Model PM4-QC
Panel Mount Display/Controller
Quadrature Pulse Input
Ratemeter/Totaliser
Operation and Instruction Manual

AMALGAMATED INSTRUMENT CO *ABN: 80 619 963 692*
Unit 5, 28 Leighton Place Hornsby *Telephone: +61 2 9476 2244* *e-mail: sales@aicpl.com.au*
NSW 2077 Australia *Facsimile: +61 2 9476 2902* *Internet: www.aicpl.com.au*

Table of Contents

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 and B pulses) encoder i.e. two offset pulses.

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.cond output can be set for retransmission only.

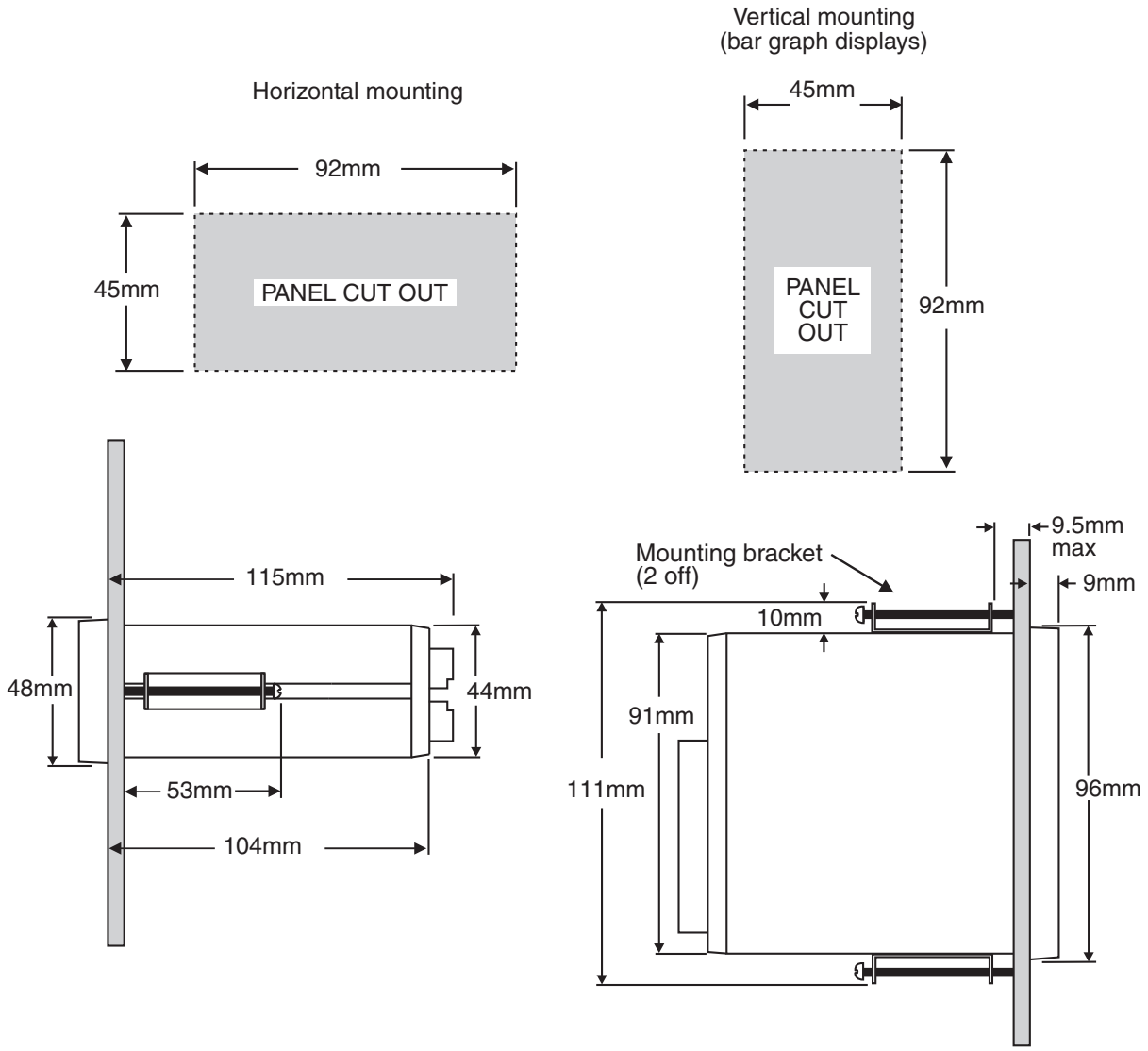
Unless otherwise specified at the time of order, your PM4 has been factory set to a standard configuration, see the function table for your selected mode for default settings. Full electrical isolation between power supply, input voltage and re-transmission output is provided by the PM4, thereby eliminating grounding and common voltage problems. This isolation feature makes the PM4 ideal for interfacing to computers, PLCs and other data acquisition devices.

The 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.

2 Mechanical Installation

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

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



3 Electrical installation

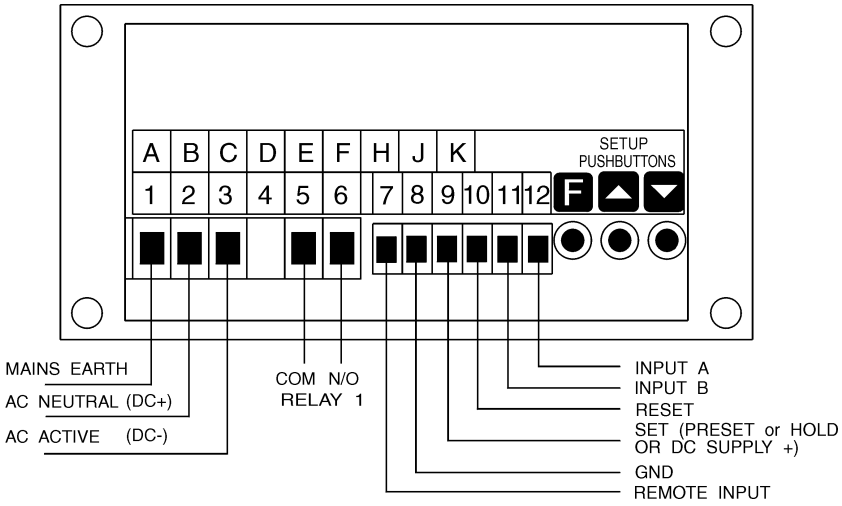
3.1 Electrical installation

The 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.

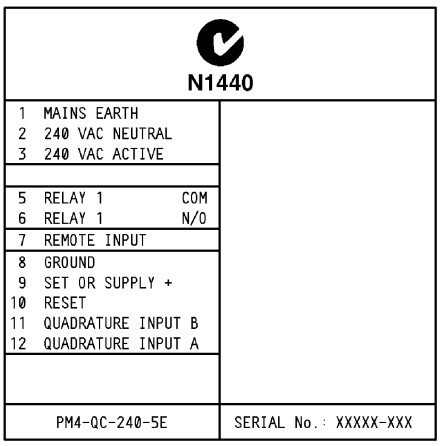
The plug in, screw type, terminal blocks allow for wires of up to 2.5mm^2 to be fitted. Connect the wires to the appropriate terminals as indicated below. Refer to connection details provided in this chapter to confirm proper selection of voltage, polarity and input type before applying power to the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

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

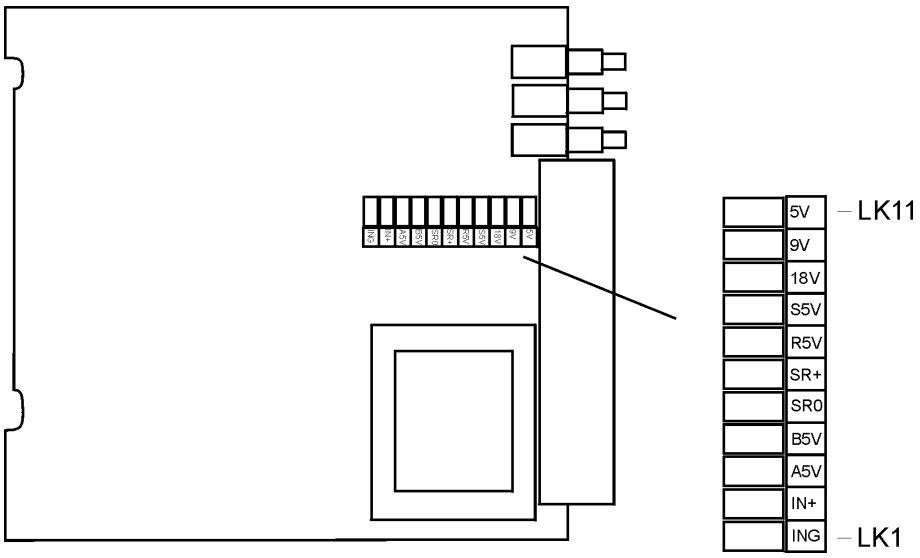
For connection details of optional outputs refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when options are fitted.



