PM4-QC

Quadrature Pulse Input

Totaliser/Ratemeter

Process Monitor/Controller

Operation and Instruction Manual

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1 Introduction

This manual contains information for the installation and operation of the PM4-QC Monitor. The instrument may be set to operate as a ratemeter or totaliser or allow toggling between rate and total displays. The PM4-QC requires an input from a quadrature output (A & B pulses) encoder. The **SEt OPEr** function allows selection of one of these three operation modes. A brief description of each mode is given below.

1. totl - totaliser/counter display

The input pulses are totalised, scaled in engineering units and displayed e.g. a display showing Total litres, mm etc. A total and grand total may be viewed via the ▲ and ▼ buttons and reset separately. The grand total is a separate total memory which accumulates the previous totals.

Explanation and examples of the totaliser functions are given in the “Totaliser Explanation of Functions” chapter.

2. FrEq - frequency/rate display

The frequency or rate of the input may be scaled in engineering units and displayed e.g. a display showing Metres/sec.,R.P.M, Bottles/min., Litres/hour etc.

Explanation and examples of the ratemeter functions are given in the “Ratemeter Explanation of Functions” chapter.

3. both - total/rate display (display may be toggled to either total or rate). This mode is primarily used when the display is required to toggle between a rate and total display via an external contact closure or via the front panel ▲ and ▼ buttons. The ▲ and ▼ buttons also allow viewing of the grand total.

A standard inbuilt relay provides an alarm/control function. Various combinations of one, two, three or six optional extra relays, analog (4-20mA, 0-1V or 0-10V) retransmission or serial (RS232 or RS485) communications and an isolated 12 or 24VDC isolated transmitter supply (20mA max.) may also be provided as options.

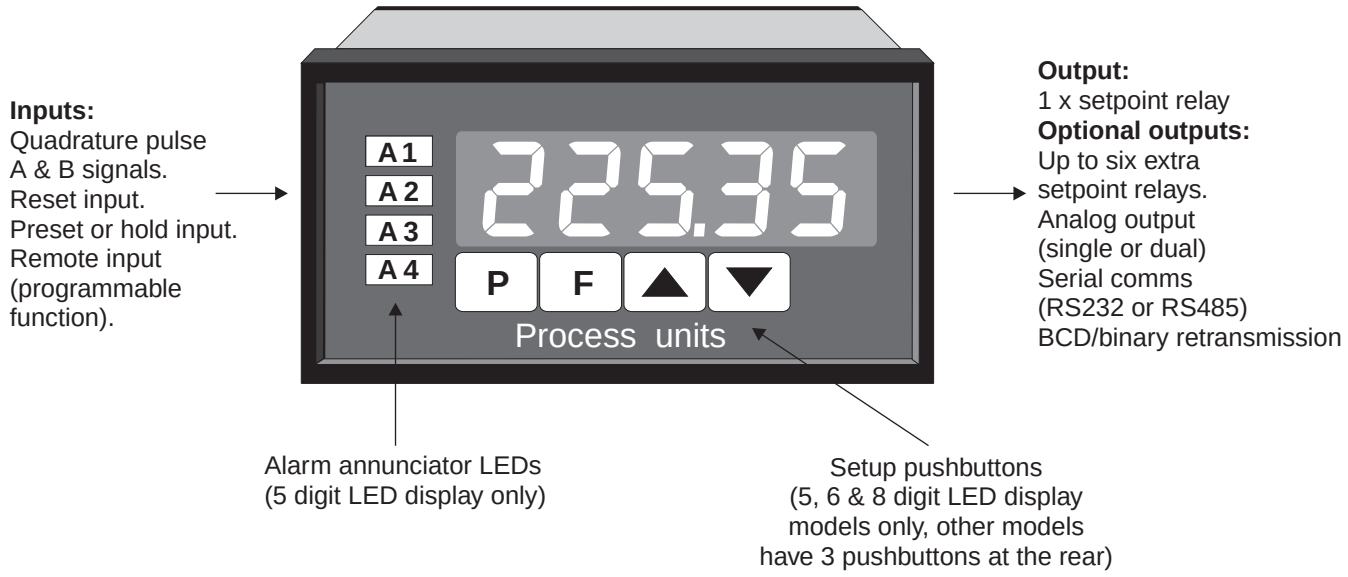
Unless otherwise specified at the time of order, your PM4 has been factory set to a standard configuration. Like all other PM4 series instruments the configuration and calibration is easily changed by the user. Initial changes may require dismantling the instrument to alter PCB links, other changes are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

Full electrical isolation between power supply, input signal 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.

Inputs & outputs

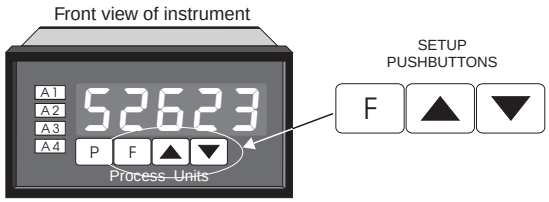


1 .1 Entry to setup and scaling functions

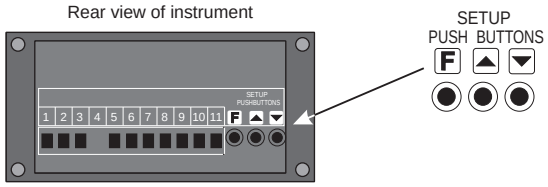
The PM4 setup and calibration functions are configured through a push button sequence. Two levels of access are provided for setting up and calibrating:-

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.



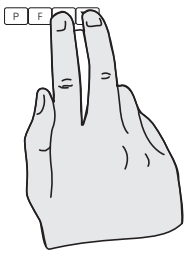
The three push buttons located at the rear of the instrument (also at the front on some display options) are used to alter settings. Once CAL or FUNC mode has been entered you can step through the functions, by pressing and releasing the F push button, until the required function is reached. Changes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



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.



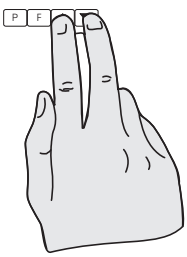
3. Within 2 seconds of releasing the F button press, then release the ▲ and ▼ buttons together. The display will now indicate FUNC followed by the first function.

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.



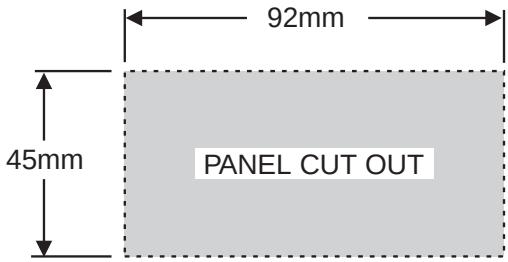
2. Within 2 seconds of releasing the F button press, then release the ▲ and ▼ buttons together. The display will now indicate FUNC followed by the first function.

2 Mechanical Installation

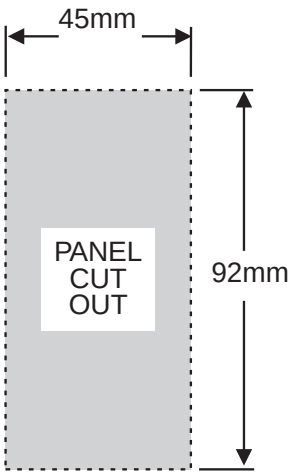
If a choice of mounting sites is available then choose a site as far away as possible from sources of electrical noise such as motors, generators, fluorescent lights, high voltage cables/bus bars etc. An IP65 access cover which may be installed on the panel and surrounds is available as an option to 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.

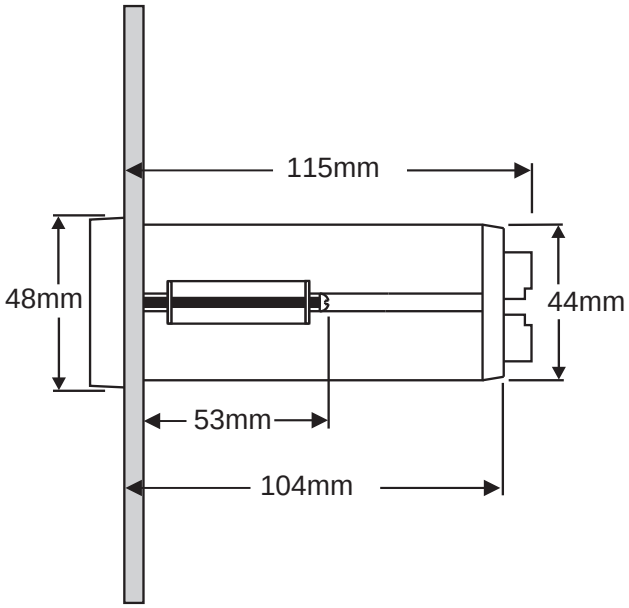
Prepare a panel cut out of 45mm x 92mm +1 mm / -0 mm (see diagram below). Insert the instrument into the cut out from the front of the panel. Then, from the rear of the instrument, fit the two mounting brackets into the recess provided (see diagram below). Whilst holding the bracket in place, tighten 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.

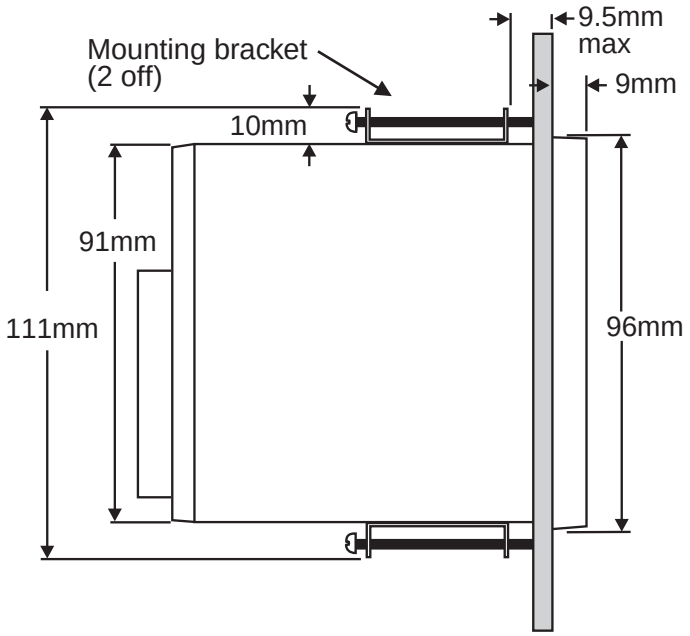
Horizontal mounting



Vertical mounting
(bar graph displays)



