PM4-TC
Thermocouple Input
Temperature
Process Monitor/Controller
Operation and Instruction Manual

Table of Contents

1   Introduction

This manual contains information for the installation and operation of the PM4 Monitor. The PM4 is a general purpose temperature monitor which can be customer configured to accept any common thermocouple (types B, E, J, K, N, R, S and T). The instrument may be calibrated to display the temperature in ^{o}C, ^{o}F or ^{o}K. A standard inbuilt relay provides an alarm/control function, optional extra relays and retransmission may also be provided.
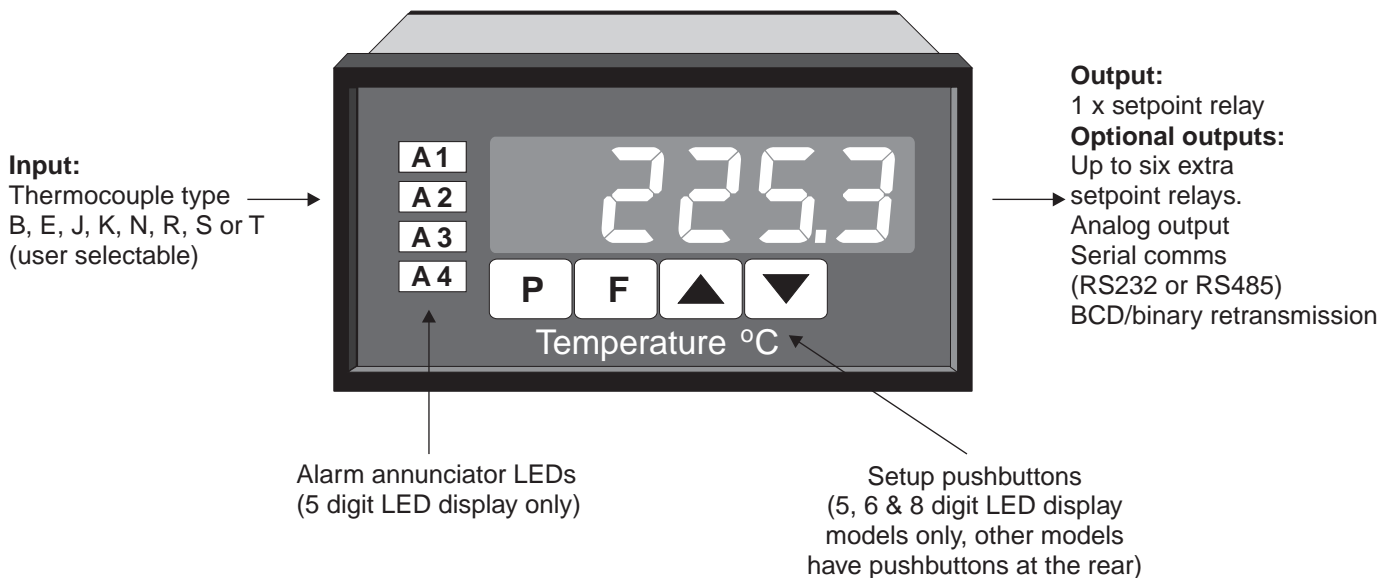
Unless otherwise specified at the time of order, your PM4 has been factory set to a standard configuration. Like all other PM4 series instruments the configuration and calibration is easily changed by the user. Initial changes may require dismantling the instrument to alter PCB links, other changes are made by push button functions.

Full electrical isolation between power supply, input and retransmission output is provided by the PM4, thereby eliminating grounding and common voltage problems. This isolation feature makes the PM4 ideal for interfacing to computers, PLCs and other data acquisition devices

The 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.

1.1   Inputs & outputs

Input:
Thermocouple type
B, E, J, K, N, R, S or T
(user selectable)

A 1
A 2
A 3
A 4

225.3

P   F   ▲   ▼

Temperature ^{o}C

Output:
1 x setpoint relay
Optional outputs:
Up to six extra
setpoint relays.
Analog output
Serial comms
(RS232 or RS485)
BCD/binary retransmission

Alarm annunciator LEDs
(5 digit LED display only)

Setup pushbuttons
(5, 6 & 8 digit LED display
models only, other models
have pushbuttons at the rear)

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.

