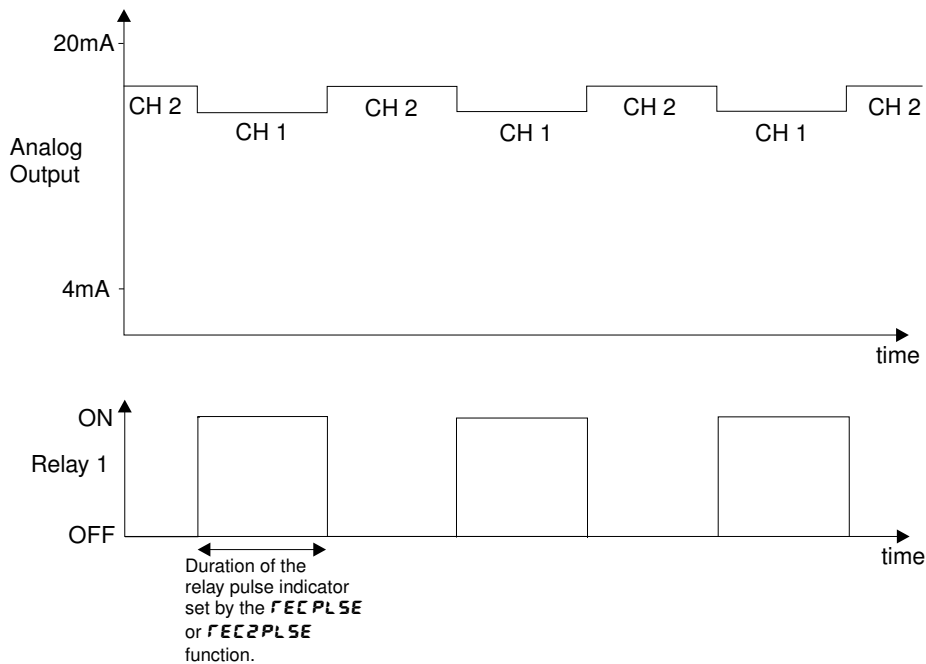
**Lo** - causes the recorder output to retransmit whichever input channel is giving the lowest reading at that time.

**AUSE** - causes the recorder output to retransmit the average value of all active channels.

**S.PLS** - causes the recorder output to retransmit each active channel in turn. As an indication that a new scan cycle is beginning the output will drop to 4mA then rise to 20mA (or 0 to 1V/0 to 10V for voltage retransmission), this indication can be used to communicate to a PLC etc. that a new cycle is beginning. The time duration of the 20mA pulse is determined by the setting of the **FEC PLSE** function.



**S.FLY** - causes the recorder output to retransmit each active channel in turn. An alarm relay contact closure (relay 1 for output 1) is activated at the beginning of each new scan to give an indication to a PLC etc. that a new scan is beginning. The time duration of the relay closure is determined by the setting of the *FEEC PULSE* function.



***FEEC PULSE* (relay/20mA indicator pulse width for analog output 1)** - Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted.

Displays and sets the time duration of the relay indicator closure (when *FEEC OPER* is set to **S.FLY**) or the 20mA indicator pulse (when *FEEC OPER* is set to **S.PLS**). The time is variable from 1 to 10 seconds. When the pulse width is increased or decreased the total retransmission time for each cycle will increase or decrease in proportion.

***FEEC2 OPER* (analog output 2 operation mode)** - Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted. See *FEEC OPER* function for description, note if **S.FLY** is chosen then relay 2 will be used to send the signal pulse (relay 2 must be fitted for the **S.FLY** mode to operate on output 2).

**FEC2 PL5E (relay/20mA indicator pulse width for analog output 2)** - Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted.

### **SEt OPER (set operating mode)**

The set operating mode function allows the selection of either arithmetic (**ARtH**) or scanning (**SCAN**) mode operation. In arithmetic mode the selected inputs will be combined according to the arithmetic values and operation types selected and the display will indicate the result. In scanning mode the inputs will be scanned and displayed one at a time at a rate determined by the **SCAN RATE** function.

**BRud (set baud rate)** - seen only with serial output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted.

Select from **300 . 600 . 1200 . 2400 . 4800 . 9600 . 19.2** or **38.4**.

**PRtY (set parity)** - seen only with serial output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted.

Select parity check to either **NONE**, **EVEN** or **odd**.

**Q.PULt (set RS232/485 communications mode)** - seen only with serial output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted.