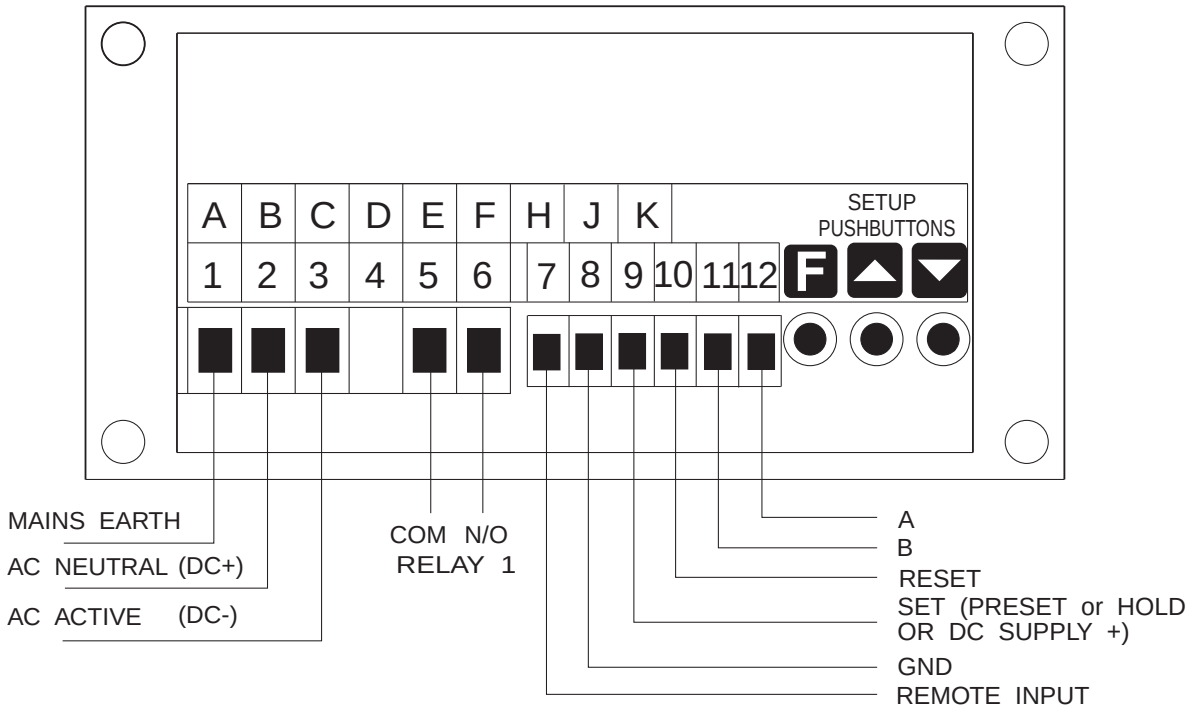




3 Electrical Installation

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.

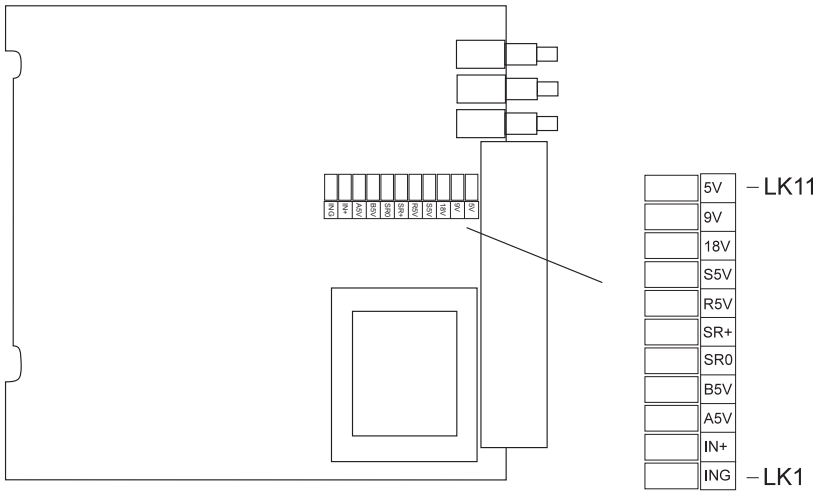
The terminal blocks allow for wires of up to 2.5mm^2 (power supply & relay) or 1.5mm^2 (signal, reset etc. connections) to be fitted. Connect the wires to the appropriate terminals as indicated below. Refer to other details provided in this manual to confirm proper selection of voltage, polarity and input type before applying power to the instrument. When power is applied 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 resultant reading.



Instrument Rear Panel

1 MAINS EARTH	
2 240VAC NEUTRAL	
3 240VAC ACTIVE	
5 RELAY 1 COM	
6 RELAY 1 N/O	
7 REMOTE INPUT	
8 GROUND	
9 SET OR SUPPLY +	
10 RESET	
11 INPUT B	
12 INPUT A	
PM4-QC-240-5E	SERIAL No.

Instrument data label (example)



Circuit board link locations

3 .1 Input link settings & circuit

The link functions are as follows:

LK1 - INPUT A & B Pull Down to GND, see table 1 below

LK2 - INPUT A & B Pull Up to 5V (VCC), see table 1 below

LK3 - INPUT A level, see table 1 below

LK4 - INPUT B level, see table 1below

LK5 - SET (for preset/hold) & RESET Inputs Pull Down to GND, see table 2 & 3 below

LK6 - SET (for preset/hold) & RESET Inputs Pull Up to 5V (VCC), see table 2 & 3 below

LK7 - RESET input level, see table 2 below

LK8 - SET terminal input level, see table 3 & 4 below

LK9 - +18V 20mA unregulated supply on Terminal 9, see table 4 below (AC supply models only)

LK10 - +9V unregulated supply on Terminal 9, see table 4 below (AC supply models only)

LK11 - +5V supply (VCC) on Terminal 9, see table 4 below (available on AC & DC supply models)

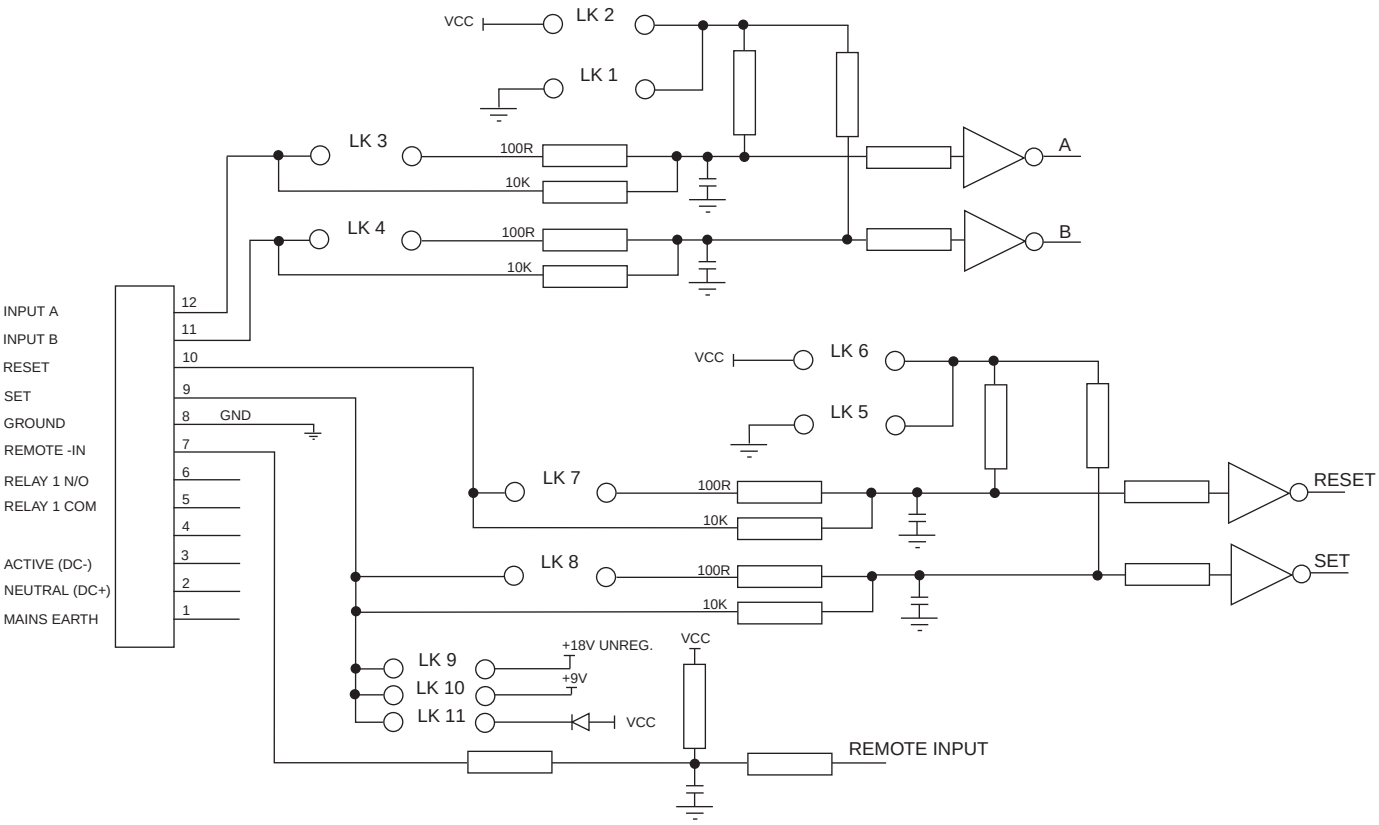
Table 1	**Input A & B - terminals 11 & 12**			
Input type	**LK1**	**LK2**	**LK3**	**LK4**
0-5V NPN or contact closure (switch/relay)	OUT	IN	IN	IN
0-5V PNP or 0-5V pulse input	IN	OUT	IN	IN
Pulse greater than 5V up to 24VDC	IN	OUT	OUT	OUT

Table 2	**Reset input - terminal 10**		
Input type	**LK5**	**LK6**	**LK7**
Contact closure (switch/relay) or 0-5V control voltage	OUT	IN	IN
Greater than 5V up to 24VDC control voltage	IN	OUT	OUT

Table 3	**SET input (preset or hold) - terminal 9**		
Input type	**LK5**	**LK6**	**LK8**
Contact closure (switch/relay)or 0-5V control voltage	OUT	IN	IN
Greater than 5V up to 24VDC control voltage	IN	OUT	OUT