Panel Meters (mounted horizontally)   ## Bar Graph Displays (mounted vertically)
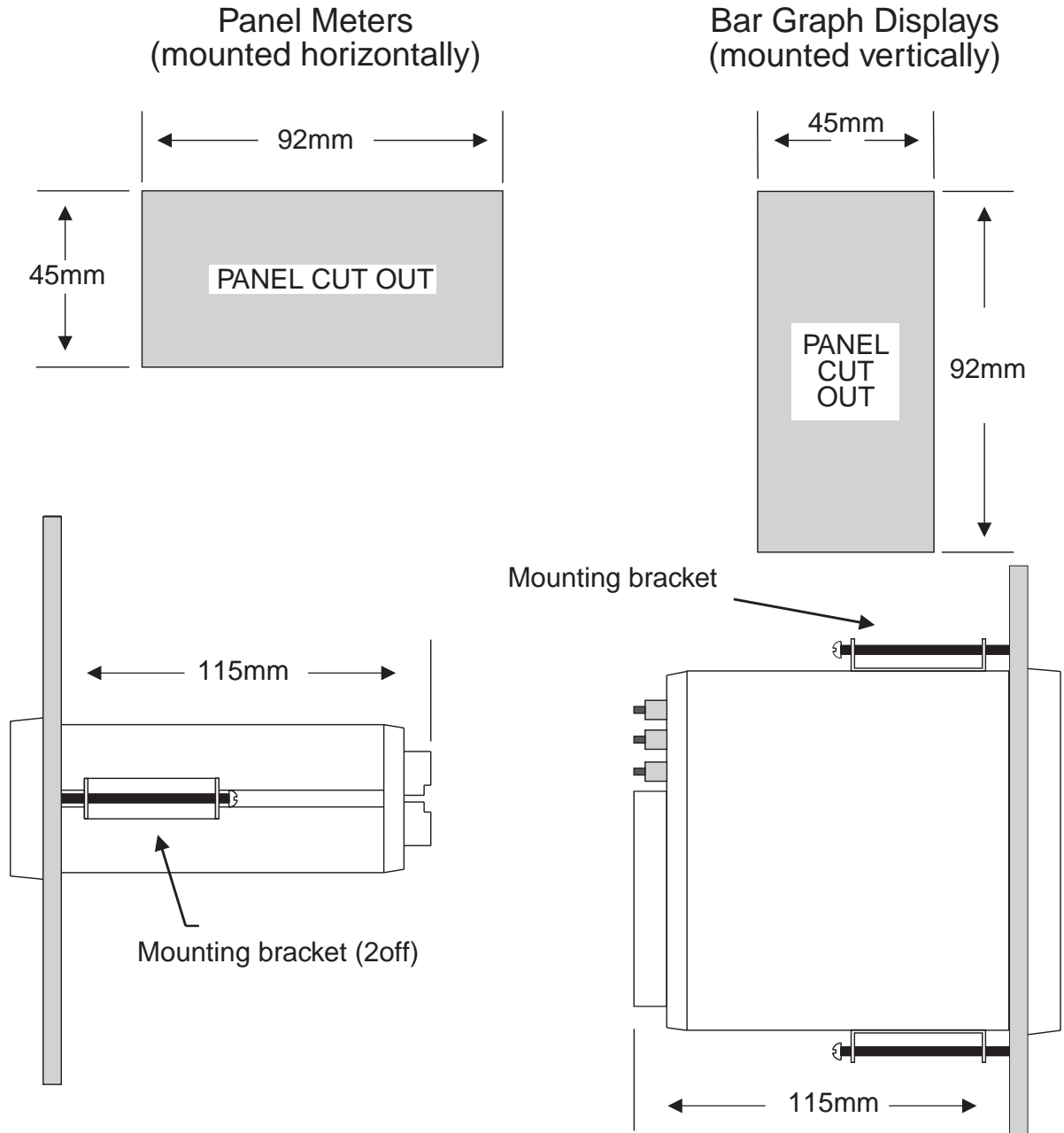
Side view of mounting panel

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^2 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 an initial display of *8888* followed by other status displays indicates that the instrument is functioning.
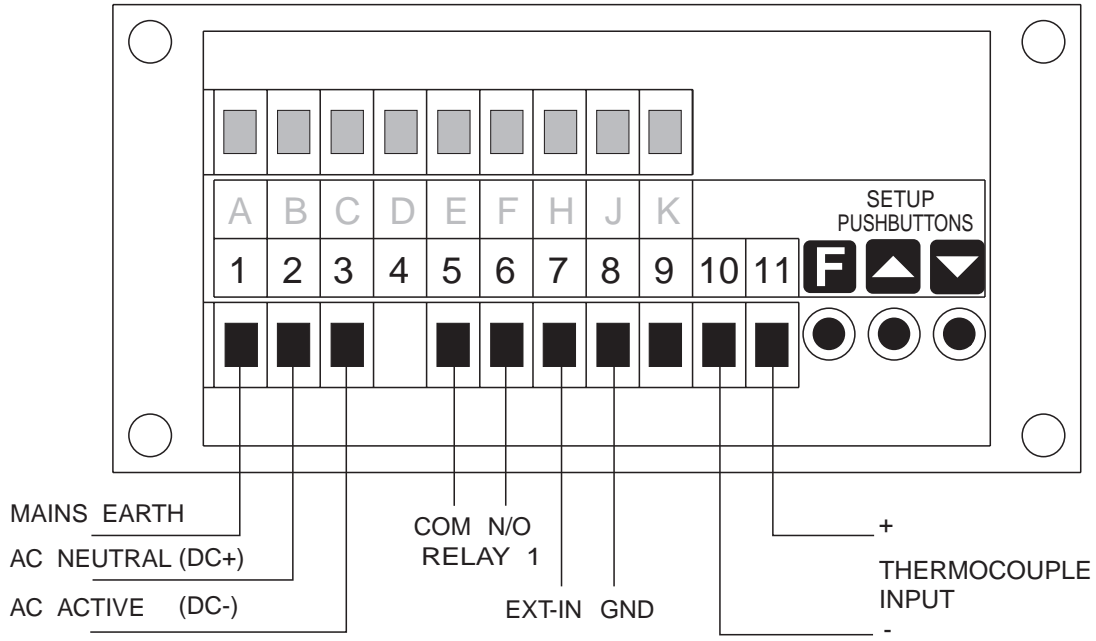
Instrument Rear Panel

| 1	MAINS EARTH		OPTIONAL OUTPUTS		
2	240VAC NEUTRAL				
3	240VAC ACTIVE		A	OUTPUT V/I	-
			B	OUTPUT V/I	+
5	RELAY 1	COM	C		
6	RELAY 1	N/O	D	DC VOLTS O/P	-
7	EXT IN		E	DC VOLTS O/P	GND
8	GROUND		F	DC VOLTS O/P	+
9			H		
10	INPUT	-	J	RELAY 2	COM
11	INPUT	+	K	RELAY 2	N/O
	PM4-TC-240-		SERIAL No:		

Instrument Data Label (example)

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:-

FUNC 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 **FUNC** 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.

Front view of instrument

SETUP PUSHBUTTONS

Rear view of instrument

SETUP PUSH BUTTONS
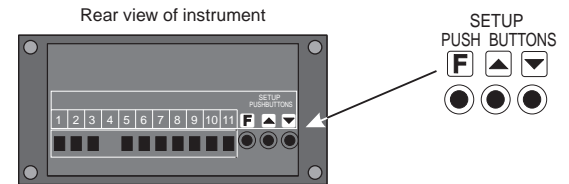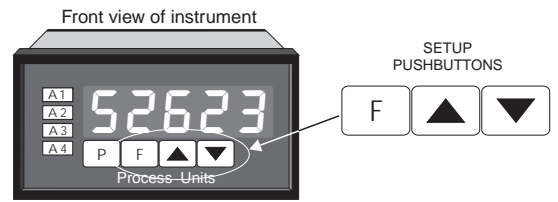
Entering **CAL** Mode

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

2. When the "wake up" messages have finished and the display has settled down to its normal reading press, then release the **F** button.
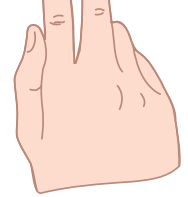
3. Within 2 seconds of releasing the **F** button press, then release the **▲** and **▼** buttons together. The display will now indicate **FUNC** followed by the first function.