Select **d**, **SP**, **Cont** or **POLL**

Allows user to select the RS232/485 interface operation as follows:-

- d, SP** Sends image data from the display without conversion to ASCII.
- Cont** Sends ASCII form of display data every time display is updated.
- POLL** Controlled by computer or PLC as host. Host sends command via RS232/485 and instrument responds as required. The PM4-LN2 can be polled
- R.buS** A special communications mode used with Windows compatible optional PC download software. Refer to the user manual supplied with this optional software.
- ̄.buS** Modbus RTU protocol.

**Addr (set unit address for polled (POLL) mode (0 to 31))** - seen only with serial output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted.

Allows several units to operate on the same RS485 interface reporting on different areas etc. The host computer or PLC may poll each unit in turn supplying the appropriate address.

The unit address ranges from 0 to 31 (DEC) but is offset by 32 (DEC) to avoid clashing with ASCII special function characters (such as <STX> and <CR>). Therefore 32 (DEC) or 20 (HEX) is address 0, 42 (DEC) or 2A (HEX) addresses unit 10.

### **Returning to the normal measure mode**

When the calibration procedure has been completed it is advisable to return the instrument to the normal mode (where calibration functions cannot be tampered with). To return to the normal mode, turn off power to the instrument, wait a few seconds and then restore power.

## 5 Function Table

| Initial display  | Meaning of display                                      | Next display   | Default display | Record Your Settings    |
|--|---|--|-----------------|-------------------------|
| <b>RxLo</b>  | Alarm low setpoint value                                | Setpoint value or <b>OFF</b>                           | <b>OFF</b>      | See table which follows |
| <b>RxHi</b>  | Alarm high setpoint value                               | Setpoint value or <b>OFF</b>                           | <b>OFF</b>      | See table which follows |
| <b>RxHY</b>  | Alarm hysteresis  | Hysteresis value in measured units                     | <b>10</b>       | See table which follows |
| <b>RxTt</b>  | Alarm trip time   | <b>0</b> to <b>120</b> Seconds                         | <b>0</b>        | See table which follows |
| <b>Rxrt</b>  | Alarm reset time  | <b>0</b> to <b>120</b> Seconds                         | <b>0</b>        | See table which follows |
| <b>Rxn.o</b> or <b>Rxn.c</b>   | Alarm action n/o or n/c                                 | <b>Rxn.o</b> or <b>Rxn.c</b>                           | <b>Rxn.o</b>    | See table which follows |
| <b>Rx.SP</b> or <b>Rx.t!</b>   | Alarm independent or trailing setpoint 1,2 etc.         | <b>Rx.SP</b> or <b>Rx.t!</b>                           | <b>AXSP</b>     |                         |
| <b>br9t</b>  | Display brightness                                      | <b>1</b> to <b>15</b> ( <b>15</b> = max brightness)    | <b>15</b>       |                         |
| <b>duLL</b>  | Remote input brightness level switching                 | <b>0</b> to <b>15</b> ( <b>15</b> = max brightness)    | <b>1</b>        |                         |
| <b>bAr-</b>  | Bar graph low reading                                   | Value in memory  | <b>0</b>        |                         |
| <b>bAr+</b>  | Bar graph high reading                                  | Value in memory  | <b>1000</b>     |                         |
| <b>rEC-</b>  | First analog output low limit                           | Value in memory  | <b>0</b>        |                         |
| <b>rEC+</b>  | First analog output high limit                          | Value in memory  | <b>1000</b>     |                         |
| <b>rEC-Ch2</b>   | Second analog output low limit                          | Value in memory  | <b>0</b>        |                         |
| <b>rEC+Ch2</b>   | Second analog output high limit                         | Value in memory  | <b>1000</b>     |                         |
| Functions below are accessible via <b>CAL</b> mode or if <b>ACCESS</b> function is set to <b>ALL</b> |   |  |                 |                         |
| <b>bAr tYPE</b>  | Bargraph mode   | <b>bAr .S.dot .d.dot</b> or <b>C.bAr</b>               | <b>bAr</b>      |                         |
| <b>bAr OPEr</b>  | Bargraph operation channel                              | <b>Arth, Ch 1</b> or <b>Ch2</b>                        | <b>Arth</b>     |                         |
| <b>drnd</b>  | Display rounding  | Value in memory  | <b>1</b>        |                         |
| <b>dCPt</b>  | Display decimal point                                   | Decimal point (i.e. <b>0.1</b> or <b>0.02</b> etc.)    | <b>0</b>        |                         |
| <b>FLtr</b>  | Digital filter  | <b>0</b> to <b>8</b> ( <b>8</b> =max filtering)        | <b>3</b>        |                         |
| <b>Chno.</b>   | Number of channels                                      | <b>1</b> or <b>2</b>                                   | <b>2</b>        |                         |
| <b>Ch 1 dCPt</b>   | Channel 1 decimal point                                 | Decimal point (e.g. <b>0.1</b> or <b>0.02</b> etc.)    | <b>0</b>        |                         |
| <b>Ch2 dCPt</b>  | Channel 2 decimal point                                 | Decimal point (e.g. <b>0.1</b> or <b>0.02</b> etc.)    | <b>0</b>        |                         |
| <b>tAb1</b>  | Lineariser table 1 on/off                               | <b>on</b> or <b>OFF</b>                                | <b>OFF</b>      |                         |
| <b>tAb2</b>  | Lineariser table 2 on/off                               | <b>on</b> or <b>OFF</b>                                | <b>OFF</b>      |                         |
| <b>#SCALE tbi E</b>  | Scaling (rounding) factor for lineariser 1 & 2 Y values | <b>1.2.5. 10.20.25.50. 100. 250.500</b> or <b>1000</b> | <b>1</b>        |                         |
| <b>#tAb1 StOP</b>  | Mode at table 1 limits                                  | <b>on</b> or <b>OFF</b>                                | <b>OFF</b>      |                         |
| <b>#tAb1 PntS</b>  | Number of points for lineariser table 1                 | <b>2</b> to <b>50</b>                                  | <b>2</b>        |                         |
| <b>#SEt tAb1</b>   | Enter points into lineariser table 1                    | <b>P 1</b>   | n/a             |                         |
| <b>#tAb2 StOP</b>  | Mode at table 2 limits                                  | <b>on</b> or <b>OFF</b>                                | <b>OFF</b>      |                         |
| <b>#tAb2 PntS</b>  | Number of points for lineariser table 2                 | <b>2</b> to <b>50</b>                                  | <b>2</b>        |                         |
| <b>#SEt tAb2</b>   | Enter points into lineariser table 2                    | <b>P 1</b>   | n/a             |                         |
| <b>#EA 1</b>   | Channel 1 A function                                    | Value in memory  | <b>1</b>        |                         |
| <b>#Eb 1</b>   | Channel 1 b function                                    | Value in memory  | <b>0</b>        |                         |