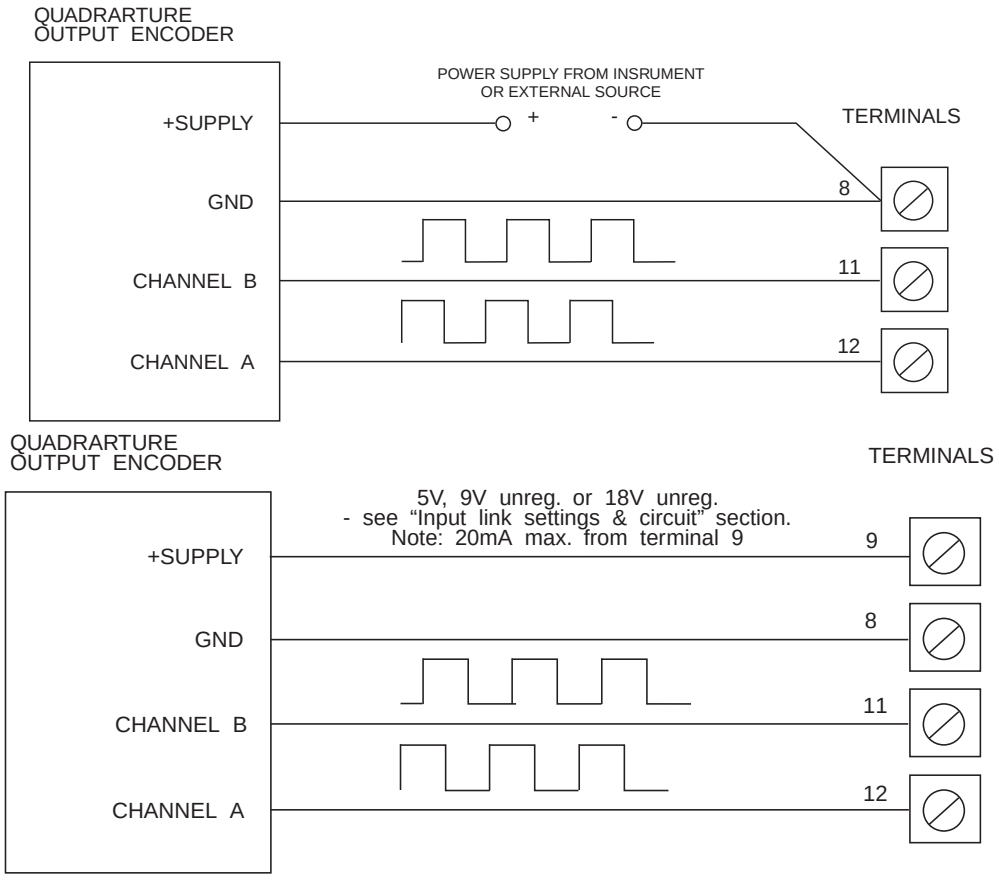
Table 4	**Encoder supply - terminal 9**		
Input type	**LK9**	**LK10**	**LK11**
+18V unregulated @ 20mA max.	IN	OUT	OUT
+9V unregulated @ 20mA max.	OUT	IN	OUT
5V regulated @ 20mA max.	OUT	OUT	IN
Terminal 9 used as preset or hold input	OUT	OUT	OUT

The circuit diagram below shows the circuit location of the various links used to configure the input to suit the sensor being used.

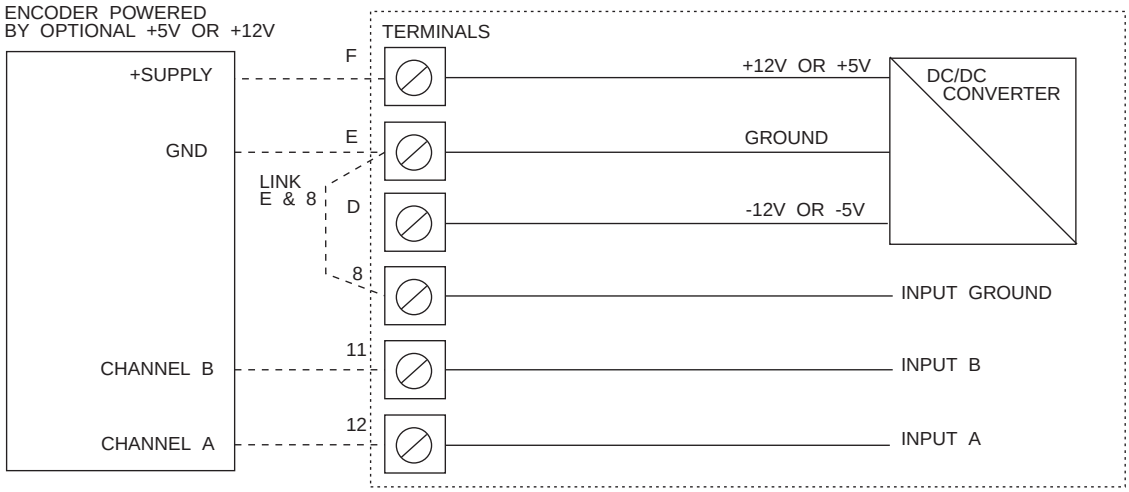


3 .2 Encoder input and power supply

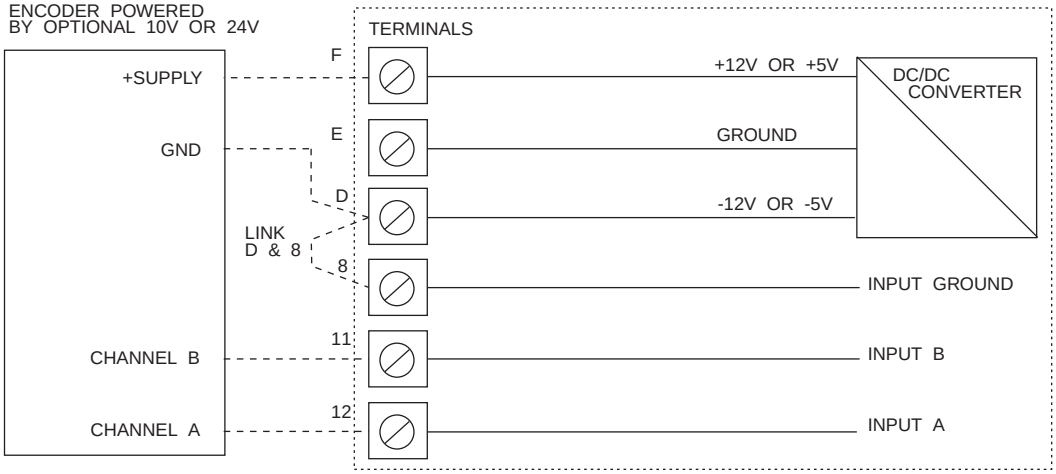
An external supply is usually required to power the encoder due to the current consumption required by these encoders. If current consumption by the encoder is 20mA or less terminal 9 may be link selected to provide a regulated 5V or unregulated 9V or unregulated 18V. Note: the encoder power supply is not available on DC powered models.



An optional 12V (or 5V) DC power supply is available and is connected as shown below. It is necessary to link terminals E and 8 to couple the power supply and input grounds. The maximum current available is 40mA @12V and 80mA @ 5V.

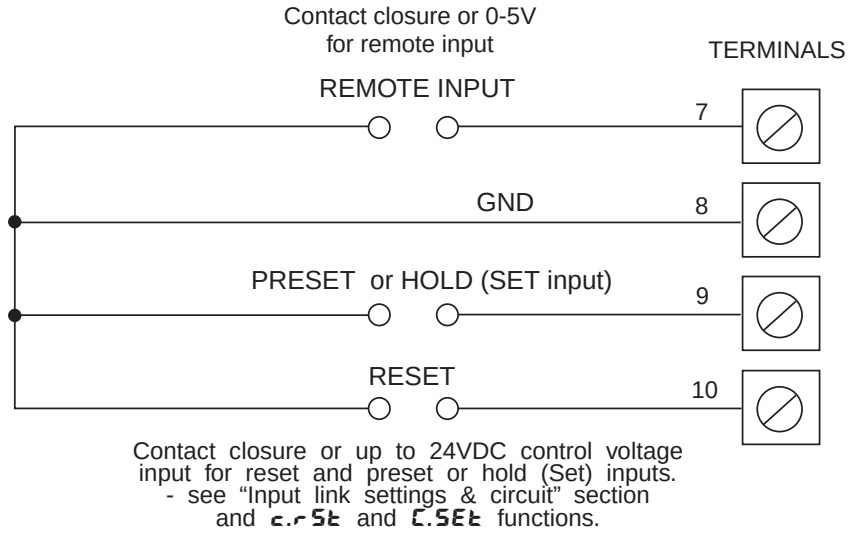


The optional supply can also be configured for 10V or 24V DC power supply and connected as shown below. It is necessary to link terminals D and 8 to couple the power supply and input grounds. The maximum current available is 20mA @ 24V and 40mA @10V.



3 .3 Reset, preset/hold and remote inputs

The RESET input (terminal 10) will zero the display when the **c.rSt** function is set to **2ERO** or to force the display to the preset value when the **c.rSt** function is set to **P.SEt**. The SET input (terminal 9) can be used, depending on the **SEt InPt** setting, to either hold the total count or force the display to a preset value, it is important that the links for this input are correctly set otherwise damage could occur, see section 3.1 for link details. The remote input (terminal 7) can be used for one of a number of user selectable operations. To use the remote input to reset the display to zero the **r.1 nP** function must be set to **2ERO** and the **c.rSt** function set to **2ERO**. To use the remote input to set the display to the preset value you can either set **r.1 nP** to **P.SEt** or set **r.1 nP** to **2ERO** and **c.rSt** to **P.SEt**. To use the remote input to hold the count display (total only) set the **r.1 nP** function to **Hold**. Other remote input functions are also available, see **r.1 nP** function.



4 Explanation of functions

Ratemeter/Frequency operation

The description of functions in this chapter covers the three PM4-QC operation modes namely FrEq (frequency/rate/period), totl (totaliser/counter) and both mode (toggle between rate and total). These modes are selected at the set operation (SEt OPEr) function. Individual function tables are given for each mode in the chapters which follow.

You will need to enter via CAL or FUNC mode to gain access to functions, the function table for each mode shows which functions require entry via CAL mode. See page 4 for details of how to enter FUNC and CAL modes.

Note: a number relays are available with certain option combinations (a maximum of 7 relays may be fitted to the PM4 if options such as serial retransmission are not required), the alarm functions are displayed only for the actual number of relays provided. The “x” shown in the following display messages represents the alarm number i.e. AxLo as shown in the text will appear as A1 Lo, A2Lo etc. on the instrument display.

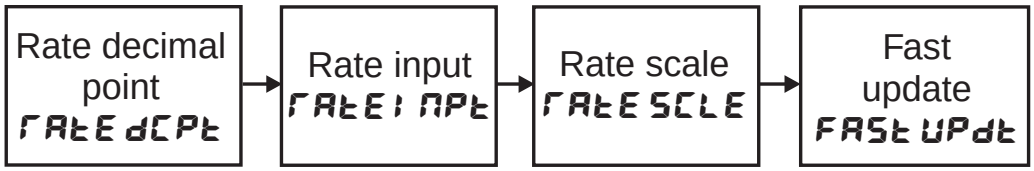
4.1 Frequency/rate mode operation mode.

This mode is chosen by selecting FrEq at the SEt OPEr function. The ratemeter mode can operate in one of 4 basic ways to give different display options namely:

1. Rate display, high frequency.

If Hi F is selected at the FrEq rnGE function the instrument acts as a general purpose frequency/ratemeter/tachometer. If a very low frequency (below approx. 4Hz) input is used then Lo F mode should be selected. With Hi F selected at frequencies below 4Hz the display may alternate between an actual frequency reading and a zero reading, this is due to the higher sampling rate when Hi F is selected.

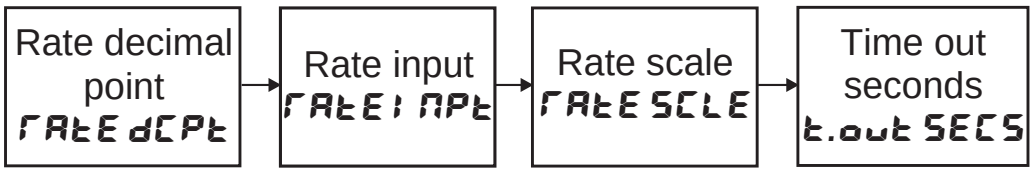
Functions specific to display with FrEqrnGE set to Hi F with a rate display



2. Rate display, low frequency.

If Lo F is selected at the FrEq rnGE function the instrument expects an input frequency of less than 1kHz. This mode allows very low frequency inputs without exhibiting the apparent display instability often seen with low frequency inputs. This display stability is accomplished by allowing the user to set a “time out” value - see the tout SECS function.