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 **FUNC** Mode

No special power up procedure is required to enter **FUNC** 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.
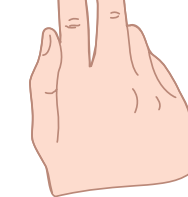
2. Within 2 seconds of releasing the **F** button press, then release the **▲** and **▼** buttons together. The display will now indicate **FUNC** followed by the first function.

PM4TCMAN1.4

The alarm and brightness functions below are accessible via `FUNC` **mode.**

Note that "x" in the alarm functions is used to indicate any alarm number e.g. if 3 setpoint alarm relays are fitted then `A1Lo`, `A2Lo` and `A3Lo` will all 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 `r.1NP` function must be set to `SP.AC`.

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 `A1-2` 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 low setpoint value for the designated alarm relay. The low alarm setpoint may be disabled by pressing the **▲** and **▼** pushbuttons simultaneously. When the alarm is disabled the display will indicate `OFF` . Use **▲** or **▼** to adjust the setpoint value if required. The alarm will activate when the displayed value is lower than the `AxLo` setpoint value. Each relay may be configured with both a low and high setpoint if required, if so the relay will be activated when the display reading moves outside the band set between low and high setpoints.

`AxHi` (alarm high setpoint)

Displays and sets the high setpoint value for the designated alarm relay. The high alarm setpoint may be disabled by pressing the **▲** and **▼** pushbuttons simultaneously. When the alarm is disabled the display will indicate `OFF`. Use **▲** or **▼** to adjust the setpoint value if required. The alarm will activate when the displayed value is higher than the `AxHi` setpoint value. Each relay may be configured with both a low and high setpoint if required, if so the relay will be activated when the display reading moves outside the band set between low and high setpoints.

`AxHY` (alarm hysteresis [deadband])

Displays and sets the alarm hysteresis limit and is common for both high and low setpoint values. The hysteresis value may be used to prevent too frequent operation of the setpoint relay when the measured value stays close to the setpoint. Without a hysteresis setting (`AxHY` set to zero) the alarm will activate when the display value goes above the alarm setpoint (for high alarm) and will reset when the display value falls below the setpoint, this can result in repeated on/off switching of the relay at around the setpoint value. The hysteresis setting operates as follows:

In the high alarm mode, once the alarm is activated the input must fall below the setpoint value minus the hysteresis value to reset the alarm.

e.g. if `A1Hi` is set to `50.0` and `A1HY` is set to `3.0` then the setpoint output relay will activate once the display value goes above `50.0` and will reset when the display value goes below `47.0` (50.0 minus 3.0).

In the low alarm mode, once the alarm is activated the input must rise above the setpoint value plus the hysteresis value to reset the alarm.

e.g. if `A1Lo` is set to `20.0` and `A1HY` is set to `10.0` then the alarm output relay will activate when the display value falls below `20.0` and will reset when the display value goes above `30.0` (20.0 plus 10.0).

The hysteresis units are expressed in displayed engineering units.
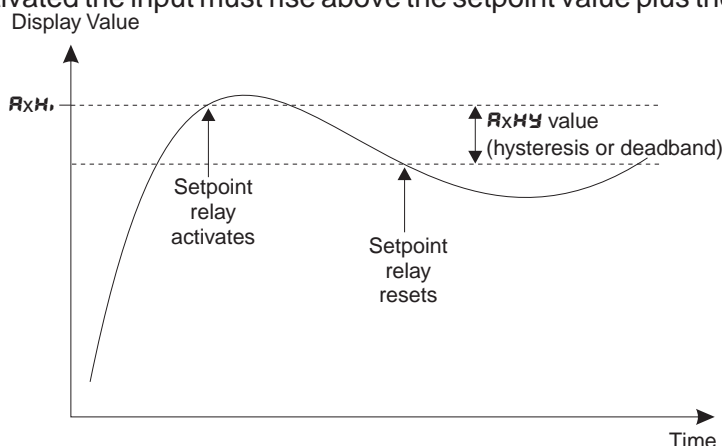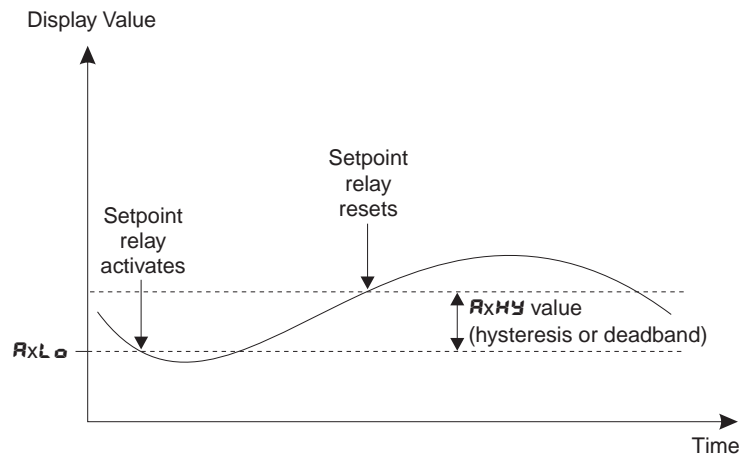
Ax**tt** **(alarm trip time)**

Displays and sets the alarm trip time and is common for both alarm high and low setpoint values. The trip time is the delay time before the alarm relay will activate, or trip, when an alarm condition is present. 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.