|            |   |   |      |                     |
|------------|---|---|------|---------------------|
| #EC1       | Channel 1 C function                              | Value in memory   | 1    |                     |
| #ER2       | Channel 2 A function                              | Value in memory   | 1    |                     |
| #Eb2       | Channel 2 b function                              | Value in memory   | 0    |                     |
| #EC2       | Channel 2 C function                              | Value in memory   | 1    |                     |
| #OP1       | Operation 1                                       | Add, Sub, Prod, d, v, H, 9H, Lo, Si, NE or COS                    | Add  |                     |
| #Ch0       | Display polarity, ch. 0                           | b0tH, POS, NEG or AbS   | b0tH |                     |
| Ch1        | Display polarity, ch. 1                           | b0tH, POS, NEG or AbS   | b0tH |                     |
| Ch2        | Display polarity, ch. 2                           | b0tH, POS, NEG or AbS   | b0tH |                     |
| Ch1CAL1    | Channel 1 cal point 1                             | Value in memory   | n/a  |                     |
| Ch1CAL2    | Channel 1 cal point 2                             | Value in memory   | n/a  |                     |
| Ch2CAL1    | Channel 2 cal point 1                             | Value in memory   | n/a  |                     |
| Ch2CAL2    | Channel 2 cal point 2                             | Value in memory   | n/a  |                     |
| UCALCh1    | Uncalibrate channel 1                             | CAL CLR   | n/a  |                     |
| UCALCh2    | Uncalibrate channel 2                             | CAL CLR   | n/a  |                     |
| P.but      | <b>P</b> button function                          | NONE, H, Lo, Hi, Lo or ZEGO                                       | NONE |                     |
| r.i.OP     | Remote input function                             | NONE, P, HLD, d, HLD, H, Lo, Hi, Lo, ZEGO, SP, AC, No, Ac or duLL | NONE |                     |
| ACCESS     | Access mode                                       | NONE, ALL, OFF or EASY  | NONE |                     |
| SPAC       | Setpoint access                                   | A1, A1-2 etc  | A1   |                     |
| Rx OPEF    | Alarm operation mode                              | Arth, CH1 or CH2  | Arth | See following table |
| *SCAN PERd | Select scan period (secs).                        | 0 to 240  | 0    |                     |
| *FEC OPEr  | First anaolg output operation                     | Arth, Ch1, Ch2, HI, 9H, Lo, RUGE, S, PLS or S, FLY                | Ch1  |                     |
| *FEC PLSE  | First analog output indicator pulse width (secs)  | 0 to 10   | 0    |                     |
| *FEC2 OPEr | Second analog output operation                    | Arth, Ch1, Ch2, HI, 9H, Lo, RUGE, S, PLS or S, FLY                |      |                     |
| *FEC2 PLSE | Second analog output indicator pulse width (secs) | 0 to 10   |      |                     |
| SEt OPEr   | Set operation mode                                | Arth or SCAN  | Arth |                     |
| bAUD       | Baud rate   | 300, 600, 1200, 2400, 4800, 9600, 192 or 384                      | 9600 |                     |
| Prty       | Parity  | NONE, EVEN or odd   | NONE |                     |
| Q.Put      | Communication mode                                | d, SP, Cont, POLL, R, bus or A, bus                               | Cont |                     |
| Addr       | Unit address                                      | 0 to 31   | 0    |                     |