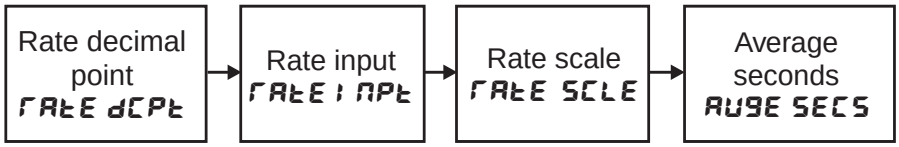
Functions specific to display with FrEqrnGE set to Lo F with a rate display



3. Averaged rate display.

With AUGE selected at the FrEq rnGE function the display will average the rate input over the number of seconds selected at the AUGE SECS function. The display will only update at the end of the averaging period. This mode allows the user to see a steady averaged display for an input which produces short term irregularities.

Functions specific to display with FrEqrnGE set to AUGE with an averaged rate display



4.2 Totaliser functions

This mode is chosen by selecting totl at the SEt OPEr function. When in totl mode certain functions which relate only to FrEq or both modes will not be seen. The totaliser mode allows the instrument to be used as a counter/totaliser.

A grand total or accumulated total memory (g.tot function) provides a separately viewable (use ▲ or ▼ button to toggle between total and grand total) and resettable total memory.

An alarm relay operation unique to the total mode operation is the “pass” mode operation e.g. A1tI /A1.PS function. This operation mode allows the selected relay to operate for a programmable time every time the total passes a programmable value, see A1PS, A2PS, A2Pt and A2Pt functions.

4.3 Both mode functions

When both mode is selected at the SEt OPEr function the user has the option of toggling between the displays available in both totaliser and ratemeter modes. This allows the meter to be used as a ratemeter/totaliser. When both mode is used the functions available allow for both the ratemeter and totaliser scaling and setup.

The ▲ and ▼ buttons can be used to toggle between total (and grand total if used) and rate displays. Alternatively a remote input contact closure can be used across terminals GND and KEY to toggle between rate and total. If these terminals are to be used to toggle between displays then the remote input function rI nP must be set to di SP.

Since the functions available in this mode are a combination of ratemeter and totaliser functions the explanation of both mode functions can be found by referring to the appropriate ratemeter or totaliser chapter.

In both mode the optional analog output, bargraph display or digital retransmission option can be set to either totl or rAtE (total or rate) via the rEC, bAr or d9.OP functions i.e. it can be set to retransmit the total value or the rate value. Similarly the alarm relays can be set to operate from rate or total in this mode set via the Ax.rt / Ax.tI etc function.

Function	Range	Description
AxPS	Value or OFF	Alarm relay pass value - only seen when SEt OPEr is set to totL or both mode and if A1PS selected at the A1PS/A1tL function.) . See “Alarm relays” chapter.
AxLo	Value or OFF	Alarm relay low setpoint - see “Alarm relays” chapter. Displays and sets each alarm low setpoint value.
AxHi	Value or OFF	Alarm relay high setpoint - see “Alarm relays” chapter. Displays and sets each alarm high setpoint value.
AxPt	0.0 to 999.9 seconds	Alarm relay pass time - only seen when SEt OPEr is set to totL or both mode and if A1PS selected at the A1PS/A1tL function). See “Alarm relays” chapter.

Function	Range	Description
AxHY	0 to 9999	Alarm relay hysteresis [deadband] - see “Alarm relays” chapter. Displays and sets the alarm hysteresis limit. This value is common for both high and low setpoint values.
AxtE	0 to 9999 seconds	Alarm relay trip time - see “Alarm relays” chapter. Displays and sets the alarm trip time in seconds of seconds. This value is common for both alarm high and low setpoint values.
Axrt	0 to 9999 seconds	Alarm relay reset time - see “Alarm relays” chapter. Displays and sets the alarm reset time in seconds of seconds. This value is common for both alarm high and low setpoint values.
Axno or Axnc	Axno or Axnc	Alarm relay normally open or normally closed - see “Alarm relays” chapter. Displays and sets the alarm relay action to normally open (de-energised) or normally closed (energised), when no alarm condition is present.
Ax.SP, Ax.t 1, Ax.t2 etc.	Ax.SP, Ax.t 1, Ax.t2	Alarm relay operation independent setpoint or trailing - see “Alarm relays” chapter.
brgt	1 to 15	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 reducing glare in darkened areas.
dull	0 to 15	Remote display brightness - displays and sets the level for remote input brightness switching, see "Remote input functions" chapter.
rEC_	Value	Analog recorder/retransmission output low value - seen only when the analog retransmission option is fitted. Refer to the separate “PM4 DIN Rail Meter Optional Output Addendum” booklet supplied when this option is fitted. Displays and sets the analog retransmission output low value (4mA or 0V) in displayed engineering units. e.g. for a 4-20mA retransmission if it is required to retransmit 4mA when the display indicates 0 then select 0 at this function via the ▲ or ▼ button.
rEC¯	Value	Analog recorder/retransmission output high value - seen only when the analog retransmission option is fitted. Refer to the separate “PM4 DIN Rail Meter Optional Output Addendum” booklet supplied when this option is fitted. Displays and sets the analog retransmission 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 at this function via the ▲ or ▼ button.
bAr_	Value	Bargraph 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 percentage fill of a tank whilst the 7 segment display is indicating actual process units.
bAr¯	Value	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.

Function	Range	Description
P.SEt	Value	Preset value - this function displays and sets the preset value which the total count can be reset to - only seen in totL or both modes. For example, if the PM4 is set to count down from a preset value then the P.SEt function sets this value. See also c.rSt function which sets the reset mode and the P.but functions P.SEt function which allows the P button to be used to force the preset value onto the display and FUNC which allows easy access for alteration of the preset value. The SET input (terminal 9) can also be used to force the display to the preset value, the c.SEt function sets the mode of operation for the SET input, see also the "Input link settings & circuit" section for details of SET input links before connecting, if links are incorrectly set damage can occur.
Entry via CAL mode (see "Introduction" chapter) must be made in order to view and adjust the functions which follow.		
bAr tYPE	bAr S.dot d.dot or C.bAr	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. 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_ 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.OP	bin2 bin b.SCL or bcd	Digital output mode - seen only with digital output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted. Selections available are: bin2 (signed binary), bin (unsigned binary), b.SCL (scaled binary), bcd (binary coded decimal).

Function	Range	Description
d9.OP	AL o or A IH,	Digital 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 AL o - active low output or AH, - active high output.
bcd StrE	0 to number of display digits minus 4	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.
d, 9_	Value	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. See example below.
d, 9¯	Value	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 d, 9_ is set to 0 and d, 9¯ 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 d, 9¯ is now changed to 32767 (2^{15}) then a display of 2 will cause a retransmission of 4.
drnd	1 to 5000	Display rounding - displays and sets the display rounding value. This value may be set to 1-5000 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 only in multiples of 10).
FLtr	0 to 8	Digital filter - displays and sets the digital filter value for ratemeter display - only seen in FrEq and both modes. 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. The digital filter uses a weighted averaging method of filtering which will increase the display update time at higher settings.
rAtE dCPt	0, 0.1 etc.	Rate decimal point selection - displays and sets the decimal point position for the rate display - only seen in FrEq and both modes. For example selecting 0 will mean no decimal points (e.g. a display such as 25), 0.1 means 1 decimal point place (e.g. 25.4), 0.02 gives 2 decimal point places (e.g. 25.35) etc. Note: If the number of decimal points is altered then the display scaling figure (rAtE SCLE) will also be affected. Always check the scaling figure following a decimal point change and alter as required.
rAtE InPt	Value	Rate input scale factor - displays and sets the number of input pulses to be used with the rate scale function to generate the display scaling - only seen in FrEq and both modes. See examples later in this chapter.
rAtE SCLE	Value	Rate scale factor - displays and sets the scale factor to be used with the rate input setting - only seen in FrEq and both modes. See examples later in this chapter. Scale and input work together as follows: $\text{Display} = \frac{\text{Input frequency (Hz)} \times \text{rAtE SCLE}}{\text{rAtE InPt}}$ The input frequency is defined as the frequency (Hz) of one phase of the input i.e. the frequency at the A or B input.

<table>
<tr><th>Function</th><th>Range</th><th>Description</th></tr>
<tr><td>tOt1
dCPt</td><td>0.
0.1 etc</td><td>Totaliser decimal point selection - displays and sets the decimal point position for the totaliser display - only seen in totL and both modes. For example selecting 0 will mean no decimal points (e.g. 25), 0.1 means 1 decimal point place (e.g. 25.4), 0.02 gives 2 decimal point places (e.g. 25.35) etc. The maximum number of decimal point places is one less than the number of digits on the display e.g. a 4 digit display can have 3 decimal points, a 5 digit display can have 4 decimal points etc.
Note: If the number of decimal point is altered then the display scaling figure (tot1 SCLE) will also be affected. Always check the scaling figure following a decimal point change and alter as required.</td></tr>
<tr><td>tOt1
1 nPt</td><td>Value</td><td>Totaliser input pulse count - displays and sets the number of input pulses to be used with the total scale function to generate the display scaling - only seen in totL and both modes. See examples which follow.</td></tr>
<tr><td>tOt1
SCLE</td><td>Value</td><td>Totaliser scale factor - displays and sets the scale factor for totaliser - only seen in totL and both modes. Scale and input work together as follows:
$\text{New Total} = \text{Old Total} + \frac{\text{Input pulses counted} \times \text{tOt1 SCLE}}{\text{tOt1 1nPt}}$</td></tr>
<tr><td>g.tot</td><td>For.
rEU.
POS.
nEg or
Abs</td><td>Grand total operating mode - only seen in totL and both modes. By using the ▲ or ▼ pushbutton the display may be toggled between a total or a grand total display (or between rate, total and grand total in both mode). The display will briefly show either rAtE, tot1 or g.tot to indicate what the following total display is showing. To reset the grand total the remote input must be set to g.rSt, see the r.1 nP function. Six modes of grand total display are provided. The following table illustrates each mode of operation.
<table>
<tr><th>Grand Total Mode</th><th>Up Count</th><th>Down Count</th></tr>
<tr><td>nonE</td><td>No effect</td><td>No effect</td></tr>
<tr><td>For</td><td>The grand total will increase with each up count input pulse. The grand total can show positive and negative totals.</td><td>The grand total will decrease with each down count input pulse. The grand total can show positive and negative totals.</td></tr>
<tr><td>rEU</td><td>The grand total will decrease with each up count input pulse. The grand total can show both positive and negative totals.</td><td>The grand total will increase with each down count input pulse. The grand total can show both positive and negative totals.</td></tr>
<tr><td>POS</td><td>The grand total will increase with each up count input pulse. The grand total display cannot go negative.</td><td>The grand total will not register any down count inputs i.e. the grand total will not change when down count only inputs are present. The grand total display cannot go negative.</td></tr>
<tr><td>nEg</td><td>The grand total will not register any up count inputs i.e. the grand total will not change when up count only inputs are present. The grand total display cannot go negative.</td><td>The grand total will increase with each down count input pulse. The grand total display cannot go negative.</td></tr>
<tr><td>Abs</td><td>The grand total will increase with any input pulse whether up or down count. The grand total display cannot go negative.</td><td>The grand total will increase with any input pulse whether up or down count. The grand total display cannot go negative.</td></tr>
</table>
</td></tr>
</table>