Ax**rt** **(alarm reset time)**

Displays and sets the alarm relay reset time. With the alarm condition is removed the alarm relay will stay in its alarm condition for the time selected as the reset time. The reset time is selectable over **0** to **60** seconds.

Ax**n.o** or **A**x**n.c** **(alarm x normally open or normally closed)**

Displays and sets the setpoint alarm relay action to normally open (de-energised) or normally closed (energised), when no alarm condition is present. A normally closed alarm is often used to provide a power failure alarm indication.

Ax**.SP**, **A**x**.t 1**, **A**x**.t2** etc. **(relay operation independent setpoint or trailing setpoint)**

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 (**A1**) is always independent. Alarm 2 (**A2**) may be independent or may be linked to Alarm 1. Alarm 3 (**A3**) may be independent or may be linked to Alarm 1 or Alarm 2. Alarm 4 (**A4**) 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) **A4.SP** = Alarm 4 normal setpoint or **A4.t 1** = Alarm 4 trailing Alarm 1 or **A4.t2** = Alarm 4 trailing Alarm 2 or **A4.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 **A1H,** is set to 1000 and **A2H,** is set to 50 then Alarm 1 will activate at 1000 and alarm 2 will activate at 1050 (i.e. 1000 + 50). If Alarm 2 had been set at -50 then alarm 2 would activate at 950 (i.e. 1000 - 50). See the trailing alarm table which follows.

	A2	**A3**	**A4**	**A5**	**A6**	**A7**
Trailing Alarm Table Showing Possible Alarm Assignments						
A 1	**A2.t 1**	**A3.t 1**	**A4.t 1**	**A5.t 1**	**A6.t 1**	**A7.t 1**
A2		**A3.t2**	**A4.t2**	**A5.t2**	**A6.t2**	**A7.t2**
A3			**A4.t 3**	**A5.t 3**	**A6.t 3**	**A7.t 3**
A4				**A5.t4**	**A6.t4**	**A7.t4**
A5					**A6.t 5**	**A7.t 5**
A6						**A7.t 6**

br9t (display brightness)

Displays and sets the digital display brightness. The display brightness is selectable from *1* to *15*, where *1* = 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)

Displays and sets the level for remote input brightness switching, see *r.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 **br9t** 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.

rEC_ (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.

rEC¯ (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.

The functions which follow are accessible via *CAL* mode only.

drnd (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. (example if set to *10* the instrument will display in multiples of 10).

dCPt (decimal point selection)

Displays and sets the decimal point. 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).

tc tYPE (thermocouple type)

Displays and selects the input thermocouple type being used.

Select from *t1b* (type B), *t2E* (type E), *t3J* (type J), *t4* (type K), *t5n* (type N), *t6r* (type R), *t7S* (type S) or *t8t* (type T).

dE9 tYPE (display units °C, °F or °K)

Displays and sets the display temperature units. Select *°C*, *°F* or *AbS* (absolute temperature or degrees Kelvin).

FLtr (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.

bAr_ (bar graph display low value). Seen only in bargraph display instruments.

Displays and sets the bar graph low value i.e. the value on the 7 segment display at which the bargraph will start to rise. This 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, not the bargraph scale values. The bargraph scale may scaled differently to the 7 segment display, as shown on the right where bargraph scale is 0 to 100 yet the display is showing *675.3*. In this example the bargraph scale may be indicating a percentage whilst the 7 segment display is indicating actual temperature.

bAr¯

%

Bargraph Scale

100
75
50
25
0

bAr_

7 Segment Display

475.3

F ▲ ▼
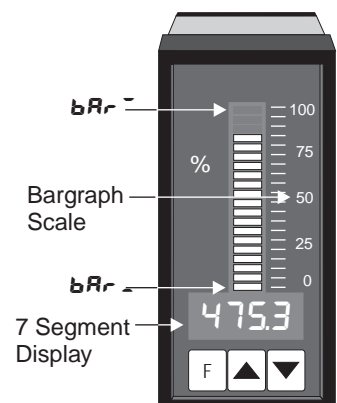
bAr ⁻ (bargraph display high value)

Seen only in bargraph display instruments.

Displays and sets the bar graph high value i.e. the value on the 7 segment display at which the bargraph will reach its maximum indication (all LED's illuminated). May be independently set anywhere within the display range of the instrument.

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 ⌐** and **bAr ⁻** functions e.g. **bAr ⌐ = 0** and **bAr ⁻ = 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**.

5.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 ⌐** and **bAr ⁻** functions e.g. **bAr ⌐ = 0** and **bAr ⁻ = 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 ⌐ = - 100 , bAr ⁻ = 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 ⌐** and **bAr ⁻** functions e.g. **bAr ⌐ = 0** and **bAr ⁻ = 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 ⌐ = - 100 , bAr ⁻ = 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 ⌐** and **bAr ⁻** functions e.g. **bAr ⌐ = 0** and **bAr ⁻ = 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**.

d9.0P (digital output operating mode) - seen only with digital output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted.

Select from:

bin2 - signed binary output, **bin** - unsigned binary output,
b.SCL - scaled binary output, **bcd** - BCD output.

d9.0P (output polarity) - seen only with digital output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted.

Select either **A l o** - active low output or **A H i** - active high output.

bcdStrt (BCD - start display position) - seen only with digital output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted.

This function affects BCD mode only and determines the number of digits to skip when outputting from the display. Select from 0 to number of display digits minus 4. e.g. for a 6 digit display you may select 0 to 2, if 2 is selected then the four left most digits will be output.

di9⌐ (scaled digital output low reading) - seen only with digital output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted.

Accepts any valid display value. Determines the low scaling point for the **b.SCL** mode and has no effect on other modes.

di9⁻ (scaled digital output high reading) - seen only with digital output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted.

Accepts any valid display value. Determines the high scaling point for the **b.SCL** mode and has no effect on other modes. For example if **di9⌐** is set to **0** and **di9⁻** is set to **65535** (2^{16}) then the retransmission will not be scaled i.e. a display of **2** will cause a retransmission of 2. If **di9⁻** is now changed to **32767** (2^{15}) then a display of **2** will cause a retransmission of 4.