Note: Functions shown shaded on this table will be displayed only when those particular options are installed.

Functions shown with # will only be seen in **Arth** operating mode.

Functions shown with \* will only be seen in **SCAN** operating mode.

| Settings for relays - record settings here |     |    |    |    |
|--|-----|----|----|----|
|  | A1  | A2 | A3 | A4 |
| RxLo                                       |     |    |    |    |
| RxHi                                       |     |    |    |    |
| RxHy                                       |     |    |    |    |
| RxLt                                       |     |    |    |    |
| Rxrt                                       |     |    |    |    |
| Rxn.o or Rxn.c                             |     |    |    |    |
| Rx.SP or Rx.lt etc.                        | n/a |    |    |    |
| Rx OPEr                                    |     |    |    |    |

## 6 Calibration

Each input channel (channel 1 & 2) may be individually scaled/calibrated to display that input in engineering units. In arithmetic mode the primary display (channel 0) is then the result of the arithmetical function. For applications requiring only one channel, the unused channel functions will not be displayed (note: channel number function **Chno** must be set to correct number of channels).

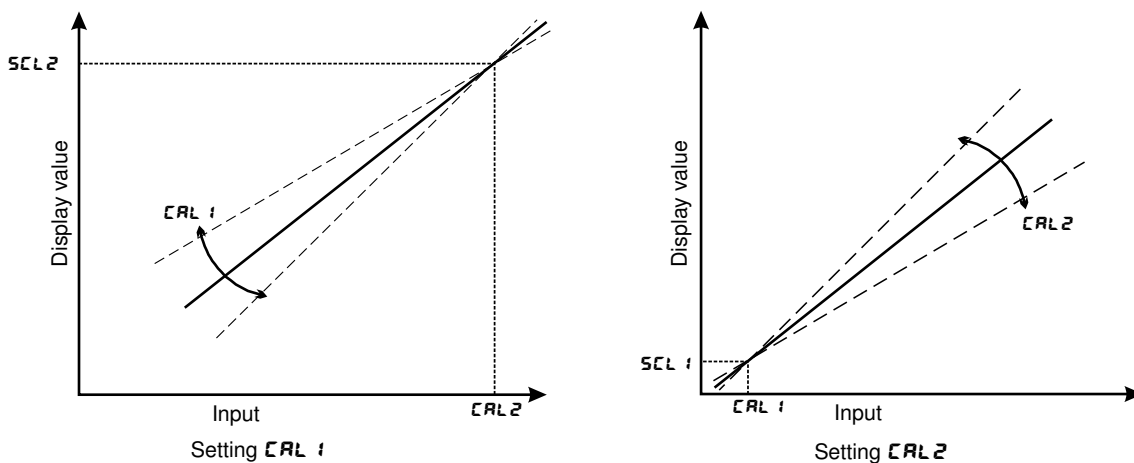
**Calibration with no linearisation** - If the lineariser table for an input is turned off the decimal point position for each channel must be selected before calibrating each input. Choose the required decimal points for each channel using **Ch1dCPE** and **Ch2dCPE** functions before calibrating.

**Calibration with linearisation** - If the lineariser table is turned on for a channel then the number of decimal points seen when calibrating will be automatically generated e.g. two decimal points for a 5 digit display. If linearisation is required for a channel it is essential that the table for that channel be turned on before calibrating. The calibration scale values entered at **SCL 1** and **SCL 2** must be chosen to represent the **P** values in the lineariser table.

To enter the calibration mode follow the "Entering via **CAL** mode" instructions on the first page of the "Explanation of Functions" chapter.