Function	Range	Description
rAP.L	Value	Total display wrap around low value - only seen in totL and both modes. Displays and sets the low value at which the display will wrap around. The manner in which this works is set by the wrap around mode function also called rAP.L described below.
rAP.H	Value	Total display wrap around high value - only seen in totL and both modes. Displays and sets the high value at which the display will wrap around. The manner in which this works is set by the wrap around mode function also called rAP.H described below.
rAP.L	nonE, rAP or StOP	Total display wrap around low value operation mode - only seen in totL and both modes. Sets the mode in which the low value total display wrap around will function. Choices are: nonE - the display will not wrap around at any value. rAP - the display will wrap around at the low value. e.g. if rAP.L is set to 0 and rAP.H is set to 1000 then when the display total falls to 0 the next down count pulse will cause the display to wrap around to 1000. StOP - the display will stop when the value is reached. e.g. if rAP.L is set to 0 then when the total display falls to 0 the display will stop counting down. The display will count up from this point if upward counting pulses are received or will reset on a reset input.
rAP.H	nonE, rAP or StOP	Total display wrap around high value operation mode - only seen in totL and both modes. Sets the mode in which the low value total display wrap around will function. Choices are: nonE - the display will not wrap around at any value . rAP - the display will wrap around at the high value. e.g. if rAP.H is set to 500 and rAP.L is set to 0 then when the display total reaches to 500 the next up count pulse will cause the display to wrap around to 0. StOP - the display will stop when the value is reached. e.g. if rAP.H is set to 500 then when the total display reaches 500 the display will stop counting up. The display will count down from this point if downward counting pulses are received or will reset on a reset input.
P.CLr	nonE, P.SEt or r.SEt	Power on total value clear mode- only seen in totL and both modes. Sets the mode in which the total will be displayed at power on. Choices are: nonE - no effect. The display will show the previous total when powered up. P.SEt - preset. On power up the total display will revert to the value set at the P.SEt function. r.SEt - reset. On power up the total display will reset to zero.
FrEq rnGE	Lo F, Hi F or AvGE	Frequency range - only seen in FrEq and both modes. Displays and sets the frequency input range. Select Lo F if the input frequency is likely to be lower than 4Hz and not greater than 1kHz. Select Hi F for frequencies with a minimum input frequency of 3Hz or higher (maximum input frequency is 100kHz). Select AvGE for an averaged display. The averaged display allows the input rate to be averaged over a period of seconds set by the AvGE SECS function. An averaged display is particularly useful when the input is irregular. By averaging the pulses over a period of time the display will give a more stable reading for these irregular inputs.
FASt UPdt	on or OFF	Fast update (seen only when FrEq rnGE set to Hi F) - with FASt UPdt set to OFF the relay and analog retransmission updates will take place approximately twice per second. With FASt UPdt set to on the relay and analog retransmission updates will take place approximately six times per second.

Function	Range	Description
rAtE SI gn	on or OFF	Sign for rate display - only seen in FrEq and both modes. Allows selection of whether a negative sign is seen when encoder changes directions. If set to OFF the rate display will never show a negative sign before the rate. If set to on the display will show a negative sign in one direction of rotation of the encoder. The negative sign is only required if an indication of direction as well as rate is needed.
t.out SECS	1 to 9999 seconds	Time out - only seen in FrEq and both modes and if LoF is selected under the FrEq rnGE function. Displays and sets the time out in seconds when using the low frequency (LoF) range. The timeout allows very low frequency inputs to be used without the display reverting to zero between samples. If no input pulses are received the display hold the previous display value for the time out period. If a pulse is received during this time the display will update. If no pulses are received or the input period exceeds the time out value set then the display will indicate 0. The allowable time out range is 1 to 9999 seconds.
AUGE SECS	1 to 9999 seconds	Average seconds - only seen in FrEq and both modes and if AUGE is selected under the FrEq rnGE function. Displays and sets the number of seconds over which the rate should be averaged when using the low frequency (LoF) range. The rate display will not update until the end of the average seconds time. This function allows the user to select a display update rate most suitable for applications in which the rate input may be irregular. The allowable averaging range is 1 to 9999 seconds.
r.I nP	nonE. P.HLd. d.HLd Hi. Lo. Hi Lo SP.Ac, no.Ac Hold P.SEt di SP. duLL or 9.rSt	Remote input function - terminals 7 and 8 are the remote input terminals. When these terminals are short circuited, via a pushbutton or keyswitch the instrument will perform the selected remote input function, only one remote input function can be selected at one time. A message will flash to indicate which function has been selected when the remote input terminals are short circuited. The remote input functions are as follows: nonE - no remote function required P.HLd - peak hold. The display will show the peak hold value whilst the remote input terminals are short circuited. **Note:** In both mode the display set by the dFlt di SP function will be held to the peak reading. d.HLd - display hold. The display will hold its value whilst the remote input terminals are short circuited. **Note:** In both mode the display set by the dFlt di SP function will be held. Hi - peak memory. The peak value stored in memory will be displayed if the remote input terminals 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 then the memory will be cleared. **Note:** In both mode the display set by the dFlt di SP function will be viewed. Lo - valley memory. The minimum value stored in memory will be displayed. Otherwise operates in the same manner as the Hi function. **Note:** In both mode the display set by the dFlt di SP function will be viewed. Hi Lo - toggle between Hi and Lo 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 Hi or P Lo will flash before each display to give an indication of display type. **Note:** In both mode the display set by the dFlt di SP function will be viewed. 2Er0 - zero the display. The total will be zeroed (or go to the preset value if c.rSt is set to P.SEt) when the remote input is short circuited. This operation works on the total only.

Function	Range	Description
r.1 nP cont.	nonE, P.HLd. d.HLd Hi . Lo. Hi Lo SP.Ac, no.Ac Hold P.SEt di SP. dull or 9.rSt	SP.Ac - setpoint access only. This blocks access to any functions except the alarm setpoint functions unless the remote input terminals are short circuited or entry is made via CAL mode. no.Ac - no access. This blocks access to all functions unless the remote input terminals are short circuited, entry is made via CAL mode or if the ACCS function is set to ALL.Hold - hold. This function operates for the total display only, not the rate. When this function is selected the remote input can be used to hold the display. During the time the display is held any incoming count pulse inputs will be ignored i.e. they will not be added to the total. See also the SEt 1 nPt function which can also be set to Hold. P.SEt - preset. This function will force the display to the value set at the P.SEt function. The P.SEt operation applies to totaliser operation only. See also the P.but functions P.SEt and FUnC for alternative operation. di SP - display toggle. This function will cause the display to toggle from the default display (rate or total selected at the dFl t di SP function in both mode) to the alternate display when the remote input terminals are short circuited. dull - 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 br9t function and the brightness level set at the dULL function. 9.rSt - grand total reset. This mode allows the remote input to be used as a reset input for the grand total seen in the totl and both modes.
P.but	nonE, Hi , Lo, Hi Lo, 2Er0, di SP, P.SEt, FUnC or 9.rSt	P button function - the P button may be set to operate some of the remote input functions. With some functions, to prevent accidental operation, the P button must be held pressed for 2-3 seconds before the function will operate. If both the remote input and P button function are operated simultaneously the P button will override the remote input. The functions below with the exception of FUnC and P.SEt are as described in the r.1 nP function above. Functions available are: nonE, Hi , Lo, Hi Lo, 2Er0. di SP. P.SEt. FUnC or 9.rSt The 2Er0, di SP. P.SEt and FUnC functions are not applicable to rate operation. The FUnC option is used to allow easy access to the preset value for adjustment. When the P button is pressed the message P.SEt will appear followed by the preset value. The ▲ or ▼ button can now be used to alter the preset value. Press the F button to accept the new value or the P button if you wish to abort the change. The P.SEt option will force the display to the value set via the separate P.SEt function. e.g. if the P.SEt function is set to 3000 then the display will revert to a value of 3000 when the P button is pressed, note that you will need to press and hold the P button for approximately 3 seconds to accomplish this.
ACCS	OFF, EASY. nonE or ALL	Access mode - the access mode function ACCS has four possible settings namely OFF, EASY. nonE or 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 “Alarm relays” chapter. 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 functions. If set to ALL then entry to all functions can be made via FUnC mode i.e. CAL mode entry is not required.

Function	Range	Description
SPAC	A 1. A 1-2 etc.	Setpoint access - allows control of which relay setpoints are accessible via FUNC mode. The following choices are available: A 1 - Allows setpoint access to relay 1 A 1-2 - Relays 1 & 2 access A 1-3 - Relays 1, 2 & 3 access (if one or two optional relays are fitted) A 1-4 - Relays 1, 2, 3 & 4 access (if three optional relays are fitted) A 1-5 - Relays 1, 2, 3, 4 & 5 access (if six optional relays are fitted) A 1-6 - Relays 1, 2, 3, 4, 5 & 6 access (if six optional relays are fitted) A 1-7 - Relays 1, 2, 3, 4, 5, 6 & 7 access (if six optional relays are fitted) To allow the SPAC function to operate the remote input r.1 NP function must be set to SPAC and the ACCS function set to OFF.
di SP rAtE	1.2.4.8. 16 or 32	Display update rate - allows selection of 1, 2, 4, 8, 16 or 32 display updates per second.
Ax.tt . Ax.PS, Ax.rP, Ax.rH or Ax.rL	Ax.tt . Ax.PS, Ax.rP, Ax.rH or Ax.rL	Alarm relay operation mode - refer to “Alarm relays” chapter.
bAr	totL or rAtE	Bargraph operation - seen only in both mode. Allows selection of either total or rate for bargraph display.
rEC	totL or rAtE	Analog retransmission operation - seen only in both mode. Allows selection of either total or rate for analog retransmission.
d90P	totL or rAtE	Digital retransmission operation - seen only in both mode. Allows selection of either total or rate for digital retransmission.
c.rSt	2Er0 or P.SEt	Counter reset value - applicable only to totL mode. The reset terminal can be programmed to cause the display to reset to either zero or the preset value programmed at the P.SEt function. Choose either 2Er0 or P.SEt to select the required operation.
c.rSt	Lo. Hi . LoE or Hi E	Counter reset mode - applicable only to totL mode. Allows selection of reset level or edge on the RESET input (terminal 10) to force a counter reset. LK 5 & 6 determine whether the reset input is pulled up to 5V or down to 0V. Reset mode options available are: Lo 0V on the reset input will force a reset e.g. if the reset line is pulled up to 5V via LK6 then 0V or a contact closure to ground will force a reset. If the reset line is pulled down to ground via LK 5 then the count input will remain reset until a control voltage at the reset input appears (LK7 determines the control voltage required, see section 3.1). Hi a high input level reset input will force a reset. e.g. if the reset line is pulled up to 5V via LK6 then the display will remain reset until 0V or a contact closure to ground is placed at the reset input. If the reset line is pulled down to ground via LK 5 then the count input will reset when a control voltage at the reset input appears (LK7 determines the control voltage required, see section 3.1). LoE operates in the same manner as Lo except that the reset is triggered by the falling edge only. Hi E operates in the same manner as Hi except that the reset is triggered by the rising edge only.
SEt iNPt	P.SEt or Hold	SET terminal operation - applicable only to totL mode. Allows the SET input (terminal 9) to be set for preset (P.SEt) or hold (Hold) operation. When P.SEt is selected the SET input can be used to force the display to the preset value (see P.SEt and P.but functions). When Hold is selected the SET input can be used to hold the display. During the time the display is held any incoming count pulse inputs will be ignored i.e. they will not be added to the total. See also the r.1 NP function which can also be set to Hold.