Instrument data label example



3.2 Input link settings and circuit



The link functions are as follows:

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

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

LK3 - INPUT A level, see table 1

LK4 - INPUT B level, see table 1

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

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

LK7 - RESET input level, see table 2

LK8 - SET terminal input level, see table 3 and 4

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

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

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

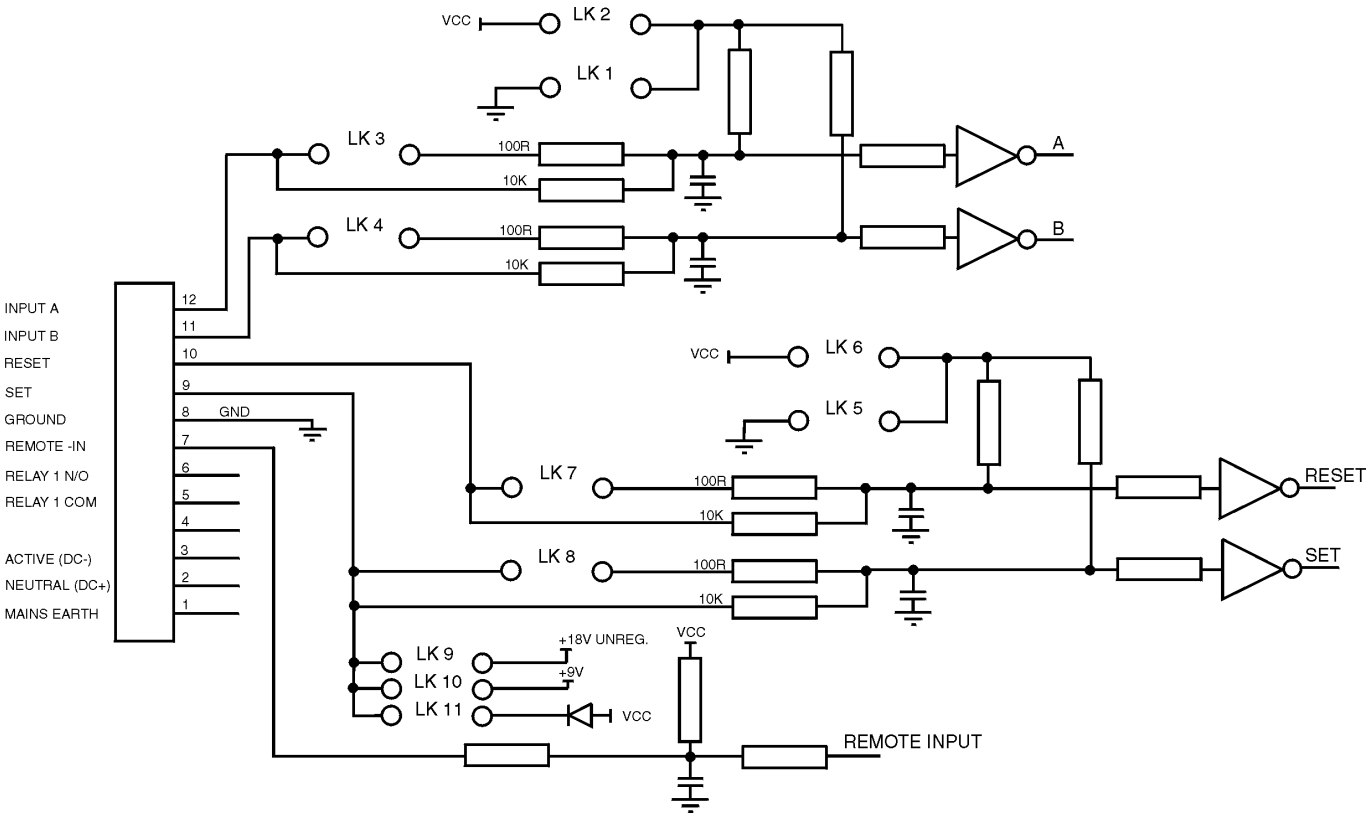
Table 1 Input A and B - Terminals 11 and 12				
Input type	**LK1**	**LK2**	**LK3**	**LK4**
0-5V NPN or voltage free contact closure	OUT	IN	IN	IN
0-5V PNP or 0-5V pulse input	IN	OUT	IN	IN
Pulse greater than 5V (24Vmax)	IN	OUT	OUT	OUT

Table 2 Reset input - Terminal 10			
Input type	**LK5**	**LK6**	**LK7**
0-5V control voltage or voltage free contact closure	OUT	IN	IN
Greater than 5V (24V max.)	IN	OUT	OUT

Table 3 Set input (preset or hold) - Terminal 9			
Input type	**LK5**	**LK6**	**LK8**
0-5V control voltage or voltage free contact closure	OUT	IN	IN
Greater than 5V (24V max.)	IN	OUT	OUT

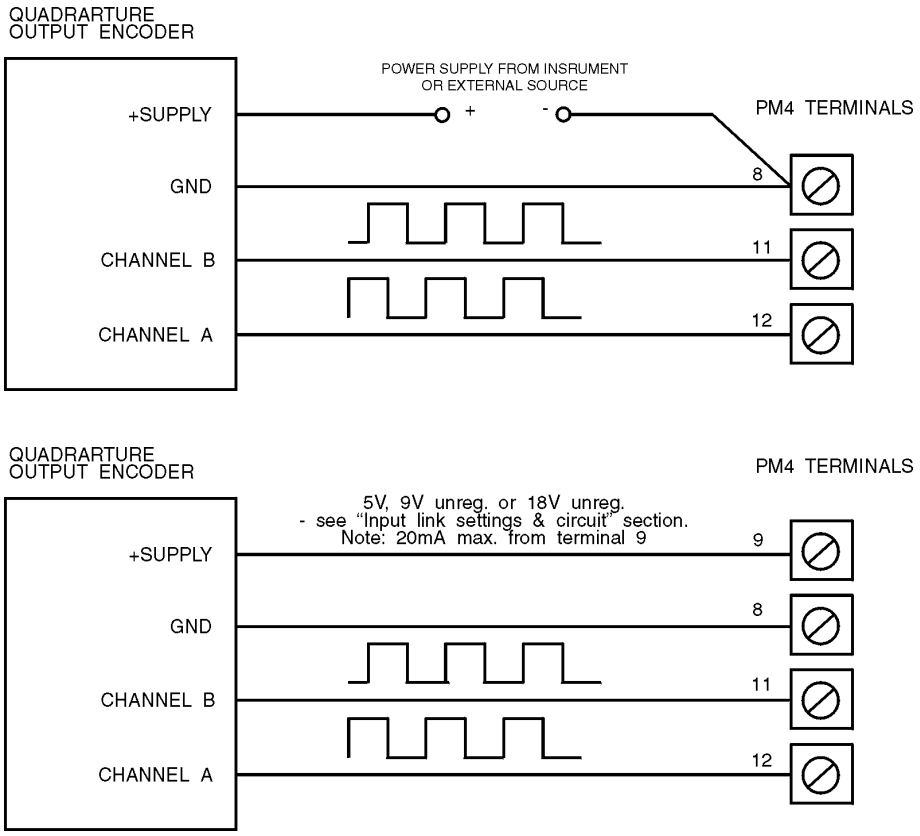
Table 4 Encoder supply - Terminal 9			
Input type	**LK9**	**LK10**	**LK11**
+18V unregulated @ 20mA max.	IN	OUT	OUT
+9V unregulated @ 20mA max.	OUT	IN	OUT
+5V regulated @ 20mA max.	OUT	OUT	IN
Terminal 9 used as preset or hold input	OUT	OUT	OUT