### Calibrating channel 1

1. Step through the functions until the display indicates **Ch1CAL1**.
2. Press the **▲** and **▼** buttons simultaneously to enter the calibration mode. The display will now indicate **Ch1CAL1** (1st calibration point) followed by the "live" reading. Apply a known input to the instrument of nominally 0% (this value is not critical and may be anywhere within the measuring range of the instrument).
3. When the reading has stabilised press the **F** button. The display will indicate **Ch1SCL1** (scale 1) followed by the scale value in memory.
4. Press the **▲** or **▼** button to obtain the required scale (calibration) value. Press the **F** button the display will now indicate **CAL End** (indicating that calibration of the first point is complete). The display will now indicate **Ch1CAL2** (2nd calibration point). Either step through the functions using the **F** button (to bypass the second calibration point) or enter the 2nd calibration mode as above by pressing the **▲** and **▼** buttons simultaneously.
5. Apply an input of 100% (again this value is not critical, for best accuracy should not be too close to the previous value).
6. When the reading has stabilised, press the **F** button, the display will now indicate **Ch1SCL2** (scale 2) followed by the second scale value in memory. Press the **▲** or **▼** button to set the required scale value.
7. Press the **F** button, the display will now read **CAL End** (indicating that calibration of the second point is complete). The display will advance the channel 2 calibration function.



**Note:** When entering the second point independently, the first calibration point may be bypassed, simply by pressing the **F** button instead of the **▲** and **▼** buttons simultaneously.

## Calibration channel 2

Follow the procedure outlined for calibrating channel 1. The display messages are updated to **CH2** e.g. **CH2 CAL 1**.

## Returning to the normal measure mode

When the calibration procedure has been completed it is advisable to return the instrument to the normal mode (where calibration functions cannot be tampered with). To return to the normal mode, turn off power to the instrument, wait a few seconds and then restore power.

## 7 Mathematical Functions

The PM4-LN2 may be set up to perform a variety of mathematical functions according the equation:

$$\frac{EA1 \times (Ch1 + Eb1)}{EC1} \left\{ \begin{array}{l} \text{add} \\ \text{sub} \\ \text{prod} \\ \text{div} \\ \text{high} \\ \text{low} \\ \text{sine} \\ \text{cos} \end{array} \right\} \frac{EA2 \times (Ch2 + Eb2)}{EC2}$$

The A, B & C value for each channel may be individually set in engineering units over the display range (note: A & C are whole numbers, B has the same decimal place as its associated channel). The display for each parameter is as follows:

|            |            |
|------------|------------|
| <b>EA1</b> | <b>EA2</b> |
| <b>Eb1</b> | <b>Eb2</b> |
| <b>EC1</b> | <b>EC2</b> |

The operation of each channel may be set up as follows:

**OP 1** (channel 1 and channel 2)

|             |  |
|-------------|--|
| <b>Add</b>  | channel 1 plus channel 2                                       |
| <b>Sub</b>  | channel 1 minus channel 2                                      |
| <b>Prod</b> | channel 1 times channel 2                                      |
| <b>div</b>  | channel 1 divided by channel 2                                 |
| <b>High</b> | highest of channel 1 or 2                                      |
| <b>Lo</b>   | lowest of channel 1 or 2                                       |
| <b>SINE</b> | channel 1 times the sine of the angle displayed at channel 2   |
| <b>COS</b>  | channel 1 times the cosine of the angle displayed at channel 2 |

### Example 1:

To add channel 1 to channel 2:  $(Ch1 + Ch2)$

Program **EA1=1.Eb1=0.EC1=1.EA2=1.Eb2=0.EC2=1.OP1=Add**

$$1 \times (Ch1 + 0) \text{ Add } 1 \times (Ch2 + 0)$$

### Example 2:

To get an average of channel 1 and channel 2:  $\left( \frac{Ch1}{2} + \frac{Ch2}{2} \right)$

Program **EA1=1.Eb1=0.EC1=2.EA2=1.Eb2=0.EC2=2.OP1=Add**

$$\frac{1 \times (Ch1 + 0)}{2} \text{ Add } \frac{1 \times (Ch2 + 0)}{2}$$

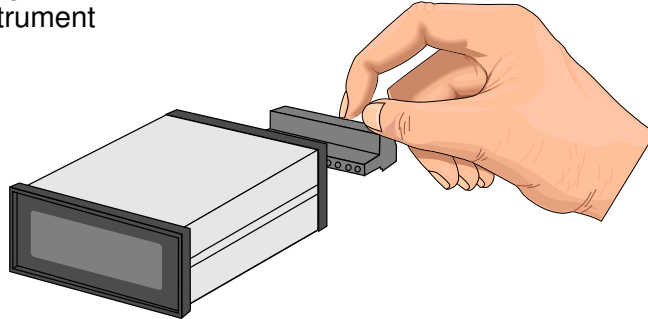
**Lineariser Tables**  
**Complete and retain for reference**