Function	Range	Description
c.SEt	Lo. Hi . LoE or Hi E	SET terminal mode - applicable only to totL mode. Allows selection of reset level or edge on the SET input (terminal 9) to force a counter preset or hold operation (see SEt inPt above), the preset is set via the P.SEt function or via the P button when P.but is set to FUNC. Set mode options available are: Lo, Hi , LoE or Hi E the operation mode of each of these choices is described in the c.rSt function above.
dFlt dISP	rAtE or totl	Default display - seen only in both mode. Allows the default display to be set to either rate (rAtE) or total (totL). The instrument will show the default display on power up but can be made to show the alternate display via the ▲ or ▼ button or via a remote input (if r.i nP function is set to dISP). For example if rAtE is set as the default display and the ▲ or ▼ button is used to toggle to the total the total will be seen with the message totl flashing every 8 seconds to indicate that the alternate display is being viewed.
SEt OPEr	both totL or FrEQ	Set operating mode - displays and sets the selected operating mode, e.g. select tOtL for totaliser operation. See the dedicated chapter in this manual for description of the required operating mode. Options are: both - Frequency and total measurement - allows toggling via the ▲ and ▼ buttons between rate and total display totL - Total measurement only FrEQ - Frequency/rate measurement only
bAud	300. 600. 1200. 2400. 4800. 9600. 19.2 or 38.4.	Set baud rate - seen only with serial output option - Refer to the separate "PM4 DIN Rail 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	nONE, EVEn or odd	Set parity - seen only with serial output option - Refer to the separate "PM4 DIN Rail Meter Optional Output Addendum" booklet supplied when this option is fitted. Select parity check to either nONE, EVEn or odd.
O.Put	dISP, Cont or POLL	Set RS232/485 communication mode - seen only with serial output option. Refer to the separate "PM4 DIN Rail Meter Optional Output Addendum" booklet supplied when this option is fitted. Select dISP, Cont or POLL Allows user to select the RS232/485 interface operation as follows:- dISP 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 requested.
Addr	0 to 31	Set unit address for polled (POLL) mode (0 to 31)) Refer to the separate "PM4 DIN Rail 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.

4.4 Examples - Ratemeter

Rate display examples

The rate input factor must always be a whole number but the rate scale factor may have decimal points if decimal points are used in the display. The formula for the rate display is:

$$\text{Display} = \frac{\text{Input frequency (Hz)} \times \texttt{rAtE SCLE}}{\texttt{rAtE I nPt}}$$

Example - Low frequency input rate display

An encoder with an output of 100 pulses per metre is being used to give an indication of a bore hole drill speed & direction. The display is required to show in metres per minute a positive reading indicates the drill is going down, a negative reading that it is being raised. The number pulse inputs can be as low as one every five seconds. No decimal points or alarm functions are required. The `rAtE I nPt` value will be 100 and the `rAtE SCLE` value will be 60. The procedure is as follows:

1. Follow the procedure shown on page 4 to enter the setup functions via `CAL` mode.

2. Step through the functions by pressing and releasing **F** until the `rAtE I nPt` function is seen.

3. Use the ▲ or ▼ push button to change the setting to `100`.

4. Press **F**, the function `rAtE SCLE` will appear followed by the previous input value.

5. Use the ▲ or ▼ push button to change the setting to `60`.

6. Press **F**, the function `FrEq rnGE` will appear followed by the previous setting.

7. Use the ▲ or ▼ push button to change the setting to `Lo F`.

8. Step through the functions by pressing and releasing **F** until the `t.out SECS` function is seen.

9. Use the ▲ or ▼ push button to change the setting to a value greater than 5 seconds e.g. `8`.

10. Press **F** to accept the change then either press **P** to exit or continue pressing and releasing **F** until the `FUNC End` message is seen and the unit returns to normal measure mode.

Example - Low frequency input averaged rate display

In applications similar to the metres/minute one above where the input rate is irregular it is sometimes preferable to show an averaged rate display. The averaged display will update at the end of the averaged period, set at the `AUGE SECS` function and will therefore show less short term variation in the rate figure. To use the average mode the `FrEq rnGE` function must be set to `AUGE`.

Example - RPM display

An encoder connected to a flywheel produces 20 pulses per revolution. The PM4 is required to display in RPM with 1 decimal point place.

The standard setpoint relay is required to close if the RPM figure falls below 518.5 or goes above 600.0 with a hysteresis of 20.0 RPM. Note that the first setting which needs to be altered is the decimal point position. The alarm settings will therefore come after the other settings in this example.

In this example 20 pulses per second would equal 1 revolution/sec which equals 60 RPM. The `rAtE I nPt` figure and `rAtE SCLE` figure could be 20 and 60.0 respectively but we will use 1 and 3.0 since they give the same ratio and hence will give the same reading on the display.

1. Follow the procedure shown on page 4 to enter the setup functions via `CAL` mode.

2. Step through the functions by pressing and releasing **F** until the `rAtE dCPt` function is seen.

3. Use the ▲ or ▼ push button to change the setting to `0.1`.

4. Press **F**, the function `rAtE I nPt` will appear followed by the previous input value.

5. Use the ▲ or ▼ push button to alter the previous input value to the new input value of `1`.

6. Press **F**, the function `rAtE SCLE` will appear followed by the previous scale value.

7. Use the ▲ or ▼ push button to alter the previous scale value to the new scale value of `3.0`.

8. Press **F** to accept the change then either press **P** to exit or continue pressing and releasing **F** until the `FUNC` End message is seen and the unit returns to normal measure mode.

9. Follow the procedure shown on page 3 to enter the setup functions via `FUNC` mode.

10. The first function is `A 1Lo` this will be seen followed by the previous low alarm setting.

11. Use the ▲ or ▼ push button to change the `A 1Lo` setting to `518.5`. Press **F** to accept the change.

12. Press F, the function A 1H, will appear followed by the setpoint value.

13. Use the ▲ or ▼ push button to alter the previous setpoint value to the new setpoint value of 600.0.

14. Press F, the function A 1HY will appear followed by the previous hysteresis value.

15. Use the ▲ or ▼ push button to alter the previous hysteresis value to the new hysteresis value of 20.0.

16. Step through the functions by pressing and releasing F until the A 1n.o/A 1n.c function is seen.

17. Use the ▲ or ▼ push button to change the setting to A 1n.o (normally open operation).

18. Press F to accept the change then either press P to exit or continue pressing and releasing F until the FUNC End message is seen and the unit returns to normal measure mode.

4.5 Examples - Totaliser

Flow Totalising

Flowmeters produce output pulses which may be counted and scaled to give the total flow. The number of pulses produced per litre, kilolitre etc. may be determined using the information provided by the manufacturer or from test results. The flow total scaling may be configured as follows:

Example - An encoder produces 56 pulses per litre. The display is required to show total litres with 1 decimal point place. The procedure is as follows.

1. Follow the procedure shown on page 4 to enter the setup functions via CAL mode.

2. Step through the functions by pressing and releasing F until the totl dCPt function is seen followed by the previous decimal point setting.

3. Use the ▲ or ▼ push button to change the totl dCPt setting to 0.1. Press F to accept the change.

4. Step through the functions by pressing and releasing F until the totl 1 nPt function followed by the previous input value is seen.

5. Use the ▲ or ▼ push button to alter the previous input value to the new input value of 56.

6. Press F, the function totl SCLE will appear followed by the previous scale value.

7. Use the ▲ or ▼ push button to alter the previous scale value to the new scale value of 1.

8. Press F to accept the change then either press P to exit or continue pressing and releasing F until the FUNC End message is seen and the display returns to normal measurement mode.

Example - Item counting

For applications in which items are being counted e.g. bottles, or pulses are being counted to give displays in total revolutions or length traveled you will need to find out how many pulses equals a given number of display units. From this information you can work out suitable input and scale factors. The table below gives some general scaling examples. The examples which follow illustrate the calculation of scaling figures and settings required for typical applications.

An encoder is connected to a shaft. The encoder puts out 1000 pulses per revolution. The encoder is connected to a threaded shaft. The totaliser is to show the distance travelled by an object connected to the shaft. The object travels a distance of 2.5 mm per revolution of the shaft i.e. 1000 pulses = 2.5 mm travel or 400 pulses = 1 mm travel. The measurement is to be in metres with 3 decimal points to give a resolution in mm.

1. Follow the procedure shown on page 3 to enter the setup functions via CAL mode.

2. Step through the functions by pressing and releasing F until the totl dCPt function is seen followed by the previous decimal point setting.

3. Use the ▲ or ▼ push button to change the totl dCPt setting to 0.003. Press F to accept the change.

4. Step through the functions by pressing and releasing F until the totl 1 nPt function followed by the previous input value is seen.

5. Use the ▲ or ▼ push button to alter the previous input value to the new input value of 400.

6. Press F, the function totl SCLE will appear followed by the previous scale value.

7. Use the ▲ or ▼ push button to alter the previous scale value to the new scale value of 0.001.

8. Press F to accept the change then either press P to exit or continue pressing and releasing F until the FUNC End message is seen and the display returns to normal measurement mode.

4.6 Error Messages - Rate and total

1. "-or-" message flashes - This display indicates an overrange reading. This means that the instrument is not being able to display the number because it is too large e.g. above 99999 on a 5 digit display. Check that the scaling figures are correct. In totaliser operation this message means that the display needs to be reset.

2. Rate value alternates between zero and a rate reading. This type of display means that the sample rate is higher than the input frequency. See FREQRNGE and t.out SECS functions which can be adjusted to overcome this problem.

3. Totaliser display reaches a value then stops. Check the rAP.L and rAP.H settings, these can be deliberately set to cause this to happen.