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

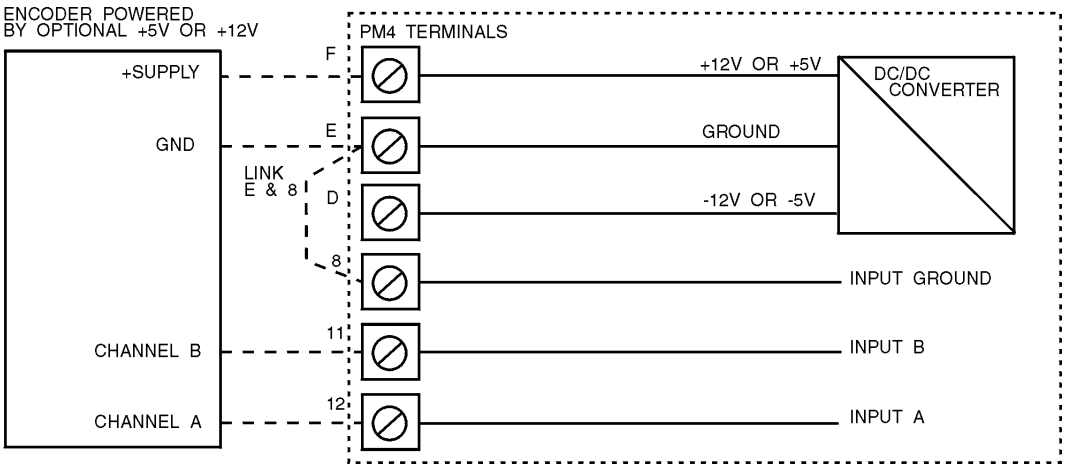


3.3 Encoder input and power supply

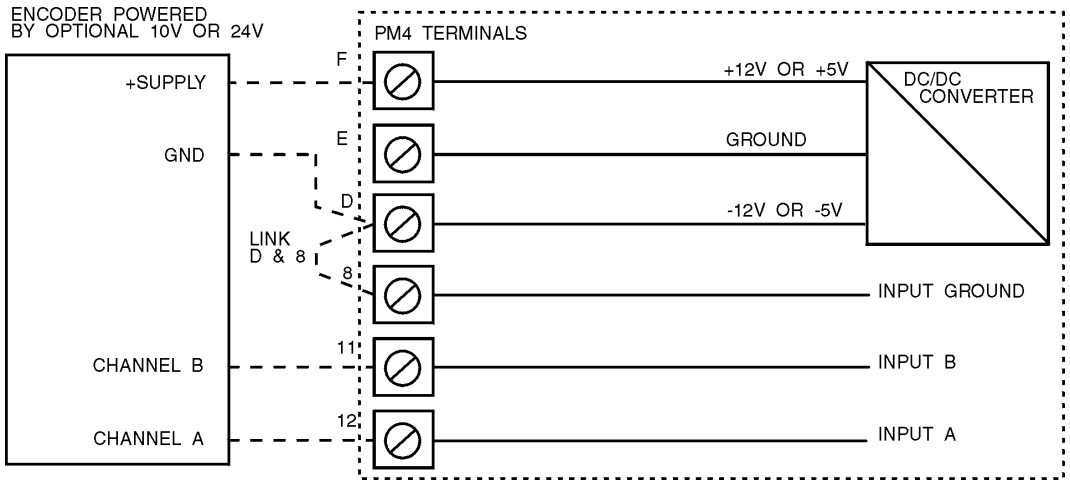
An external supply is usually required to power the encoder due to the current consumption required by these encoders. If current consumption by the encoder is 20mA or less terminal 9 may be link selected to provide a regulated 5V or unregulated 9V or unregulated 18V. Note: the encoder power supply is 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.

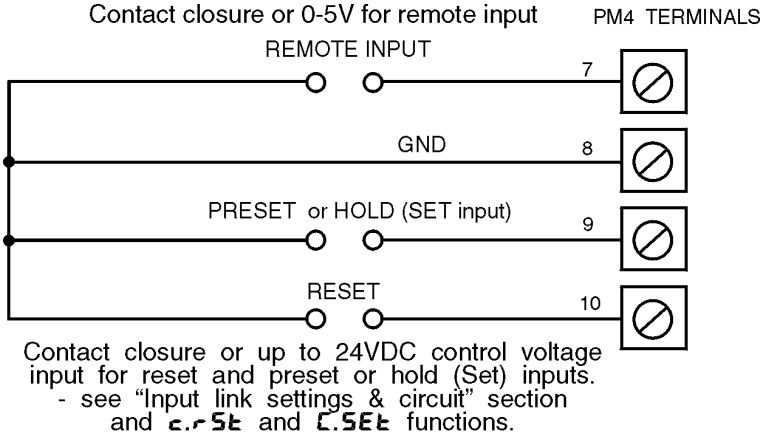


The optional supply can also be configured for 10V or 24V DC power supply and connected as shown below. It is necessary to link terminals D and 8 to couple the power supply and input grounds. The maximum current available is 20mA @ 24V and 40mA @10V.



3.4 Reset, preset/hold and remote inputs

The RESET input (terminal 10) will zero the display when the **c.rSt** function is set to **ZERO** 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 i nPt** 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.i nP** function must be set to **ZERO** and the **c.rSt** function set to **ZERO**. To use the remote input to set the display to the preset value you can either set **r.i nP** to **P.SEt** or set **r.i nP** to **ZERO** and **c.rSt** to **P.SEt**. To use the remote input to hold the count display (total only) set the **r.i nP** function to **Hold**. Other remote input functions are also available, see **r.i nP** function.



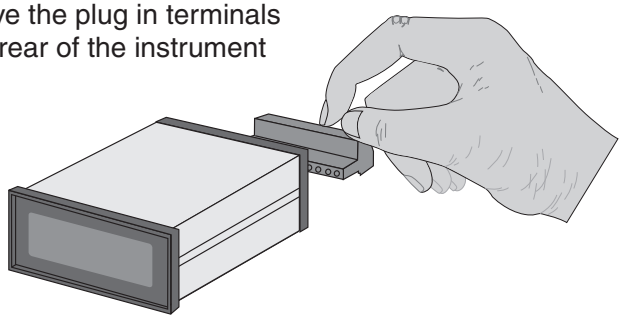
3.5 Relay connections

The PM4 is supplied with one alarm relay as standard with connections on terminals 5 and 6, extra relays are optionally available. The relay is a single pole, single throw type and is rated at 5A, 240VAC into a resistive load. The relay contact is voltage free and may be programmed for normally open or normally closed operation. The relay will close when power is removed.

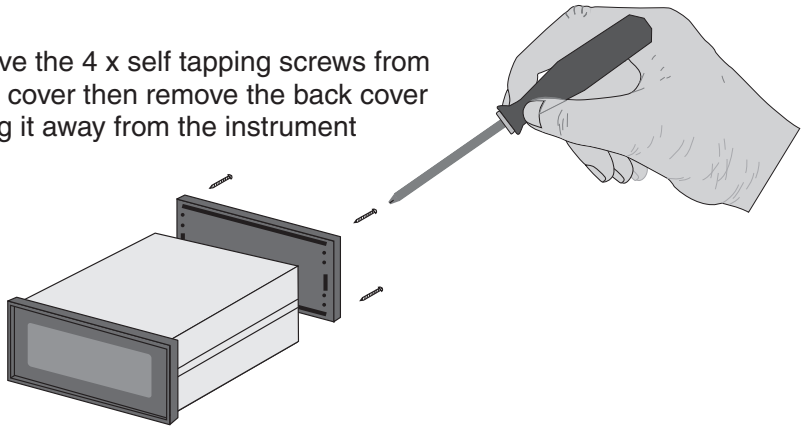
3.6 Input Output Configuration

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

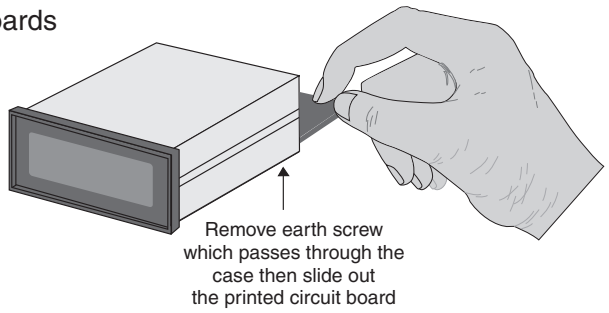
1. Remove the plug in terminals from the rear of the instrument



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



3. Remove the earth screw which passes through the underside of the case then slide out the board or boards



4. Configure the PCB links as requred, see appropriate chapter

5. Slide PCB back into case

6. Replace the earth screw which passes through the case

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

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

4 Function table

The function table below shows the functions which will be seen when the **SEt OPEr** function is set to **both**. When **both** mode is used the functions available allow for both the ratemeter and totaliser scaling and setup.

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

If the **SEt OPEr** function is set to **totL** or **FrEq** then the functions in the table below which are not applicable to the mode selected will not appear.

Functions in this first table are available in **FUnC** or **CAL** mode

Display	Function	Range	Default	Your record	Ref/Page
A*x*PS	Relay pass value	Any display value	**OFF**	See 4.1	5.1 / 18
A*x*Pt	Relay pass time	**0.0** to **999.9**	**0.0**	See 4.1	5.2 / 19
A*x*Lo	Low setpoint value for designated alarm relay *x*	Any display value or **OFF**	**OFF**	See 4.1	5.3 / 19
A*x*Hi	High setpoint value for designated alarm relay *x*	Any display value or **OFF**	**OFF**	See 4.1	5.4 / 20
A*x*HY	Hysteresis value for the designated alarm relay *x*.	**0** to **9999**	**10**	See 4.1	5.5 / 21
A*x*tt	Trip time delay for the designated alarm relay *x*.	**0** to **9999**	**0**	See 4.1	5.6 / 21
A*x*rt	Reset time delay for the designated alarm relay *x*.	**0** to **9999**	**0**	See 4.1	5.7 / 22
A*x*n.o or **A*x*n.c**	Alarm relay *x* action to normally open (de-energised) or normally closed (energised)	**A*x*n.o** or **A*x*n.c**	**A*x*n.o**	See 4.1	5.8 / 22
A*x*SP or **A*x*t 1** etc.	Relay operation independent setpoint or trailing setpoint (*__Optional__)	**A*x*SP** or **A*x*t 1** etc.	**A*x*SP**	See 4.1	5.9 / 22
brGt	Display brightness level	**1** to **15**	**15**		5.10 / 23
duLL	Display remote brightness switching	**0** to **15**	**1**		5.11 / 23
P.SEt	Preset value	Any display value	**0**		5.12 / 23