| Table 1 |  |                                    |  | Table 2 |  |                                    |  |
|---------|--|------------------------------------|--|---------|--|------------------------------------|--|
| P Value |  | Y Value<br>(Value to be displayed) |  | P Value |  | Y Value<br>(Value to be displayed) |  |
| P 1     |  | Y 1                                |  | P 1     |  | Y 1                                |  |
| P 2     |  | Y 2                                |  | P 2     |  | Y 2                                |  |
| P 3     |  | Y 3                                |  | P 3     |  | Y 2                                |  |
| P 4     |  | Y 4                                |  | P 4     |  | Y 4                                |  |
| P 5     |  | Y 5                                |  | P 5     |  | Y 5                                |  |
| P 6     |  | Y 6                                |  | P 6     |  | Y 6                                |  |
| P 7     |  | Y 7                                |  | P 7     |  | Y 7                                |  |
| P 8     |  | Y 8                                |  | P 8     |  | Y 8                                |  |
| P 9     |  | Y 9                                |  | P 9     |  | Y 9                                |  |
| P 10    |  | Y 10                               |  | P 10    |  | Y 10                               |  |
| P 11    |  | Y 11                               |  | P 11    |  | Y 11                               |  |
| P 12    |  | Y 12                               |  | P 12    |  | Y 12                               |  |
| P 13    |  | Y 13                               |  | P 13    |  | Y 13                               |  |
| P 14    |  | Y 14                               |  | P 14    |  | Y 14                               |  |
| P 15    |  | Y 15                               |  | P 15    |  | Y 15                               |  |
| P 16    |  | Y 16                               |  | P 16    |  | Y 16                               |  |
| P 17    |  | Y 17                               |  | P 17    |  | Y 17                               |  |
| P 18    |  | Y 18                               |  | P 18    |  | Y 18                               |  |
| P 19    |  | Y 19                               |  | P 19    |  | Y 19                               |  |
| P 20    |  | Y 20                               |  | P 20    |  | Y 20                               |  |
| P 21    |  | Y 21                               |  | P 21    |  | Y 21                               |  |
| P 22    |  | Y 22                               |  | P 22    |  | Y 22                               |  |
| P 23    |  | Y 23                               |  | P 23    |  | Y 23                               |  |
| P 24    |  | Y 24                               |  | P 23    |  | Y 24                               |  |
| P 25    |  | Y 25                               |  | P 25    |  | Y 25                               |  |
| P 26    |  | Y 26                               |  | P 26    |  | Y 26                               |  |
| P 27    |  | Y 27                               |  | P 27    |  | Y 27                               |  |
| P 28    |  | Y 28                               |  | P 28    |  | Y 28                               |  |
| P 29    |  | Y 29                               |  | P 29    |  | Y 29                               |  |
| P 30    |  | Y 30                               |  | P 30    |  | Y 30                               |  |

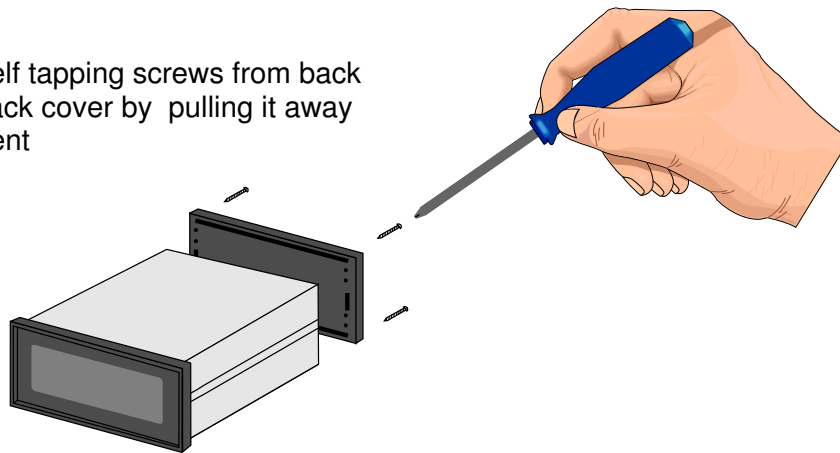
## 9 Input/Output Configuration

If you need to alter the input or output configuration proceed as shown in the diagrams below. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when options are fitted.