5 Ratemeter Function Table

Initial display	Meaning of display	Next display	Default setting	Record your settings
AxLo	Alarm relay low setpoint value	Setpoint value or OFF	OFF	See following table
AxHi	Alarm relay high setpoint value	Setpoint value or OFF	OFF	See following table
AxHY	Alarm relay hysteresis	Hysteresis value in measured units	10	See following table
Axtt	Alarm relay trip time	No of seconds before relay trips	0	See following table
Axrt	Alarm relay reset time	No of seconds before relay resets	0	See following table
Axno or Axnc	Alarm relay action N/O or N/C	Axno or Axnc	Axno	See following table
AxSP or Axti	Setpoint or trailing alarm relay	AxSP or Axti	AxSP	See following table
brgt	Digital display brightness	0 to 15 (15 = highest brightness)	15	
dULL	Remote input brightness control	0 to 15 (15 = highest brightness)	1	
rEC_	Analog retransmission low value	Value in memory	0	
rEC^	Analog retransmission high value	Value in memory	1000	
bAr_	Bargraph low reading	Value in memory	0	
bAr^	Bargraph high reading	Value in memory	1000	
Functions below are accessible only via CAL mode				
bAr tYPE	Bargraph operation mode	bAr, S.dot, d.dot or C.bAr	bAr	
d9OP	Digital output mode	bcd, b.SCL, bin or bin2	bin2	
d9.OP	Digital retransmission output polarity	ALo or AHi	AHi	
bcd Strt	BCD retransmission start value	Value in memory	0	
di 9_	Scaled digital output low reading	Value in memory	0	
di 9^	Scaled digital output high reading	Value in memory	1000	
drnd	Display rounding selects resolution	1 to 5000	1	
FLtr	Digital filter range 0 to 8	0 to 8 (8 = most filtering)	2	
rAtE dCPt	Decimal point setting for rate display	Value in memory	0	
rAtE inPt	Rate input setting (Hz)	Value in memory	1	
rAtE SCLE	Rate scale setting	Value in memory	1	
FrEq rnGE	Frequency range low or high frequency	Hi F, LoF or AUGE	Hi F	

FASt UPdt	Fast update mode (seen only when FrEq rnGE set to Hi F)	on or OFF	OFF	
rAtE SI gn	Rate display sign	on or OFF	on	
t.out SECS	Timeout (seen only when FrEq rnGE set to LoF)	Value in memory	30	
AUgE SECS	Averaging time (seen only when FrEq rnGE set to AUgE)	Value in memory	0	
r.I nP	Remote input	nonE, P.HLd, d.HLd, Hi . Lo, Hi Lo, 2Er0, SP.Ac, no.Ac, P.SEt, Hold, dI SP, duLL or 9.rSt	nonE	
P.but	P button operation.	nonE, Hi . Lo, Hi Lo, 2Er0, P.SEt, dI SP, FUnC or 9.rSt	nonE	
ACCS	Alarm relay access mode	OFF, EASY, nonE or ALL	OFF	
SPAC	Setpoint access	A1, A1-2 etc.	A1	
dI SP rAtE	Display update rate	1, 2, 4, 8, 16 or 32	4	
c.rSt	Reset value	2Er0 or P.SEt	2Er0	
c.rSt	Reset mode	Lo , Hi , LoE or Hi E	Lo	
SEt I nPt	SET input operation	P.SEt or Hold	P.SEt	
c.SEt	SET input mode	Lo, Hi , LoE or Hi E	Lo	
SEt OPEr	Set operating mode	both, totl or FrEq	FrEq	
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	Serial communications mode	nonE, dI SP, Cont or POLL	Cont	
Addr	Set unit address for POLL mode	0 to 31	0	

Functions shown shaded will be seen only if the appropriate option is fitted.

Settings for relays - record settings here							
	A1	A2	A3	A4	A5	A6	A7
AxPS							
AxPt							
AxLo							
AxHi							
AxHY							
Axtt							
Axrt							
Axn.o or Axn.c							
Ax.SP or Ax.tI	n/a						
Ax.tI , Ax.PS, Ax.rP, Ax.rH, Ax.rL							

6 Totaliser Function Table

Initial display	Meaning of display	Next display	Default Setting	Record Your Settings
AxPS	Alarm pass value	Pass value or OFF	OFF	See following table
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
AxPt	Alarm pass time	Time in seconds	0.0	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
AxSP or Axti	Setpoint or trailing alarm	AxSP or Axti	AxSP	See following table
brgt	Digital display brightness	0 to 15 (15 = highest brightness)	15	
dULL	Remote input brightness control	0 to 15 (15 = highest brightness)	0	
rEC_	Analog output low limit	Value in memory	0	
rEC^	Analog output high limit	Value in memory	1000	
bAr_	Bargraph low reading	Value in memory	0	
bAr^	Bargraph high reading	Value in memory	1000	
P.SEt	Preset value	Value in memory	0	
Functions below are accessible only via CAL mode				
bAr tYPE	Bargraph operation mode	bAr, S.dot, d.dot or C.bAr	bAr	
d90P	Digital output mode	bcd, b.SCL, bin or bin2	bin2	
d9.0P	Digital retransmission output polarity	ALo or AHi	AHi	
bcd Strt	BCD retransmission start value	Value in memory	0	
di 9_	Scaled digital output low reading	Value in memory	0	
di 9^	Scaled digital output high reading	Value in memory	1000	
toti dCPt	Decimal point setting for totaliser display	Value in memory	0	
toti inPt	Totaliser input setting	Value in memory	1	
toti SCLE	Totaliser scale setting	Value in memory	1	
9.tot	Grand total operating mode	NONE, For, rEU, POS, nEG or AbS	NONE	
rAP.L	Total wrap around low value	Value in memory	0	

rAP.H	Total wrap around high value	Value in memory	1000	
rAP.L	Total wrap around low mode	nonE, rAP or StOP	nonE	
rAP.H	Total wrap around high mode	nonE, rAP or StOP	nonE	
P.CLr	Power on reset mod	nonE, P.SEt or r.SEt	nonE	
r.1 nP	Remote input	nonE, P.HLd, d.HLd, Hi, Lo, Hi Lo, 2Er0, SP.Ac, no.Ac, P.SEt, Hold, dI SP, duLL or 9.rSt	nonE	
P.but	P button operation.	nonE, Hi, Lo, Hi Lo, 2Er0, P.SEt, dI SP, FUnC or 9.rSt	nonE	
ACCS	Alarm relay access mode	OFF, EASY, nonE or ALL	OFF	
SPAC	Setpoint access	A1, A1-2 etc.	A1	
dI SP rAtE	Display update rate	1, 2, 4, 8, 16 or 32	4	
Ax.tL/Ax.P/ Ax.rP/Ax.rH or Ax.rL	Alarm operation mode rate, total or pass	Ax.rt, Ax.tL, Ax.PS, Ax.rP, Ax.rH or Ax.rL	Ax.rt	See following table
c.rSt	Reset value	2Er0 or P.SEt	2Er0	
c.rSt	Reset mode	Lo, Hi, LoE or Hi E	Lo	
SEt InPt	SET input operation	P.SEt or Hold	P.SEt	
c.SEt	SET input mode	Lo, Hi, LoE or Hi E	Lo	
SEt OPEr	Set operating mode	both, totl or FrEE	FrEE	
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	Serial communications mode	nonE, dI SP, Cont or POLL	Cont	
Addr	Set unit address for POLL mode	0 to 31	0	

Functions shown shaded will be seen only if the appropriate option is fitted.

Settings for relays - record settings here							
	A1	A2	A3	A4	A5	A6	A7
AxPS							
AxPt							
AxLo							
AxHi							
AxHY							
Axtt							
Axrt							
Axn.o or Axn.c							
Ax.SP or Ax.tI	n/a						
Ax.tI, Ax.PS, Ax.rP, Ax.rH, Ax.rL							

7 Both Mode Function Table

Initial display	Meaning of display	Next display	Default Setting	Record Your Settings
AxPS	Alarm relay pass value	Pass value or OFF	OFF	See following table
AxLo	Alarm relay low setpoint value	Setpoint value or OFF	OFF	See following table
AxHi	Alarm relay high setpoint value	Setpoint value or OFF	OFF	See following table
AxPt	Alarm relay pass time	Time in seconds	0.0	See following table
AxHY	Alarm relay hysteresis	Hysteresis value in measured units	10	See following table
Axtt	Alarm relay trip time	No of seconds before relay trips	0	See following table
Axrt	Alarm relay reset time	No of seconds before relay resets	0	See following table
Axn.o or Axn.c	Alarm relay action N/O or N/C	Axn.o or Axn.c	Axn.o	See following table
AxSP or Axti	Setpoint or trailing alarm relay	AxSP or Axti	AxSP	See following table
brgt	Digital display brightness	0 to 15 (15 = highest brightness)	15	
dULL	Remote input brightness control	0 to 15 (15 = highest brightness)	0	
rEC_	Analog output low limit	Value in memory	0	
rEC¯	Analog output high limit	Value in memory	1000	
bAr_	Bargraph low reading	Value in memory	0	
bAr¯	Bargraph high reading	Value in memory	1000	
P.SEt	Preset value	Value in memory	0	
Functions below are accessible only via CAL mode				
bAr tYPE	Bargraph operation mode	bAr .S.dot .d.dot or C.bAr	bAr	
d9OP	Digital output mode	bcd .b.SCL .bin or bin2	bin2	
d9.OP	Digital retransmission output polarity	ALo or AHi	ALo	
bcd Strt	BCD retransmission start value	Value in memory	0	
di 9_	Scaled digital output low reading	Value in memory	0	
di 9¯	Scaled digital output high reading	Value in memory	1000	
drnd	Display rounding selects resolution	Value in memory	1	
FLtr	Digital filter range 0 to 8	0 to 8 (8 = most filtering)	2	
rAtE dCPt	Decimal point setting for rate display	Value in memory	0	
rAtE inPt	Rate input setting (Hz)	Value in memory	1	
rAtE SCLE	Rate scale setting	Value in memory	1	

Initial display	Meaning of display	Next display	Default Setting	Record Your Settings
tot! dCPt	Decimal point setting for totaliser display	Value in memory	0	
tot! InPt	Totaliser input setting	Value in memory	1	
tot! SCLE	Totaliser scale setting	Value in memory	1	
G.tot	Grand total operating mode	nonE, For, rEU, POS, nEG or AbS	nonE	
rAP.L	Total wrap around low value	Value in memory	0	
rAP.H	Total wrap around high value	Value in memory	1000	
rAP.L	Total wrap around low mode	nonE, rAP or StOP	nonE	
rAP.H	Total wrap around high mode	nonE, rAP or StOP	nonE	
P.CLr	Power on reset mod	nonE, P.SEt or r.SEt	nonE	
FrEq rnGE	Frequency range low or high frequency	Hi F, LoF or AUGE	Hi F	
FASt UPdt	Fast update mode (seen only when FrEq rnGE set to Hi F)	on or OFF	OFF	
rAtE SI gn	Rate display sign	on or OFF	OFF	
t.out SECS	Timeout (seen only when FrEq rnGE set to LoF)	Value in memory	0	
AUGE SECS	Averaging time (seen only when FrEq rnGE set to AUGE)	Value in memory	0	
r.I nP	Remote input	nonE, P.HLd, d.HLd, Hi .Lo, Hi Lo, 2Er0, SP.Ac, no.Ac, P.SEt, Hol d, di SP, duLL or G.rSt	nonE	
P.but	P button operation.	nonE, Hi .Lo, Hi Lo, 2Er0, P.SEt, di SP, FUnC or G.rSt	nonE	
ACCS	Alarm relay access mode	OFF, EASY, nonE or ALL	OFF	
SPAC	Setpoint access	A 1, A 1-2 etc.	A 1	
di SP rAtE	Display update rate	1, 2, 4, 8, 16 or 32	4	
Axrt or Ax.tL or Ax.PS or Ax.rP or Ax.rH or Ax.rL	Alarm operation mode rate, total or pass	Axrt, Ax.tL, Ax.PS, Ax.rP, Ax.rH or Ax.rL	Ax.rt	See following table
bAr	Bargraph operation mode	tot! or rAtE	rAtE	
rEC	Analog output mode	tot! or rAtE	rAtE	
d90P	Digital retransmission mode	tot! or rAtE	rAtE	
c.rSt	Reset value	2Er0 or P.SEt	2Er0	
c.rSt	Reset mode	Lo, Hi, LoE or Hi E	Lo	
SEt InPt	SET input operation	P.SEt or Hol d	P.SEt	
c.SEt	SET input mode	Lo, Hi, LoE or Hi E	Lo	
dFlt di SP	Default display rate, total or period, total depending upon the di SP setting	rAtE or tot!	rAtE	
SEt OPEr	Set operating mode	both, tot! or FrEq	FrEq	