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

Functions in this second table are available only in CAL mode or if ACCS is set to ALL

Display	Function	Range	Default	Your record	Ref/Page
bAr_	Bargraph low value (seen only on bargraph display instruments)	Any display value	0		5.13 / 24
bAr^	Bargraph high value (seen only on bargraph display instruments)	Any display value	1000		5.14 / 24
bAr tYPE	Bargraph type for instruments with bargraph display (seen only on bargraph display instruments)	bAr, S.dot, d.dot or C.bAr	bAr		5.15 / 24
d90P	Digital output option mode (*Optional)	bcd, b.SCL, bin or bin2	bin2		5.16 / 25
d9.0P	Digital output option polarity (*Optional)	AIo or AHi	AIo		5.17 / 25
bcd Strt	Digital output option BCD start position (*Optional)	0, 1 or 2	0		5.18 / 25
di 9_	Digital output option low value (*Optional)	Any display value	0		5.19 / 26
di 9^	Digital output option high value (*Optional)	Any display value	1000		5.20 / 26
rEC_	Analog output option low display value (*Optional)	Any display value	0		5.21 / 26
rEC^	Analog output option high display value (*Optional)	Any display value	1000		5.22 / 27
drnd	Display rounding	1 to 5000	1		5.23 / 27
FLtr	Digital filter	0 to 8	2		5.24 / 27
rAtE dCPt	Rate display decimal point selection	0 to number of display digits minus 1	0		5.25 / 28
rAtE inPt	Rate input scale factor	Any display value	1		5.26 / 28
rAtE SCLE	Rate scale factor	Any display value	1		5.27 / 28
tOtI dCPt	Total display decimal point selection	0 to number of display digits minus 1	0		5.28 / 29
totI inPt	Total input	Any positive display value	1		5.29 / 29
totI SCLE	Total scale	Any display value	1		5.30 / 29

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

9.tot	Grand Total	nONE. For, rEU, POS, nEG or AbS	nONE		5.31 / 29
rAP.L	Totaliser display wrap around low value	Any display value	0		5.32 / 30
rAP.H	Totaliser display wrap around high value	Any display value	1000		5.33 / 31
rAP.L	Totaliser display wrap around low mode	nONE, rAP or StOP	nONE		5.34 / 31
rAP.H	Totaliser display wrap around high mode	nONE, rAP or StOP	nONE		5.35 / 31
FrEq rnGE	Frequency range	LoF. Hi F, AUGE or r.AUG	Hi F		5.36 / 32
FASt UPdt	Fast update	on or OFF	OFF		5.37 / 32
P.CLr	Power on reset mode	nONE, rSEt or PSEt	nONE		5.38 / 32
rAtE SI gn	Sign for rate display	onor OFF	on		5.39 / 33
tout SECS	Rate display time out	1 or 9999	1		5.40 / 33
AUGE SECS	Average display seconds	1 or 9999	1		5.41 / 33
AUGE cnt	Average display counts	1 or 30	1		5.42 / 33
r.I nP	Remote input function	nONE, P.HLd, d.HLd, Hi , Lo, Hi Lo, 2Er0, SP.Ac, no.Ac, P.SEt, Hol d, di SP, dULL or 9.rSt	nONE		5.43 / 34
P.but	P button function	nONE, Hi , Lo, Hi Lo, 2Er0, P.SEt, di SP, FUnC or 9.rSt	nONE		5.44 / 35
ACCS	Access mode	OFF .EASY. nONE or ALL	OFF		5.45 / 35

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

SPAC	Setpoint access mode (*Optional)	A 1, A 1-2 etc.	A 1		5.46 / 36
di SP rAtE	Display update rate	1, 2, 4, 8, 16 or 32	4		5.47 / 36
Ax.rt, Ax.tL, Ax.PS, Ax.rP, Ax.rH or Ax.rL	Alarm relay operation mode	Ax.rt, Ax.tL, Ax.PS, Ax.rP, Ax.rH or Ax.rL	Ax.rt		5.48 / 36
rEC	Analog operation mode (*Optional)	rAtE or totL	rAtE		5.49 / 37
bAr	Bargraph display operation mode	rAtE or totL	rAtE		5.50 / 37
d9OP	Digital output operation mode (*Optional)	rAtE or totL	rAtE		5.51 / 37
c.rSt	Totaliser counter reset value	2Er0 or PSEt	2Er0		5.52 / 38
c.rSt	Totaliser counter reset signal	Lo, LoE, Hi or Hi E	Lo		5.53 / 38
SEt inPt	SET terminal input function	P.SEt or Hold	P.SEt		5.54 / 38
c.SEt	SET terminal operation signal	Lo, LoE, Hi or Hi E	Lo		5.55 / 38
dFlt di SP	Default display	rAtEor totl	rAtE		5.56 / 39
SEt OPEr	Set display operation	FrEq, totL or both	FrEq		5.57 / 39
bAUd rAtE	Baud rate for serial communications (*Optional)	300.600. 1200.2400. 4800.9600. 19.2 or 38.4	9600		5.58 / 39
PrtY	Parity for serial communications (*Optional)	nonE.EUEn or odd	nonE		5.59 / 39
O.Put	Output for serial communications (*Optional)	di SP.Cont. POLL or A.buS	Cont		5.60 / 40
Addr	Instrument address for serial communications (*Optional)	0 to 31	0		5.61 / 40

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

4.1 Relay table

Record your relay settings in the table below

Display	Relay 1	Relay 2	Relay 3	Relay 4	Relay 5	Relay 6	Relay 7
Rx Lo							
Rx Hi							
Rx HY							
Rx tt							
Rx rt							
Rx n.o or **Rx n.c**							
Rx SP or **Rx t 1** etc.	n/a						
Rx.rt, **Rx.tL** or **Rx.PS**							

5 Explanation of functions

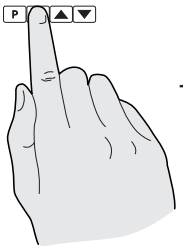
The PM4 setup and calibration functions are configured through a push button sequence. The three push buttons located at the rear of the instrument (also at the front on some display options) are used to alter settings. Two basic access modes are available:

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.

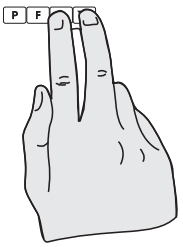
Once CAL or FUNC mode has been entered you can step through the functions, by pressing and releasing the F push button, until the required function is reached. Changes to functions are made by pressing the ▲ or ▼ push button (in some cases both simultaneously) when the required function is reached. See the flow chart example on the following page.

Entering CAL Mode



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

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



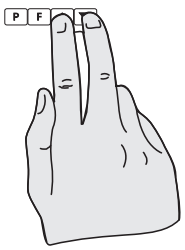
3. Within 2 seconds of releasing the F button press, then release the ▲ and ▼ buttons together. The display will now indicate FUNC followed by the first function.

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.



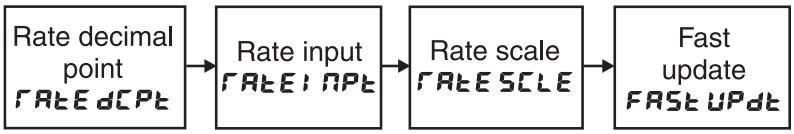
2. Within 2 seconds of releasing the F button press, then release the ▲ and ▼ buttons together. The display will now indicate FUNC followed by the first function.

Frequency/rate mode operation modes

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

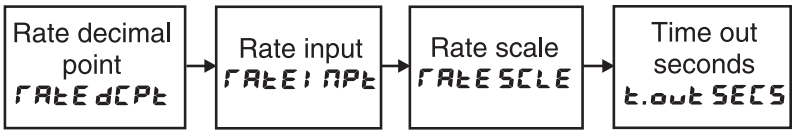
1. Rate display, high frequency
If **Hi F** is selected at the **FrEq rnGE** function the instrument acts as a general purpose frequency/ratemeter/tachometer. If a very low frequency (below approx. 4Hz) input is used then **LoF** mode should be selected. At frequencies below 4Hz, if **Hi F** is selected, 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



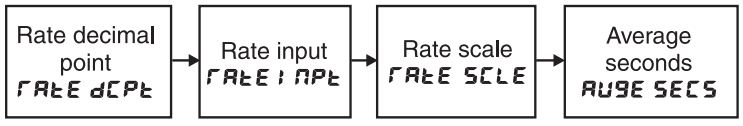
2. Rate display, low frequency
If **LoF** is selected at the **FrEq rnGE** function the instrument expects an input frequency of less than 1kHz. This mode allows very low frequency inputs without exhibiting the apparent display instability often seen with low frequency inputs. This is accomplished by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

Functions specific to display with **FrEqrnGE** set to **LoF** with a rate display



4. 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



Totaliser functions

This mode is chosen by selecting **totI** at the **SEt OPEr** function. When in **totI** 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 (**9.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. **A 1tI** /**A 1.PS** function. This operation mode allows the selected relay to operate for a programmable time every time the total passes a programmable value, see **A 1PS**, **A2PS**, **A2Pt** and **A2Pt** functions.