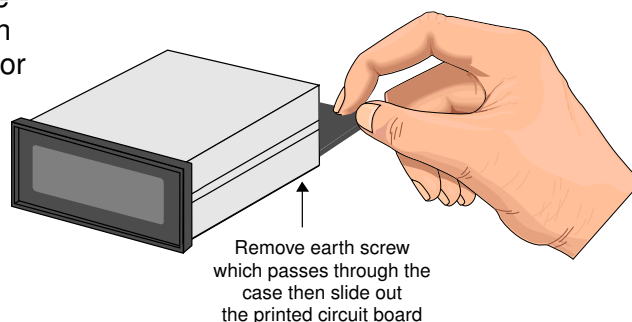
1. Remove the plug in terminals from the rear of the instrument



2. Remove 4 x self tapping screws from back cover, remove back cover by pulling it away from the instrument



3. Using a screwdriver, loosen the earth screw which passes through the PCB then slide out the board or boards



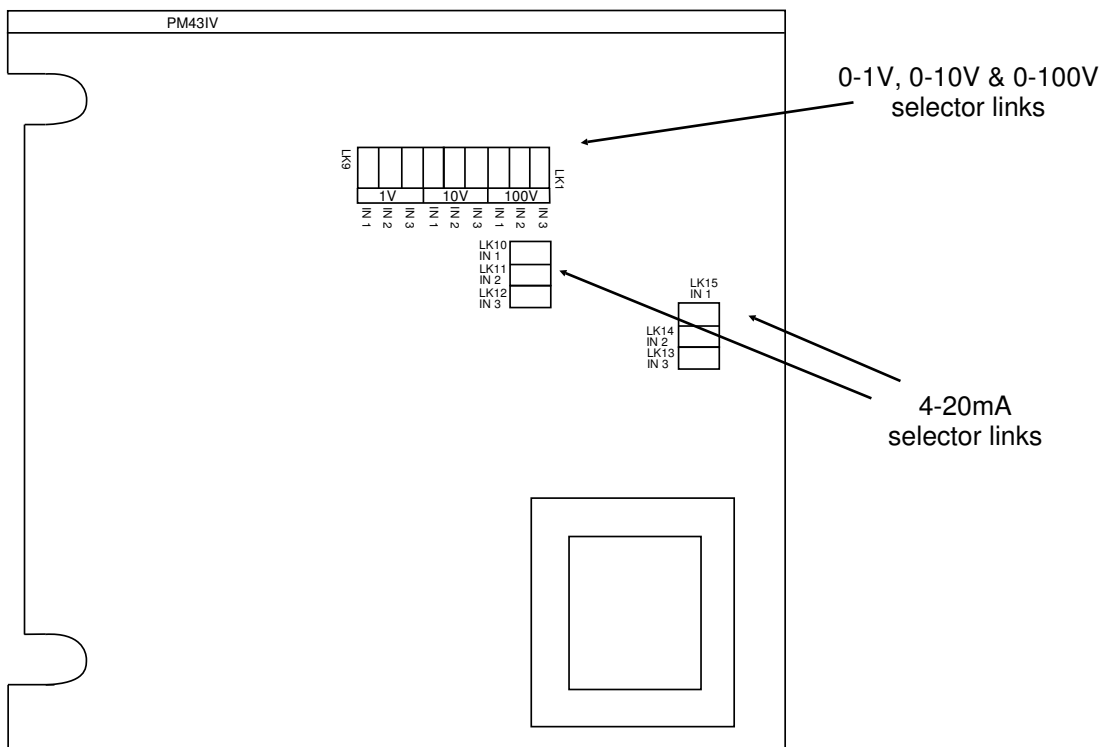
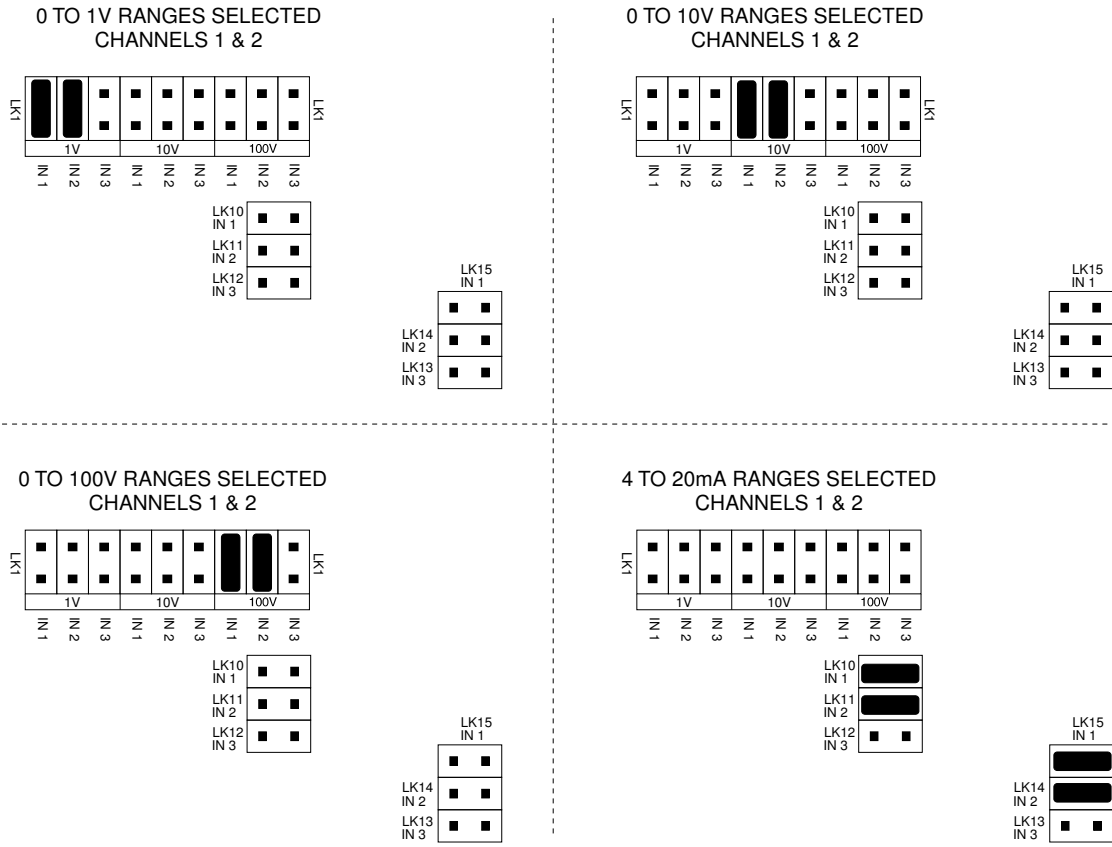
4. Configure the PCB links as required, see appropriate chapter
5. Slide PCB back into the case
6. Re tighten the earth screw which passes through the PCB
7. Refit back cover and fix with the self tapping screws
8. Plug the terminal strips back into the rear of the instrument