Initial display	Meaning of display	Next display	Default Setting	Record Your Settings
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	Serial communications mode	nonE, POLL, Cont or di SP	POLL	
Addr	Set unit address for POLL mode	0 to 31	0	

Note: Functions shown shaded will be seen only if the appropriate option is fitted

Settings for relays - record settings here							
	A1	A2	A3	A4	A5	A6	A7
AxPS							
AxPt							
AxLo							
AxH,							
AxHY							
Axtt							
Axrt							
Axn.o or Axn.c							
Ax.SP or Ax.t1	n/a						
Ax.t1 , Ax.PS, Ax.rP, Ax.rH, Ax.rL							

8 Alarm relays

The PM4 is provided with one relay as standard. One, two, three or six extra optional independent relays may also be provided, these relays are designated A1 , A2 etc. Each alarm has the following parameters which may be set by the user:

1. Low trip point, adjustable in measurement units.
2. High trip point, adjustable in measurement units.
3. Alarm hysteresis, adjustable in measurement units.
4. Alarm trip time, adjustable in one second steps.
5. Alarm reset time, adjustable in one second steps.
6. N/O or N/C relay operation.
7. Independent or trailing alarms (available on relays 2 and upwards).
8. Pass alarm mode (totaliser operation only).
9. Wrap around mode (totaliser operation only).
10. Rate or total operation (both mode only).

Note that when both is selected at the SEt OPEr function the relays can be made to operate from rate or total, the alarm settings will automatically take on the decimal points for the mode (rate or total) selected.

The alarms operate in the following way:

If the measured value is at or above the High Trip Point, or at or below the Low Trip Point, the alarm trip timer starts. This timer is reset if the measured value drops below the High Trip Point or above the Low Trip point. When the alarm trip timer's time exceeds the Trip delay time, the alarm is operated.

When the alarm has tripped, the measured value is compared to the High Set Point less the Hysteresis value and the Low Set Point plus the Hysteresis value. If it is less than the High Set Point less the Hysteresis value and greater than the Low Set Point plus the Hysteresis value, the alarm is reset. The reset alarm timer can be used to delay the reset if required.

Alarm low setpoint (AxLo)

Displays and sets the low setpoint value for the designated alarm relay. The low alarm setpoint may be disabled by pressing the ▲ and ▼ keypads 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 equal to or 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.

Alarm high setpoint (AxHi)

Displays and sets the high setpoint value for the designated alarm relay. The high alarm setpoint may be disabled by pressing the ▲ and ▼ keypads 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 equal to or 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.

Alarm hysteresis (AxHY)

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 A 1Hi is set to 50.0 and A 1HY 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 A 1Lo is set to 20.0 and A 1HY 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.

Alarm trip time (AxtE)

The alarm trip time determines how long the measured value has to be above the high trip point or below the low trip point before an alarm is given. This can be used to prevent false alarms on noisy inputs. The value is set in seconds, with a range of 0 to 9999 seconds. For normal operation a delay of three to five seconds is suitable.

Alarm reset time (Axrt)

The alarm reset time determines how long the measured value has to be below the high trip point or above the low trip point before the alarm is reset. The value is set in seconds, with a range of 0 to 9999 seconds. For normal operation a delay of zero seconds is suitable.

Alarm relay N/O or N/C operation (Axno/nc)

Each alarm may be programmed to operate as a normally open (N/O e.g. A1 no) or normally closed (N/C e.g. A2nc) device. A N/O relay is de-energised when no alarm condition is present and is energised when an alarm condition is present. A N/C relay is normally energised and is de-energised when an alarm condition is present. The N/C mode is useful for power failure detection.

Alarm pass value (AxPS) - used only when Ax.PS selected.

Displays and sets the alarm pass value. The alarm relay will activate at multiples of the pass value e.g. if AxPS is set to 50 then the relay will activate at a total display value of 50, 100, 150 etc. The time for which the relay remains activated at each pass value is set via the AxPt function which follows. The pass value may be set anywhere in the display range of the instrument.

Alarm pass or wrap around time (AxPt) - only seen if Ax.PS or Ax.rP or Ax.rH or Ax.rL selected.

Displays and sets the alarm pass or wrap around time in seconds & tenths of seconds within the range 0.0 to 999.9 seconds. The value set is the time for which the relay will remain energised when activated at a pass or wrap around value e.g. if set to 2.0 with a AxPS value of 50 then the relay will remain energised for 2.0 seconds every time the display passes a multiple of 50. **Note:** If the pass time exceeds the time taken to reach consecutive pass values then the PM4 will "store" any relay operations it does not have time to activate and will perform these activations when the total display update rate allows. For this reason the relay may be seen to activate repeatedly for a period after the total update rate has slowed down or stopped.

Alarm relay operation mode (Ax.rt . Ax.tL . Ax.PS . Ax.rP . Ax.rH . Ax.rL)

In both and tot! modes a choice of alarm relay operation modes is offered, these are:

Ax.rt - the alarm relay operated from the rate value e.g. if A 1H, is set to 100 the alarm relay will activate when the rate value reaches 100 or higher. Values for hysteresis, trip time, reset time, normally open/normally closed operation and setpoint or trailing alarms can also be set. This option is seen only in both mode. In FrEq mode the alarm relays automatically operate from the rate.

Ax.tL - the relay will operate from the total. e.g. if A 1H, is set to 1500 the alarm relay will activate when the total value reaches 1500 or higher. Values for hysteresis, trip time, reset time, normally open/normally closed operation and setpoint or trailing alarms can also be set.

Ax.PS - the relay will operate on a pass value i.e. it will operate on multiples of the AxPS value set. For example if A 1PS is set to 1000 the alarm relay will operate at the total display value of 1000, 2000, 3000 etc. The length of time for which the relay remains activated at each pass is set at the AxPt function. Note that if Ax.PS is selected a separate function with almost the same name (AxPS) will appear early in the functions, the pass value is set at this AxPS function. The pass mode can also be used when the wrap around display functions are used an will still operate at multiples of the Ax.PS value .e.g. if the display is set to wrap around to zero whenever the count reaches 100 then and the pass value is set to 40 then the relay will operate at display values of 40, 80, 20, 60, 100 etc. i.e. 40 counts between relay operations.

Ax.rP - the relay will operate at both the high and low wrap around values. If the wrap around mode and value functions have been set (rAP.H & rAP.L) the and Ax.rP is selected then the relay will activate at both the low and high total wrap around values. For example if the high and low wrap around modes have

been set to rAP and rAP.H is set to 10000 and rAP.L is set to 0 then the relay will activate whenever the total display wraps around from 10000 or 0. The length of time for which the relay remains activated at each wrap around is set at the AxPt function.

Ax.rH - the relay will operate at only the high wrap around value. For example if the high wrap around modes have been set to rAP and rAP.H is set to 10000 then the relay will activate whenever the total display wraps around from 10000. The length of time for which the relay remains activated at each wrap around is set at the AxPt function.

Ax.rL - the relay will operate at only the low wrap around value. For example if the low wrap around modes have been set to rAP and rAP.L is set to 0 then the relay will activate whenever the total display wraps around from 0. The length of time for which the relay remains activated at each wrap around is set at the AxPt function.

Trailing or independent set points

A function exists to allow relays, other than relay 1, to be used as independent relays with their own set points or they may be made to "trail" another relays setpoint. For example if A2.SP is selected then alarm 2 will act as an independent relay. If A2.t 1 is selected then the alarm 2 relay will trail alarm 1 relay. With A2.t 1 selected if alarm 1 high setpoint is set to 50 and alarm 2 high set point set to 20 then alarm 2 relay will operate at a display of 70 (50 + 20). Alternatively alarm 2 could be set to operate at 30 (50 - 20) by setting alarm 2 high setpoint to -20.

Trailing Alarm Table
Showing Possible Alarm Assignments

	A2	A3	A4	A5	A6	A7
A1	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.t3	A5.t3	A6.t3	A7.t3
A4				A5.t4	A6.t4	A7.t4
A5					A6.t5	A7.t5
A6						A7.t6

8.1 Easy Alarm Access

The PM4 has an easy alarm access facility which allows operator access to the selected alarm setpoints (only to the setpoints selected at the SPAC function) simply by pressing the F button. 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. Either the ACCS function must be set to EASY or the r.I nP function must be set to SP.AC. If the ACCS function is used the remote input function r.I nP can be assigned to a different use.

2. The selected relays must have a setpoint, nothing will happen if all the alarm relay 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.

Switching Inductive Loads

If the alarm relay is to be used to switch an inductive load, such as a solenoid, it is advisable to use a suppressor circuit either across the load or across the relay contacts. Switching inductive loads without a suppressor circuit can cause arcing at the relay contacts resulting in electrical interference and wear on the contacts. A typical suppressor circuit consists of a 100Ω resistor in series with a 0.1uF capacitor, this circuit is then placed across the load or relay contacts. Ensure that the resistor and capacitor are of sufficiently high rating to cope with the voltage and current encountered.

9 Specifications

Technical Specifications

Input:	Quadrature encoder A & B inputs
Maximum Input Frequency:	2MHz (500kHz phase input)
Display Update Frequency:	User selectable as 1, 2, 4, 8, 16 or 32 per sec.
Memory retention:	Total/grand total memory retained for a minimum of forty days with power removed
Microprocessor:	MC68HC11 CMOS
Ambient Temperature:	LED -10 to 60°C, LCD -10 to 50°C
Humidity:	5 to 95% non condensing
Display Models:	4 digit 20mm, 5 digit 14.2mm + status LEDs + 4 way keypad. 6 digit 14.2mm + 4 way keypad 8 digit 10mm + 4 way keypad LED Bar Graph 20 segment bar + 5 digit 7.6mm LCD Models 4 digit 12.7mm, 6 digit 10.2mm
Transducer Power:	Link selectable +5V regulated or +9V unregulated or +18V unregulated (20mA max). 9V & 18V available on AC powered models only, 5V available on all models.
Power Supply:	AC 240V, 110V or 24V 50/60Hz or DC isolated wide range 12 to 48V. 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, DC supply, typically 55mA at 12VDC, 25mA at 24VDC for basic instrument with no transmitter supply used.
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:	Single or dual. 4 to 20mA or 0 to 1V or 0 to 10V, link selectable. 4 to 20mA output can drive into 1kΩ load maximum.
Serial Communications:	RS232 or RS485 (factory configured)
DC Voltage Output:	Isolated ±12V(24V) standard or ±5V(10V), 20mA max. at 24V, 40mA max. at 10 or 12V, 80mA max. at 5V.

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 wire size 2.5mm^2 (relays & power) or 1.5mm^2 (signal, reset etc.))
Weight:	400 gms Basic model, 450 gms with option card

10 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 product is designed and manufactured in Australia.