4 .1   Calibration

CAL dEg (temperature calibration)

To alter the instruments calibration values the instruments functions must be entered via **CAL** mode.

The temperature calibration function should only be entered when a new temperature calibration is required.

Two methods of calibration are given below. The first method uses direct input from the thermocouple using either a reference thermometer or temperature calibrator to check the temperature reading. The second method uses direct mV input.

Calibration Method 1 - Thermocouple input

A. Place the thermocouple and reference thermometer in a suitable heat source. The temperature should ideally be 80 to 100% of the full range of the thermocouple. If the temperature is below 10% of the full range of the thermocouple range then a **SPAn Err** error message will be seen at the end of the calibration process indicating that an error has taken place.

B. Enter the calibration function by pressing the ▲ and ▼ buttons simultaneously at the **CAL dEg** function prompt. The display will now indicate a "live" temperature reading.

C. When the reading has stabilised press the **F** button and note the reading on the reference thermometer. The display will indicate **dEg** followed by the scale value in memory.

D. Use the ▲ or ▼ button to obtain the required scale (calibration) value i.e. the temperature measured by the reference thermometer.

E. Press the **F** button, the display will now read **CAL End** indicating that the calibration is complete. The display will return to the measure mode (with calibration access).

Calibration Method 2 - Direct mV input

A. Enter the calibration function by pressing the ▲ and ▼ buttons simultaneously at the **CAL dEg** function prompt. The display will now indicate a "live" temperature reading.

B. Using thermocouple millivolt tables, apply an input to the instrument from an accurate millivolt source. Note: You will need to subtract the mV reading for the cold junction temperature (use the ▲ or ▼ button to view the cold junction temperature).

e.g. to calibrate a type K thermocouple to 1200 degrees with a cold junction temperature of 25 degrees the mV input will need to be 48.828 - 0.879 = 47.949 where 48.828 is the mV reading for 1200 degrees and 0.879 is the mV reading for 25 degrees.

The millivolt value should be approximately 80 to 100% of the thermocouple measuring range (this value is not critical and should ideally be close to the normal measuring temperature of the instrument).

C. When the reading has stabilised press the **F** button. The display will indicate **dEg** followed by the scale value in memory.

D. Use the ▲ or ▼ button to obtain the required scale (calibration) value i.e. the temperature for that millivolt input.

E. Press the **F** button, the display will now read **CAL End** indicating that the calibration is complete. The display will return to the measure mode (with calibration access).

dEg (scaling/calibration value)

Used with the **CAL dEg** function. When the live input **CAL dEg** input has been accepted the display will indicate **dEg** followed by a temperature reading. This reading should now be adjusted via the ▲ or ▼ push button to indicate the actual known temperature.

UCAL (uncalibration)

Used to set the instrument back to the factory calibration values. This function should only be used when calibration problems exist, and it is necessary to clear the calibration memory.

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

Applicable only in models with front panel **P** buttons.

The P button may be set to operate some of the remote input functions, see **r.I nP** below for a description of these functions. The **P** button is located at the front of 5 or 6 digit LED models. If both the remote input and **P** button function are operated simultaneously the **P** button will override the remote input. The functions below are as described in the **r.I nP** function above with the exception of the **P.SEt** function.

Functions available are: **nOnE**, **HI** , **Lo** or **HI Lo**

ᴦ.ı ᴨᴘ (remote input function)

Pins 7 and 8 at the rear of the instrument are the remote input pins. When these pins are short circuited, via a pushbutton or keyswitch the instrument will perform the selected remote input function. A message will flash to indicate which function has been selected when the remote input pins are short circuited. The remote input functions are as follows:

ᴨᴏᴨᴇ - no remote function required.

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

d.ᕼᒪd - display hold. The display value will be held whilst the remote input pins are short circuited.

ᕼı - peak memory. The peak value stored in memory will be displayed if the remote input pins are short circuited, if the short circuit is momentary then the display will return to normal measurement after 20 seconds. If the short circuit is held for 1 to 2 seconds or the power is removed from the instrument then the memory will be reset.

ᒪᴏ - valley memory. The minimum value stored in memory will be displayed. Otherwise operates in the same manner as the **ᕼı** function.

ᕼı ᒪᴏ - toggle between **ᕼı** and **ᒪᴏ** 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. **P ᕼı** or **P ᒪᴏ** will flash before each display to give an indication of display type.

SP.Ac - setpoint access only. This blocks access to any functions except the alarm setpoint functions unless the remote input pins are short circuited or entry is made via **CᴀᏞ** mode.

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

CᴀᏞ.S - calibration select. Two sets of setup values can be entered in, one set with the remote input open circuit and another set with the remote input short circuit to ground. The remote input can then be used to switch between one set and the other. This feature provides a simple switch change-over to allow toggling between degree type display, thermocouple type, decimal point place etc. Note: the alarm and retransmission settings cannot be changed between the two selections but will function for whichever selection is displayed at the time.

dᴜᒪᒪ - display brightness control. The remote input can be used to change the display brightness. When this mode is selected the display brightness can be switched, via the remote input, between the brightness level set at the **bᴦ9ᴛ** function and the brightness level set at the **dᴜᒪᒪ** function.

SPᴀC (setpoint access)

Seen only if more than 1 relay fitted.

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

ᴀ ı - Allows setpoint access to alarm 1 only.

ᴀ ı-2 - Allows access to alarms 1 and 2 only.

ᴀ ı-3 allows access to alarms 1,2 and 3 etc. up to the maximum number of relays fitted.

The remote input function (**ᴦ.ı ᴨᴘ**) must be set to **SP.ᴀC** for this function to operate. Note: Only the setpoints which have been given a value will be accessible e.g. if **ᴀ ıᕼı** is set to **ᴏFF** then there will be no access to the **ᴀ ıᕼı** function when **SPᴀC** is used.

4 .2   Alarm, bargraph and retransmission operation modes

The following describes the output modes for alarm, bargraph, analog and digital retransmission. The serial output (RS232 or RS485) is controlled via polling commands, see the "RS232/RS485 Commands" appendix for details. Retransmission and extra alarm relays are optional outputs. The following commands only apply if the option is fitted to the instrument.