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 **A**x.**rt**/**A**x.**tl** etc. function.

Easy alarm relay adjustment access facility

The display 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. Note: this easy access also functions in the same manner for the PI control setpoint (relay and/or analog PI output) if PI control is available. The instrument must be set in the manner described below to allow the easy access facility to work:

1. The **r.I nP** function must be set to **SPAC** or the **ACCS** function must be set to **EASY**.
2. At least one alarm must have a setpoint, nothing will happen if all the alarm setpoints are set to **OFF**.
3. The **SPAC** 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 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 functions unless the instrument is powered up in **CAL** mode.

Explanation of Functions

5.1 Relay pass value

Display:	***AxPS***
Range:	Any display value
Default Value:	**OFF**

Alarm relay pass value - only seen when **SEt OPEr** function is set to **totL** or **both** and when ***AxPS*** is selected at the ***Axrt*/*AxtL*/*AxPS*** function. Displays and sets the chosen alarm relay

(A 1Pt, A2Pt etc.) pass time in seconds. The alarm relay will activate at multiples of the pass value e.g. if A 1PS is set to 50 then relay 1 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, positive or negative. The pass value can be set to OFF (disabled) by pressing the ▲ and ▼ buttons together.

5.2 Relay pass time

Display: AxPt
Range: 0.0 to 999.9
Default Value: 0.0

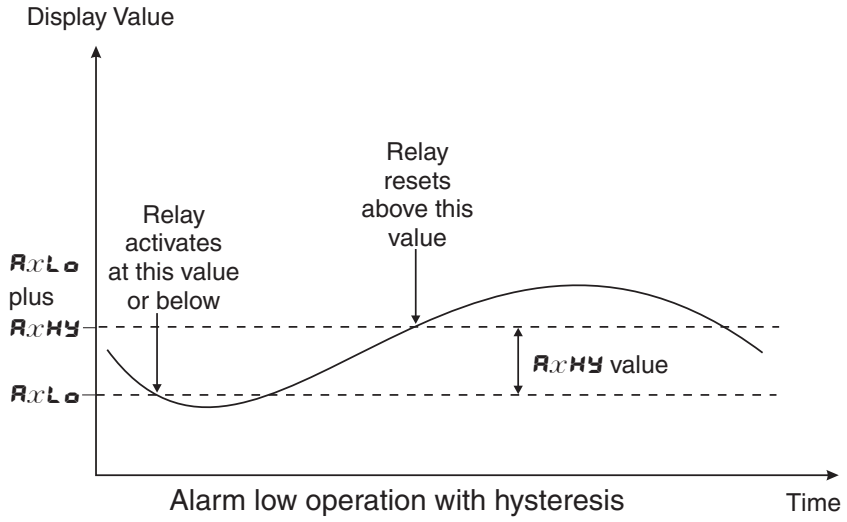
Alarm relay pass time - only seen when SEt OPEr function is set to totL or both and AxPS selected at the Axrt/AxtL/AxPS function. Displays and sets the chosen alarm relay (A 1Pt, A2Pt etc.) pass time in seconds. The value set is the time for which the relay will remain energised when activated at a pass value. e.g. if set to 2.0 with a A 1PS 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 instrument 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.

5.3 Alarm relay low setpoint

Display: AxLo
Range: Any display value or OFF
Default Value: OFF

Displays and sets the low setpoint value for the designated alarm relay x. Note x will be replaced by the relay number when displayed e.g. A 1Lo for relay 1. Use this low setpoint function if a relay operation is required when the display value becomes equal to or less than the low setpoint value. To set a low alarm value go to the AxLo function and use the ▲ or ▼ push buttons to set the value required then press F to accept this value. The low alarm setpoint may be disabled by pressing the ▲ and ▼ push buttons simultaneously. When the alarm is disabled the display will indicate OFF. If the relay is allocated both a low and high setpoint then the relay will activate when the value displayed moves outside the band set by the low and high setpoints. The value at which the relay will reset is controlled by the AxHY function.

Example:
If A 1Lo is set to 10 then relay 1 will activate when the display value is 10 or less.



5.4 Alarm relay high setpoint

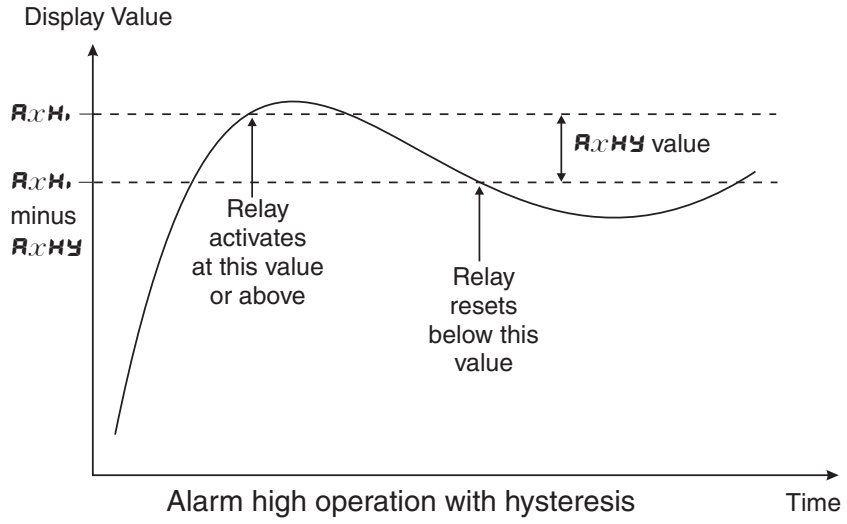
Display: RxH,

Range: Any display value or OFF

Default Value: OFF

Displays and sets the high setpoint value for the designated alarm relay x. Note x will be replaced by the relay number when displayed e.g. R 1H, for relay 1. Use this high setpoint function if a relay operation is required when the display value becomes equal to or more than the low setpoint value. To set a high alarm value go to the RxH, function and use the ▲ or ▼ push buttons to set the value required then press F to accept this value. The high alarm setpoint may be disabled by pressing the ▲ and ▼ push buttons simultaneously. When the alarm is disabled the display will indicate OFF. If the relay is allocated both a low and high setpoint then the relay will activate when the value displayed moves outside the band set by the low and high setpoints. The value at which the relay will reset is controlled by the RxHY function.

Example:
If R 1H, is set to 100 then relay 1 will activate when the display value is 100 or higher.



5.5 Alarm relay hysteresis (deadband)

Display: A*x*HY
Range: 0 to 9999
Default Value: 10

Displays and sets the alarm relay hysteresis limit for the designated relay x. Note x will be replaced by the relay number when displayed e.g. A 1HY for relay 1. To set a relay hysteresis value go to the A*x*HY function and use the ▲ or ▼ push buttons to set the value required then press F to accept this value. The hysteresis value is common to both high and low setpoint values. The hysteresis value may be used to prevent too frequent operation of the relay when the measured value is rising and falling around setpoint value. e.g. if A 1HY is set to zero the alarm will activate when the display value reaches 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 1H, 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 to 50.0 or above and will reset when the display value goes below 47.0 i.e. at 46.9 or below. 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 to 20.0 and A 1HY is set to 10.0 then the alarm output relay will activate when the display value falls to 20.0 or below and will reset when the display value goes above 30.0 i.e at 30.1 or above. The hysteresis units are expressed in displayed engineering units.

Example: If A 1H, is set to 100 and A 1HY is set to 10 then relay 1 will activate when the display value is 100 or higher and will reset at a display value of 89 or lower.

5.6 Alarm relay trip time

Display: A*x*tt
Range: 0 to 9999
Default Value: 0

Displays and sets the alarm trip time in seconds. The trip time is common for both alarm high and low setpoint values. The trip time provides a time delay before the alarm relay will activate when an alarm condition is present. The alarm condition must be present continuously for the whole trip time period before the alarm will activate. If the input moves out of alarm condition during this period the timer will reset and the full time delay will be restored. This trip time delay is useful for preventing an alarm trip due to short non critical deviations from setpoint. The trip time is selectable over 0 to 9999 seconds. To set a trip time value go to the A*x*tt function and use the ▲ or ▼ push buttons to set the value required then press F to accept this value.

Example: If A 1tt is set to 5 seconds then the display must indicate an alarm value for a full 5 seconds before relay 1 will activate.

5.7 Alarm relay reset time

Display: Axrt
Range: 0 to 9999
Default Value: 0

Displays and sets the alarm reset delay time in seconds. The reset time is common for both alarm high and low setpoint values. With the alarm condition is removed the alarm relay will stay in its alarm condition for the time selected as the reset time. If the input moves back into alarm condition during this period the timer will reset and the full time delay will be restored. The reset time is selectable over 0 to 9999 seconds. To set a reset time value go to the Axrt function and use the ▲ or ▼ push buttons to set the value required then press F to accept this value.