# 10 Hardware Configuration

## 10.1 Selecting the input range

Dismantle the instrument as described in “Input/output Configuration” chapter. Insert the links into the appropriate location on the pin header, to suit the range required.

Note: input ranges shown are common for each channel. Combinations of input types e.g. 1 x 4-20mA & 1 x 0-1V may be selected as required.



Main Circuit Board

---

# 11 Specifications

---

## 11.1 Technical Specifications

|                      |  |
|----------------------|--|
| Input Types:         | One or two inputs, link selectable 4 to 20mA or DC Volts 0-1V (range -2 to 2V), 0-10V (range -20 to 20V) or 0-100V (range -100 to 100V)  |
| Impedance:           | 80Ω (4 to 20mA) & 1MΩ on DC Voltage  |
| Linearisation:       | Two 30 point tables  |
| Maths Function:      | Add, subtract, product, divide, highest, lowest, sine or cosine  |
| ADC Resolution:      | 1 in 20,000  |
| Accuracy:            | 0.1% when calibrated   |
| Sample Rate:         | 1 sample every 2 seconds   |
| Conversion Method:   | Dual Slope ADC   |
| Microprocessor:      | MC68HC11 CMOS  |
| Ambient Temperature: | LED -40 to 60°C  |
| Humidity:            | 5 to 95% non condensing  |
| Display:             | 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 + relay status LEDs<br>LED Circular Bar Graph 16 segment + 5 digit 7.6mm + relay status LEDs |
| Power Supply:        | AC 240V, 110V or 24V 50/60Hz or DC isolated wide range 12 to 48V.<br>Special supply types 32VAC, 48VAC 50/60Hz or DC isolated 50 to 110V also available. Note: supply type is factory configured.                          |
| Power Consumption:   | AC supply 4 VA max,<br>DC supply, (depends on display type & options)  |
| Output (standard):   | 1 x relay, Form, A rated 5A resistive  |
| Relay Action:        | Programmable N.O. or N.C.  |

## 11.2 Output Options

|                        |   |
|------------------------|---|
| Extra Relays:          | One or three extra relays   |
| Analog Retransmission: | 4 to 20mA, 0 to 1V or 0 to 10V link selectable<br>single or dual channel analog retransmission options available<br>4 to 20mA output can drive into 1kΩ load maximum. |
| Serial Communications: | RS232 or RS485 (ASCII or Modbus RTU)  |
| DC Voltage Output:     | Isolated ±12V(24V) standard, ±5V(10V) link selectable (25mA max.)   |

## 11.3 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 &- 0mm                       |
| Connections:   | Plug in screw terminals (max 1.5mm wire)      |
| Weight:        | 400 gms Basic model, 450 gms with option card |

---

## 12 Guarantee and Service

---

The product supplied with this manual is guaranteed against faulty workmanship for a period of 2 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 document is the property of  
the instrument manufacturer  
and may not be reproduced in whole or part without the  
written consent of the manufacturer.**

**This product is designed and manufactured in Australia.**