ᴀ ı.ᴀ2 etc. (Alarm relay operation mode for relays 1, 2 etc.)

The following choices are available for alarm operation mode:

dı SP - display mode. If the live display mode is used then the alarms will operate purely on the display value at the time i.e. if the display is showing above high setpoint or below the low setpoint value then the alarm relay will activate. For example if the remote input were set to peak memory and **ᴀ ı** were set to live display mode then, unless the display is actually showing the peak memory value (i.e. the remote input has just been activated), the alarm relay is free to operate from the changing display value i.e. the memory does not have to be reset to clear an alarm condition.

ᴛᴀᴦᴇ - tare mode. The alarm relay operation will follow the tare function. e.g. in the example above (**dı SP**) if **ᴀ ı** is set to **ᴛᴀᴦᴇ** then the alarm would activate at a display reading of **ıᴏᴏ** (the setpoint

value) rather than **70**.

P.HLd - peak hold mode. If the peak hold mode is used and the remote input is set to peak hold then once the peak display goes above any alarm high setpoint the alarm relay will activate and will not de-activate until the peak hold is released and the display value falls below the setpoint value.

d.HLd - display hold mode. If the display hold mode is used and the remote input is set to display hold then the alarm relay will be held in its present state (activated or de-activated) until the display hold is released and the display is free to change.

Hi - peak (max.) memory mode. If the peak memory mode is used and the remote input is set to peak memory then the alarm will be activated if the peak memory value is above the high setpoint value. The alarm will not de-activate until the memory is reset.

Lo - valley (min.) memory mode. If the valley memory mode is used and the remote input is set to valley memory then the alarm relay will be activated if the valley memory value is below the low setpoint value. The alarm will not de-activate until the memory is reset.

LiuE - live input mode. The alarm relay operation will always follow the electrical input at that time irrespective of the 7 segment display value. e.g. assume the remote input is set to **tArE** and **A 1Hi** is set to **100**. If the instrument is tared at a display reading of **30** then the alarm will now activate at a display reading of **70**.

bAr (bargraph operation mode) - applicable only to bargraph displays.

The following choices are available for bargraph operation mode:

diSP - display mode. The bargraph display will follow whatever value is on the 7 segment display. For example if the remote input is set to **tArE** then the 7 segment and bargraph will indicate the tared value and both will also be changed if the remote input toggles the displays between **nEtt** and **9roS**. If the **bAr** function had been set to **tArE** then the bargraph would not respond to the **9roS** toggle.

tArE - tare mode. The bargraph will tare (fall to zero) along with 7 segment display when the remote input tare function is operated. If the remote input toggles the 7 segment display to show gross (**9roS**) then the 7 segment display will change to show the gross value but the bargraph will not respond (see **LiuE** for alternative operation).

P.HLd - peak hold mode. The bargraph (and 7 segment display) will indicate the peak value only whilst the peak value function is operated via a contact closure on the remote input i.e. the bargraph & 7 segment display can rise but not fall whilst the remote input switch is closed. When the remote input switch is opened the bargraph value will remain fixed i.e. it will not rise or fall, although the 7 segment display value will be free to alter. This peak bargraph reading can be cleared by closing the remote input switch for another operation or by removing power from the instrument. Note: In this mode the bargraph will show a zero reading until the remote input is operated for the first time after switch on.

d.HLd - display hold mode. The bargraph (and 7 segment display) value will be held whilst the remote input display hold switch is closed. When the switch is opened the bargraph value will remain fixed at the held value although the 7 segment display value will be free to alter. The held bargraph reading can be cleared by closing the remote input switch for another operation or by removing power from the instrument. Note: In this mode the bargraph will show a zero reading until the remote input is operated for the first time after switch on.

Hi - peak (max.) memory mode. With the peak remote input switch open the bargraph will indicate the peak value in memory i.e. the bargraph can rise but not fall. The bargraph can be reset by clearing the memory. The memory may be cleared either by closing the remote input switch for approximately 2 seconds or by removing power.

Lo - valley (min.) memory mode. With the valley remote input switch open the bargraph will indicate the valley (min.) value in memory i.e. the bargraph can fall but not rise. The bargraph can be reset by clearing the memory. The memory may be cleared either by closing the remote input switch for approximately 2 seconds or by removing power.

LiuE - live input mode. The bargraph will respond to the electrical input only and will not necessarily follow the 7 segment display value. For example if the remote input is set for peak hold operation then when the remote input is closed the 7 segment display will only show the peak value but the bargraph will be free to move up and down to follow the electrical input.

rEt (analog retransmission operation mode) and **d.90P** (digital output retransmission). Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted.

The following choices are available for analog or digital retransmission operation mode:

diSP - display mode. The retransmission output will follow whatever value is on the 7 segment display. For example if the remote input is set to **tArE** then the 7 segment and retransmission output will indicate the tared value and both will also be changed if the remote input toggles the displays between **nEtt** and **9roS**. If the **rEt** or **d90P** function had been set to **tArE** then the

retransmission output would not respond to the **9ſ05** toggle.

ŁAſE - tare mode. The retransmission value will tare (fall to zero) along with 7 segment display when the remote input tare function is operated. If the remote input toggles the 7 segment display to show gross (**9ſ05**) then the 7 segment display will change to show the gross value but the retransmission will not respond (see **Lı ᴜE** for alternative operation).

P.HLd - peak hold mode. The 7 segment display and retransmission value will indicate the peak value only whilst the peak value function is operated via a contact closure on the remote input i.e. the 7 segment display and retransmission can rise but not fall whilst the remote input switch is closed. When the remote input switch is opened the retransmission value will remain fixed i.e. it will not rise or fall, although the 7 segment display value will be free to alter. This peak retransmission output can be cleared by closing the remote input switch for another operation or by removing power from the instrument. Note: In this mode the retransmission will show a zero reading until the remote input is operated for the first time after switch on.

d.HLd - display hold mode. The 7 segment display and retransmission value will be held whilst the remote input display hold switch is closed. When the switch is opened the retransmission value will remain fixed at the held value although the 7 segment display value will be free to alter. The held retransmission output can be cleared by closing the remote input switch for another operation or by removing power from the instrument. Note: In this mode the bargraph will show a zero reading until the remote input is operated for the first time.