Example: If A 1rt is set to 10 seconds then the resetting of alarm relay 1 will be delayed by 10 seconds.

5.8 Alarm relay normally open/closed

Display: Axn.o or Axn.c
Range: Axn.o or Axn.c
Default Value: Axn.o

Displays and sets the setpoint alarm relay x action to normally open (de-energised) or normally closed (energised), when no alarm condition is present. Since the relay will always open when power is removed a normally closed alarm is often used to provide a power failure alarm indication. To set the alarm relay for normally open or closed go to the Axn.o or Axn.c function and use the ▲ or ▼ push buttons to set the required operation then press F to accept this selection. **Example:** If set to A 1n.o alarm relay 1 will be open circuit when the display is outside alarm condition and will be closed (short circuit across terminals) when the display is in alarm condition.

5.9 Alarm relay setpoint or trailing operation

Display: AxSP or Axt 1 etc.
Range: AxSP or Axt 1 etc.
Default Value: AxSP

Relay operation independent setpoint or trailing setpoint, this function only be seen where more than one relay is fitted. Each alarm relay, except relay 1, may be programmed to operate with an independent setpoint value or may be linked to operate at a fixed difference to another relay setpoint, known as trailing operation. 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 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.t3 = 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.

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).

5.10 Display brightness

Display: brGt
Range: 1 to 15
Default Value: 15

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. See also the dULL function. To set brightness level go to the brGt function and use the ▲ or ▼ push buttons to set the value required then press F to accept this value.

5.11 Display remote brightness switching

Display: dULL
Range: 0 to 15
Default Value: 1

Displays and sets the level for remote input brightness switching, see r.1 nP function. When a remote input is set to dULL the remote input can be used to switch between the display brightness level set by the brGt function 5.10 and the display brightness set by the dULL function. The display dull level 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. To set dull level go to the dULL function and use the ▲ or ▼ push buttons to set the value required then press F to accept this value.

Example: With dULL set to 4 and brGt set to 15 and the r.1 nP function set to dULL the display brightness will change from the 15 level to 4 when a switch connected to the remote input terminals is activated.

5.12 Preset value

Display: P.SEt
Range: Any display value
Default Value: 0

A preset value can be entered at this function, for totaliser operation only. If a remote input (r.1 nP function) is programmed to PSEt then operation of the remote input will cause the display to change to the preset value. Any change in input from this point will cause a variation above or below the preset value. To set preset value go to the P.SEt function and use the ▲ or ▼ push buttons to set the value required then press F to accept this value.

The display can also be set to default to the preset value when a reset input is applied. This selection is made at the c.rSt function.

The P.but function can be used to change the preset value if this function is set to FUnC. This

will only normally be used where the preset value is required to be changed regularly.

Example:
With a display showing a value of **50** at a given input if the **P.SEt** function is set to **70** and the remote function is set to **P.SEt** then once the remote input is activated the same input will now have a display value of **70**.

5.13 Bargraph low value

Display: **bAr_**
Range: Any display value
Default Value: **0**

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. For example the bargraph scale may be indicating percentage fill of a tank whilst the 7 segment display is indicating actual process units. To set bargraph low level go to the **bAr_** function and use the ▲ or ▼ push buttons to set the value required then press **F** to accept this value.

5.14 Bargraph high value

Display: **bAr¯**
Range: Any display value
Default Value: **1000**

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 (e.g. all LEDs illuminated). May be independently set anywhere within the display range of the instrument. To set bargraph high level go to the **bAr¯** function and use the ▲ or ▼ push buttons to set the value required then press **F** to accept this value.

5.15 Bargraph type for instruments with bargraph display

Display: **bAr tYPE**
Range: **bAr**, **S.dot**, **d.dot** or **C.bAr**
Default Value: **bAr**

Bar graph display operation mode - seen only in vertical or circular bargraph display instruments. Allows selection of bargraph operation mode. Choices available are:

- **bAr** - conventional solid bargraph display i.e. all LEDs 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 double 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.

5.16 Digital output option mode

Display: d9OP
Range: bcd, b.SCL, bin or bin2
Default Value: bin2

Seen only with the 16 bit 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) i.e. -32767 to 32767, bin (unsigned binary) i.e. 0 to 65535, b.SCL (scaled binary, see d9_ and d9^ below), bcd (binary coded decimal) i.e. up to four BCD numbers. .

5.17 Digital output option polarity

Display: d9.OP
Range: AIo or AHi
Default Value: AIo

Seen only with the 16 bit digital output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted. Selections available are: AIo (active low i.e. logic 1 = 0V output, logic 0 = +V output) or AHi (active high i.e. logic 1 = +V output, logic 0 = 0V output).

5.18 Digital output option BCD start position

Display: bcd Strt
Range: 0, 1 or 2
Default Value: 0

Seen only with the 16 bit 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. As the output is 16 bit it can output up to 4 BCD numbers. 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, if set to 0 then the four right most digits will be output.

5.19 Digital output option low value

Display: d.9_

Range: Any display value

Default Value: 0

Seen only with the 16 bit 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 which follows in 5.20.

5.20 Digital output option high value

Display: d.9¯

Range: Any display value

Default Value: 1000

Seen only with the 16 bit digital output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted. Determines the high scaling point for the b.SCL mode and has no effect on other modes.

Example: If d.9_ is set to 0 and d.9¯ is set to 65535 ($2^{16} - 1$) 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 ($2^{15} - 1$) then a display of 2 will cause a retransmission of 4 (note: rounding may occur on retransmission).

5.21 Analog output option low value

Display: rEC_

Range: Any display value

Default Value: 0

Seen only when analog retransmission option fitted. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted for wiring details and link settings. 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. To set the analog output low value go to the rEC_ function and use the ▲ or ▼ push buttons to set the required value then press F to accept this selection.

Example: If it is required to retransmit 4mA when the display indicates 0 then select 0 in this function using the ▲ or ▼ button.

5.22 Analog output option high value

Display: rEC^

Range: Any display value

Default Value: 1000

Seen only when analog retransmission option fitted. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted for wiring details and link settings. Displays and sets the analog retransmission (4–20mA, 0–1V or 0–10V, link selectable) output high display value (20mA, 1V or 10V) in displayed engineering units. To set the analog output high value go to the rEC^ function and use the ▲ or ▼ push buttons to set the required value then press F to accept this selection.

Example: If it is required to retransmit 20mA when the display indicates 50 then select 50 in this function using the ▲ or ▼ button.

5.23 Display rounding

Display: drnd

Range: 1 to 5000

Default Value: 1

Displays and sets the display rounding value for the rate/frequency display only. 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. To set the display rounding value go to the drnd function and use the ▲ or ▼ push buttons to set the required value then press F to accept this selection.

Example:
If set to 10 the rate/frequency display values will change in multiples of 10 only i.e. display moves from 10 to 20 to 30 etc.

5.24 Digital filter

Display: FLtr

Range: 0 to 8

Default Value: 2

Displays and sets the digital filter value. Digital filtering uses a weighted average method of determining the display value and is used for reducing display value variation due to short term interference. The digital filter range is selectable from 0 to 8, where 0 = none and 8 = most filtering. Use ▲ or ▼ at the FLtr function to alter the filter level if required. Note that the higher the filter setting the longer the display may take to reach its final value when the input is changed, similarly the relay operation and any output options will be slowed down when the filter setting is increased. To set the digital filter value go to the FLtr function and use the ▲ or ▼ push buttons to set the required value then press F to accept this selection.

5.25 Rate display decimal point selection

Display: rAtE dCPt
Range: 0 to number of display digits minus 1
Default Value: 0

Rate decimal point selection - only seen when FrEq or both mode selected. Displays and sets the decimal point position for the rate display. 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. 2.4), 0.02 gives 2 decimal point places (e.g. 2.35) 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 6 digit display can have 5 decimal points 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.

5.26 Rate input scale factor

Display: rAtE InPt
Range: Any display value
Default Value: 1

Rate input scale factor - only seen when FrEq or both mode selected. Displays and sets the number of input pulses to be used with the rate scale function to generate the display scaling. See examples later in this chapter and formula below.

5.27 Rate scale factor

Display: rAtE SCLE
Range: Any display value
Default Value: 1

Rate scale factor - only seen when FrEq or both mode selected. Displays and sets the scale factor to be used with the rate input setting. See examples later in this chapter. Scale and input work together as follows:

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

Note: if either the rate input or rate scale factor are set to 0 the scaling will be 1:1 i.e. a 1Hz input will give a display of 1 i.e. it is assumed that there are no scaling factors.
Example: If an encoder sensing revolutions of a shaft puts out 20 pulses per revolution a rAtE InPt of 20 and a rAtE SCLE of 60 will give a display in RPM. Note as the display value is calculated from the ratio between rAtE InPt and rAtE SCLE settings of rAtE InPt = 1 and rAtE SCLE = 3 will give the same result.