Hı - peak (max.) memory mode. With the peak remote input switch open the retransmission will indicate the peak value in memory i.e. the retransmission output can rise but not fall. The retransmission output can be reset by clearing the memory. The memory may be cleared either by closing the remote input switch for approximately 2 seconds or by removing power to the instrument.

Lo - valley (min.) memory mode. With the valley remote input switch open the retransmission will indicate the valley (min.) value in memory i.e. the retransmission output can fall but not rise. The retransmission output can be reset by clearing the memory. The memory may be cleared either by closing the remote input switch for approximately 2 seconds or by removing power to the instrument.

Lı ᴜE - live input mode. The retransmission will follow the electrical input and will not necessarily follow the 7 segment or bargraph display. For example if the remote input is set for peak hold operation then when the remote input is closed the 7 segment display will only show the peak value but the retransmission will be free to change to follow the electrical input.

Serial output functions - the following functions will be seen only with serial output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted.

bAᴜd (set baud rate)

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

Prᴛy (set parity)

Select parity check to either **n0nE**, **EᴜEn** or **odd**.

0.Pᴜᴛ (set RS232/485 interface mode).

Select **dı 5P**, **Conᴛ** or **P0LL**. Allows user to select the RS232/485 interface operation as follows:-

dı 5P Sends image data from the display without conversion to ASCII.

Conᴛ Sends ASCII form of display data every time display is up dated.

P0LL Controlled by computer or PLC as host. Host sends command via RS232/485 and instrument responds as required.

Addr (set unit address (0 to 31) for polled (P0LL) mode)

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 normal measure mode

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

4 .3 Error Messages

The following details some of the instruments error messages.

OPEN Err - this message indicates that the thermocouple input is open circuit. This could be caused by a broken wire, loose termination or a broken thermocouple junction.

SPAN Err - if this message is seen following an attempt at calibration it means that the input was below 10% of the full range of the thermocouple. Recalibrate using a higher temperature or higher mV input (ideally 80 to 100% of the thermocouple range).

dEG GAIN Err - if this message is seen following an attempt at calibration it means that change in temperature attempted is more than 10% outside the factory calibrated setting. It means that the change attempted is not considered valid and has not been accepted. This error message is used as a form of protection against large errors in the calibration procedure. Check that the correct thermocouple type has been selected and that the temperature measured by the reference thermometer or mV input during calibration were correct.

COP FAIL - this message indicates that the instrument power has been interrupted, usually due a spike on the power supply or signal input lines. The instrument will show this error message and then reset itself i.e. the "wake up" display messages will be seen after the *COP FAIL* message. Check the power supply and input lines for spikes, usually caused by something with a large inductance (e.g. solenoid, motor etc.) on the same supply circuit switching on or off. It may be necessary to suppress the interference at the source and/or place the PM4 on a different supply line.

the bars across the display indicate that the instrument is seeing an input which is out of its range i.e. the mV input is higher than the analog to digital converter is expecting. Check the correct thermocouple type has been selected. Also check that no stray voltages are present at the input.

-or - this message indicates that the display is "overrange" i.e. it is being asked to display a number larger than its display range. e.g. larger than *9999* for a 4 digit instrument. Check also that the input scaling value used during calibration are correct i.e. that the scaled temperature for the input mV (obtained from thermocouple mV tables) is correct. Also check that no stray voltages are present at the input. Use of a decimal point can also cause this error display e.g. if one decimal point is used then the *-or -* error display will be seen if the temperature goes above 999.9 degrees.

5 Function table for fully optioned instrument

Initial display	Meaning of display	Next display	Default setting	Record your settings
AxLo	Alarm low setpoint value	Setpoint value or OFF	OFF	See following table
AxHi	Alarm high setpoint value	Setpoint value or OFF	OFF	See following table
AxHY	Alarm hysteresis	Hysteresis value in measured units	10	See following table
Axtt	Alarm trip time	No of seconds before relay trips	0	See following table
Axrt	Alarm reset time	No of seconds before relay resets	0	See following table
Axn.o or Axn.c	Alarm action N/O or N/C	Axn.o or Axn.c	Axn.o	See following table
brgt	Digital display brightness	1 to 15 (15 = highest brightness)	15	
duLL	Remote brightness control	0 to 15 (15 = highest brightness)	1	
rEC_	Recorder output low limit	Value in memory	0	
rEC‾	Recorder output high limit	Value in memory	100	
Functions below are accessible only via CAL mode				
drnd	Display rounding - selects resolution	Value in memory	1	
dCPt	Display decimal point	0 or 0.1	0	
tc tYPE	Thermocouple type Note: when selecting t4 (type K) "K" is not displayed	t1 b t2 E t3 J t4 t5 n t6 r t7 S t8 t	t4	
dEg tYPE	°C, °F or °K selection	°C, °F or AbS	°C	
FLtr	Digital filter range 0 to 8	0 to 8 (8=most filtering)	2	
bAr_	Bar graph low reading	Value in memory	0	
bAr‾	Bar graph high reading	Value in memory	100	
dg.OP	Digital output type	bin2.bin.b.SCL or bcd	bin2	
dg.OP	Digital output polarity	ALo or AHi	ALo	
bcdStrt	Start display (BCD mode)	Value in memory	0	
dig_	Digital output - low reading (scaled binary mode)	Value in memory	0	
dig‾	Digital output - low reading (scaled binary mode)	Value in memory	1000	
CAL dEg	Temperature calibration	Live reading	n/a	
UCAL	Uncalibration	CAL CLr	n/a	
P.but	P button function	NONE.Hi.Lo or Hi Lo	NONE	
r.i nP	Remote input function	NONE.PHLd.dHLd.Hi.Lo. Hi Lo.SP.Ac.no.Ac.CAL.S. or duLL	NONE	
SPAC	Setpoint access	A1.A1-2 etc.	A1	
A1.A2 etc	Alarm operation mode	LivE.P.HLd.d.HLd.Hi.Lo or diSP	LivE	
rEC	Analog retransmission operation mode	LivE.P.HLd.d.HLd.Hi.Lo or diSP	LivE	
dgOP	Digital retransmission operation mode	LivE.P.HLd.d.HLd.Hi.Lo or diSP	LivE	
bAud rAtE	Baud rate	300.600.1200.2400. 4800.9600.19.2 or 38.4	9600	
Prty	Parity select	NONE.EUEN or Odd	NONE	

O.Put	Output, continuous or controlled	*POLL.Cont* or *diSP*	*POLL*	
Addr	Set unit address for *POLL* mode	*0* to *31*	*0*	

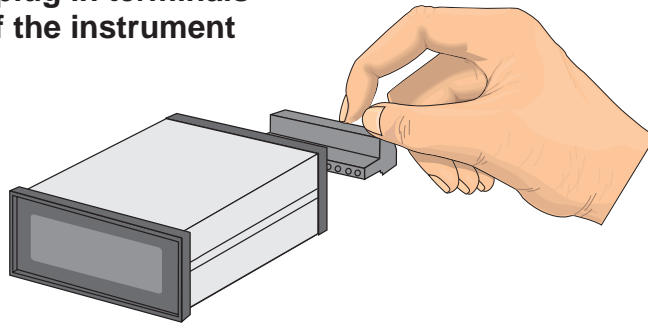Note: Functions shown shaded are only seen only when those options are fitted.

| Settings for relays - record settings here							
	A1	A2	A3	A4	A5	A6	A7
AxLo							
AxHi							
AxHY							
Axtt							
Axrt							
Axn.o or *Axn.c*							
Ax.SP or *Ax.t1* etc	n/a						

6   Input/output configuration

If you need to alter the input or output configuration proceed as follows:

**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**
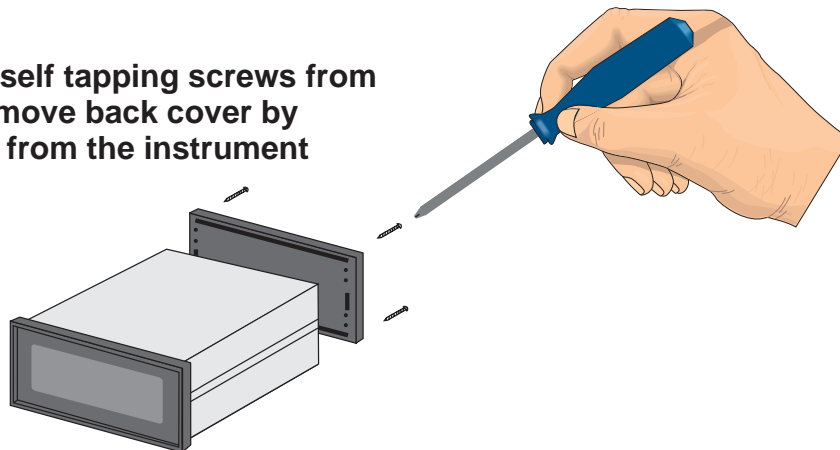
**3. Using a screwdriver, remove
the earth screw which passes
through the case then slide out
the board or boards**

Remove earth screw
which passes through the
case then slide out
the printed circuit board
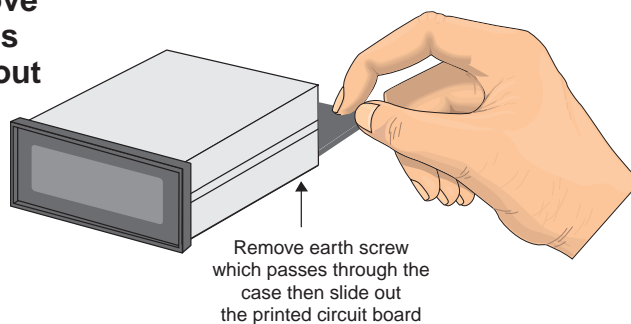
4. Configure the PCB links as required, see appropriate chapter

5. Slide PCB back into the case

6. Replace the earth screw which passes through the case

7. Refit back cover and fix with the self tapping screws

8. Plug the terminal strips back into the rear of the instrument

7 Specifications

Technical Specifications

Input Types:	Thermocouple types B, E, J, K, N, R, S or T (user selectable)
Temperature Range:	B 400 to 1866°C, E -100 to 1000°C
	J -100 to 870°C, K -100 to 1372°C
	N -100 to 1300°C, R -35 to 1768°C
	S -35 to 1768°C, T -100 to 400°C
ADC Resolution:	1 in 20,000
Accuracy:	Better than 1°C at 25°C
Conversion Method:	Dual Slope ADC, 4 samples per second
Microprocessor:	MC1468HC11 CMOS
Ambient Temperature:	LED -10 to 60°C, LCD -10 to 50°C
Humidity:	5 to 95% non condensing
Display:	LED Models 4 digit 20mm,
	5 digit 14.2mm + status LEDs + 4 way keypad.
	6 digit 14.2mm + 4 way keypad
	LED Bar Graph 20 segment bar + 4 digit 7.6mm
	LCD Models 4 digit 12.7mm, $4\frac{1}{2}$ digit 10.2mm
Power Supply:	AC 240V, 110V or 24V 50/60Hz, DC 9 to 55V
Power Consumption:	AC supply 4 VA max,
	DC supply, consult AIC (depends on display type & options)
Output (standard):	1 x relay, Form, A rated 5A resistive
Relay Action:	Programmable N.O. or N.C.

Output Options

Extra Relays:	Same specs as Relay 1
Analog Retransmission:	4 to 20mA standard
	0 to 1V and 0 to 10V link selectable
Serial Communications:	RS232 or RS485

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 12g wire)
Weight:	400 gms Basic model, 450 gms with option card

8   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.