5.28 Total display decimal point selection

Display: tOt! dCPt
Range: 0 to number of display digits minus 1
Default Value: 0

Total decimal point selection - Displays and sets the decimal point position for the total display. 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. 2.4), 0.02 gives 2 decimal point places (e.g. 2.35) 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 6 digit display can have 5 decimal points etc. Note: If the number of decimal points is altered then the calculated total display be affected. Always check the scaling values following a decimal point change and alter as required.

5.29 Total input scaling factor

Display: tot! I nPt
Range: Any positive display value
Default Value: 1

Displays and sets the number of input pulses to be used with the tot! SCLE function to generate the required display scaling, see tot! SCLE below.

5.30 Total scaling factor

Display: tot! SCLE
Range: Any display value
Default Value: 1

Displays and sets the scaling factor to be used with the tot! I nPt function to generate the required display scaling. The total scale factor can be set to any display value and the decimal point value seen at this function will be set by the tot! dCPt function. The display value is calculated in the following manner:

$$\text{New total} = \frac{\text{Input pulses counted} \times \texttt{tot! SCLE}}{\texttt{tot! I nPt}}$$

Example: To scale the display to count total kilolitres with 2 decimal place from an input which gives 10 pulses per litre (i.e. 10,000 pulses per kilolitre) set tot! dCPt to 0.02, set tot! I nPt to 10000 and set the tot! SCLE to 1.00 (i.e. display will increment by 0.01 kilolitres for every 100 input pulses and by 1.00 kilolitres for every 10000 input pulses).

5.31 Grand total

Display: G.tot
Range: nonE, For, rEU, POS, nEG or Abs
Default Value: nonE

Grand total operating mode - 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**, **totl** or **gtot** to indicate what the following total display is showing. To reset the grand total the remote input or **P** button must be set to **grSt**, see the **rI nP** and **P.but** functions. Six modes of grand total display are provided namely:

nonE - no grand total display
For - Forward
rEU - Reverse
POS - Positive
nEG - Negative
AbS - Absolute

These modes allow a choice of how the grand total will be displayed.

Mode	Up Count	Down Count
nonE	Not applicable	Not applicable
For	The grand total will increase with each up count input pulse. The grand total can show positive and negative totals.	The grand total will decrease with each down count input pulse. The grand total can show positive and negative totals.
rEU	The grand total will decrease with each up count input pulse. The grand total can show both positive and negative totals.	The grand total will increase with each down count input pulse. The grand total can show both positive and negative totals.
POS	The grand total will increase with each up count input pulse. The grand total display cannot go negative.	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.
nEG	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.	The grand total will increase with each down count input pulse. The grand total display cannot go negative.
AbS	The grand total will increase with any input pulse whether up or down count. The grand total display cannot go negative.	The grand total will increase with any input pulse whether up or down count. The grand total display cannot go negative.

5.32 Totaliser display wrap around low value

Display: **rAP.L**
Range: Any display value
Default Value: **0**

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.

5.33 Totaliser display wrap around high value

Display: rAP.H
Range: Any display value
Default Value: 1000

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.

5.34 Totaliser display wrap around low mode

Display: rAP.L
Range: nonE, rAP or StOP
Default Value: nonE

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.

5.35 Totaliser display wrap around high mode

Display: rAP.H
Range: nonE, rAP or StOP
Default Value: nonE

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.

5.36 Frequency range

Display: FrEq rnGE
Range: LoF, Hi F, AUGE or r.AUG
Default Value: Hi F

Frequency range - Displays and sets the frequency input range.

Select LoF 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).

Note that the period display (in both or FrEq modes) will only be accessible when the frequency range is set to LoF and hence the input frequency must not be above 1kHz.

Select AUGE for an averaged display. The averaged display allows the input rate to be averaged over a period of seconds set by the AUGE 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 pulses.

Select r.AUG for a "rolling averaged" display (note the filter FLtr function is not available when this mode is selected). The rolling average allows the frequency/rate reading to be averaged over a period set by the AUGE SECS function but this average is taken over a programmable number of counts set at the AUGE Cnt function. For example if the with the FrEq rnGE function set to r.AUG (rolling average), the AUGE SECS function set to 300 (300 seconds or 5 minutes) and the AUGE Cnt (average count) function set to 12 the display will be averaged and updated every 5 minutes with each new update showing not the average of the last 5 minutes but the average of the last 12 x 5 minute (1 hour) time periods.

For this example starting with a zero display a steady input scaled to read 1200 per hour would read 100 after the first 5 minutes, 200 after the second 5 minutes etc. up to 1200 after 1 hour (12 x 5 minutes). Beyond this time the display will update every 5 minutes showing the average over the last 12 x 5 minute time periods. The rate will be zeroed when the display is switched off of if the input stops for a sufficient time to allow the rate to fall to zero.

5.37 Fast update

Display: FASt UPdt
Range: on or OFF
Default Value: OFF

Seen only when SEt OPEr is set to FrEq and FrEq rnGE set to HI F. With FASt UPdt set to OFF the relay updates will take place approximately twice per second. With FASt UPdt set to on the relay updates will take place approximately six times per second.

5.38 Power on reset mode

Display: P.CLr
Range: nonE, rSEt or PSEt
Default Value: nonE

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.

r.SEt - reset. On power up the total display will reset to zero.

P.SEt - preset. On power up the total display will revert to the value set at the **P.SEt** function.

5.39 Sign for rate display

Display: rAtE SI gn
Range: on or OFF
Default Value: on

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 sign is only required if an indication of direction is needed.

5.40 Rate display time out

Display: tout SECS
Range: 1 or 9999
Default Value: 1

Only seen if **LoF** is selected under the **FrEqrnGE** 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 holds 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** if displaying rate or **-or-** if displaying period.

5.41 Average display seconds

Display: AUGE SECS
Range: 1 or 9999
Default Value: 1

Only seen if **AUGE** or **r.AUG**is selected under the **FrEqrnGE** 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.

5.42 Average display counts

Display: AUGE cnt
Range: 1 or 30
Default Value: 1

Only seen if **r.AUG** is selected at the **FrEqrnGE** function. Sets the number of time periods counted over which the rolling average display will be calculated. For example if the **AUGE SECS**

is set to **60** and the **AUGEcnt** is set to **10** then the rolling average displayed will be the average of the last ten **60** second averaged periods.

5.43 Remote input function

Display: **r.i nP**
Range: **nONE**, **P.HLd**, **d.HLd**, **Hi** , **Lo**, **Hi Lo**, **2Er0**, **SP.Ac**, **no.Ac**, **P.SEt**, **Hold**, **di SP**, **duLL** or **9.rSt**
Default Value: **nONE**

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. 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:

nONE - no remote function required.

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

Hi - 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 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. **PHi** or **PLo** will flash before each display to give an indication of display type. 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.

2Er0 - zero the display. The total will be reset when the remote input is short circuited. If the **c.rSt** function is set to **2Er0** then the display will zero when reset. If the **c.rSt** function is set to **P.SEt** then the display will go to the preset value when reset. This function is not applicable to rate or period displays.

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 **CAL** mode.

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

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. With the **SEt OPEr** function set to both this function will cause the display to toggle from the default display to the alternate display when the remote input pins are short circuited i.e allows toggling between the rate and total display. When the alternate display is being viewed a message will flash every 8 seconds to indicate that the alternate display is being shown e.g. if rate is the alternate display the message **rAtE** will be seen momentarily once every 8 seconds whilst the display is showing rate.

Hoi d - 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 i nPt** function which can also be set to **Hoi d**.

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. Not applicable to electromagnetic displays.

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.

5.44 P button function

Display: **P.but**
Range: **nonE**, **Hi** , **Lo**, **Hi Lo**, **2Er0**, **P.SEt**, **di SP**, **FUnC** or **9.rSt**
Default Value: **nonE**

The P button may be set to operate one chosen special function. This button is located on the main circuit board. 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 available functions, except for **FUnC**, are as described in the **r.i np** function above. The **FUnC** function is used only in totalising and can be used to adjust the preset value. When set to **FUnC** the message **P.SEt** will appear when the P button is pressed. The operator can then adjust the preset via the ▲ or ▼ button, F is then pressed to accept the change. A message **End** will be seen when the new preset value is accepted. When the total is next reset the display will reset to the new preset value if the **c.rSt** function is set to **P.SEt**.

5.45 Access mode

Display: **ACCS**
Range: **OFF**,**EASY**,**nonE** or **ALL**
Default Value: **OFF**

Access mode - the access mode function **ACCS** has four possible settings namely **OFF**,**EASY**, **nonE** and **ALL**. If set to **OFF** the mode function has no effect on alarm relay operation. If set to **EASY** the "easy alarm access" mode will be activated. Refer to "Easy alarm relay adjustment access facility" section. If set to **nonE** there will be no access to any functions via **FUnC** mode, entry via **CAL** mode must be made to gain access to alarm and calibration functions. If set to **ALL** then access to all functions, including calibration functions, can be gained via **FUnC** mode.

5.46 Setpoint access mode

Display: SPAC
Range: A 1, A 1-2 etc.
Default Value: A 1

Setpoint access - seen only if more than 1 relay fitted. Sets the access via FUNC mode and "easy alarm access" mode to the alarm relay setpoints. The following choices are available:
A 1 - Allows setpoint access to alarm 1 only.
A 1-2 - Allows setpoint access to alarms 1 and 2 only.
A 1-3 - Allows setpoint access to alarms 1, 2 and 3 etc. up to the maximum number of relays fitted.
The remote input function (r.1 nP) must be set to SP.AC for this function to operate. Note: Only the setpoints which have been given a value will be accessible e.g. if A 1H, is set to OFF then there will be no access to the A 1H, function when SPAC is used.

5.47 Display update rate

Display: di SP rAtE
Range: 1, 2, 4, 8, 16 or 32
Default Value: 4

Display update rate - allows selection of 1, 2, 4, 8, 16 or 32 display updates per second.

5.48 Alarm relay operation mode

Display: A*x*.rt, A*x*.tL, A*x*.PS, A*x*.rP, A*x*.rH or A*x*.rL
Range: A*x*.rt, A*x*.tL, A*x*.PS, A*x*.rP, A*x*.rH or A*x*.rL
Default Value: A*x*.rt

This function is used to set the operation mode for alarm relays, the "*x*" indicates relay number e.g. A 1.rt.

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

A*x*.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.

A*x*.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.

A*x*.PS - the relay will operate on a pass value i.e. it will operate on multiples of the A*x*.PS value set. For example if A*x*.PS is set to1000the 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 A*x*Pt function. Note that if A*x*.PS is selected a separate function with almost the same name (A*x*PS) 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**, **120**, **160**, **200** 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** and **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.

5.49 Analog output operation mode

Display: **rEC**
Range: **rAtE** or **totL**
Default Value: **rAtE**

Seen only when the **SEt OPEr** function is set to **both**. Sets the operation mode for the optional analog retransmission. The output can be set to retransmit the total (**totL** or rate (**rAtE**).

5.50 Bargraph display operation mode

Display: **bAr**
Range: **rAtE** or **totL**
Default Value: **rAtE**

Seen only when **SEt OPEr** is set to **both**. Allows the choice of rate or total to be displayed on the bargraph in bargraph model displays.

5.51 Digital output operation mode

Display: **d9OP**
Range: **rAtE** or **totL**
Default Value: **rAtE**

Seen only when **SEt OPEr** is set to **both**. Allows the choice of rate or total to be output on the optional digital output.

5.52 Totaliser counter reset value

Display: c.rSt
Range: ZERO or PSEt
Default Value: ZERO

The reset terminal operation can be programmed to cause the display to reset to either zero or the selected preset value. Choose either ZERO or PSEt to select the required operation. PSEt is most commonly selected when the display is required to count down (S.1 nP set to Lo) from a preset value.

5.53 Totaliser counter reset signal

Display: c.rSt
Range: Lo, LoE, Hi or Hi E
Default Value: Lo

Allows selection of reset level or edge to force a counter reset. If set to Lo a low input level or closed switch on the reset terminal will force a reset, the display will continuously reset whilst the input is low. If set to Hi a high input level or open switch on the reset terminal will force a reset, the display will continuously reset whilst the reset line is high. If set to LoE then a falling edge or switch closure on the reset terminal will force a reset. If set to Hi E then a rising edge or switch opening on the reset terminal will force a reset.

5.54 SET terminal input function

Display: SEt i nPt
Range: P.SEt or Hold d
Default Value: P.SEt

SET terminal operation - applicable only to totL mode. Allows the SET input (terminal 9) to be set for preset (P.SEt) or hold (Hold d) 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 d 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 d.

5.55 SET terminal operation signal

Display: c.SEt
Range: Lo, LoE, Hi or Hi E
Default Value: Lo

SET terminal operation signal 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 i nPt above), the preset is set via the P.SEt function or via the P button when P.but is set to FUNC.

5.56 Default display

Display: dFlt dISP
Range: rAtE or totl
Default Value: rAtE

Seen only in both mode. Sets the display default to either total or rate. The display will always revert to the default display on power up but can be forced to the alternate display via the P button or remote input (see P.but and r.i nP functions). If the alternate display is being viewed an identifier will flash briefly every 8 seconds approx. e.g. if the rate is the default display and the display is now toggled to show total the message totl will flash briefly every 8 seconds.

5.57 Set display operation

Display: SEt OPEr
Range: FrEq, totL or both
Default Value: FrEq

Displays and sets the selected operating mode. Options are:

both - Frequency and total - allows toggling between rate and total display

totL - Total/counter display

FrEq - Frequency/rate display

5.58 Baud rate for optional serial communications

Display: bAUd rAtE
Range: 300. 600. 1200. 2400. 4800. 9600. 19.2 or 38.4
Default Value: 9600

Set baud rate - seen only with serial output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when optional outputs are fitted. Select from 300. 600. 1200. 2400. 4800. 9600. 19.2 or 38.4 baud. The baud rate should be set to match the device being communicated with.

5.59 Parity for optional serial communications

Display: PrtY
Range: nonE. EUEn or odd
Default Value: nonE

Set parity - seen only with serial output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when optional outputs are fitted. Select parity check to either nonE, EUEn or odd. The parity should be set to match the device being communicated with.

5.60 Output mode for optional serial communications

Display:	**O.Put**
Range:	**di SP**, **Cont**, **POLL** or **A.buS**
Default Value:	**Cont**

Set serial interface mode - seen only with serial output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when optional outputs are fitted. . Allows user to select the serial interface operation as follows:

di SP - sends image data from the display without conversion to ASCII.
Cont - sends ASCII form of display data at a rate typically 90% of the sample rate.
POLL - controlled by computer or PLC as host. Host sends command via RS232/485 and instrument responds as requested.
A.buS - is a special communications mode used with Windows compatible optional PC download software. Refer to the user manual supplied with this optional software.

5.61 Instrument address for optional serial communications

Display:	**Addr**
Range:	**0** to **31**
Default Value:	**0**

Set unit address for polled (**POLL**) or **A.buS** mode (**0** to **31**)) - seen only with serial output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when optional outputs are fitted. Allows several units to operate on the same RS485 interface reporting on different areas etc. if RS485 is available. 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) is address 10. Do not use address 0 in **A.buS** mode.

5.62 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 are less likely to be tampered with). To return to normal mode, turn off power to the instrument, wait a few seconds and then restore power.

5.63 Examples

Example - RPM display

A proximity sensor connected to a flywheel produces 20 pulses per revolution. The instrument is required to display in RPM with 1 decimal point place. In this example 20 pulses per second would equal 1 revolution/sec which equals 60 RPM. The **rAtE 1 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 18 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 1 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 of continue pressing and releasing F until the FUNC End message is seen and the unit returns to normal measure mode.

Example - Low frequency input rate display

A transducer is being used to give one pulse out for every bottle passing a point on a track. The display is required to show bottles per hour. The number of bottles passing can be as low as one every five seconds up to two per second. The rAtE 1 nPt value will be 1 and the rAtE SCLE value will be 3600 i.e. 1 bottle per second = 3600 bottles per hour. The procedure is as follows:

1. Follow the procedure shown on page 18 to enter the setup functions via CAL mode.
2. Step through the functions by pressing and releasing F until the FrEq rnGE function is seen.
3. Use the ▲ or ▼ push button to change the setting to LoF.
4. Step through the functions by pressing and releasing F until the t.out SECS function is seen.
5. Use the ▲ or ▼ push button to change the setting to a value greater than 5 seconds e.g. 8.
6. Step through the functions by pressing and releasing F until the rAtE 1 nPt function is seen.
7. Use the ▲ or ▼ push button to change the setting to 1.
8. Press F, the function rAtE SCLE will appear followed by the previous input value.
9. Use the ▲ or ▼ push button to change the setting to 3600.
10. Press F to accept the change then either press P to exit of continue pressing and releasing F until the FUNC End message is seen and the unit returns to normal measure mode.

Example - Flow rate display

See previous examples for detailed steps showing how to alter functions. Flowmeters produce an output frequency proportional to the rate of flow the scaling is calculated using information provided by the manufacturer or from test results. e.g.: A turbine produces 767 pulses per litre

- to display litres/minute set rAtE 1 nPt to 767 and rAtE SCLE to 60.
- to display litres/hour set rAtE 1 nPt to 767 and rAtE SCLE to 3600.
- to display kilolitres/hour set rAtE 1 nPt to 7670 and rAtE SCLE to 36.

Example - Low frequency input averaged rate display

In applications 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. In applications similar to the bottles/minute example above the **FFEQ rnGE** function must be set to **AUGE** and instead of setting a **t.out SECS** time the **AUGE SECS** function would be used to set the required averaging period.

Example - Flowmeter totalising

A flowmeter produces 56 pulses per litre. The display us required to show total litres with 1 decimal point place. The procedure is as follows.

1. Follow the procedure shown on page 18 to enter the setup functions via **CAL** mode.
2. Step through the functions by pressing and releasing **F** until the **toti dCPt** function is seen followed by the previous decimal point setting.
3. Use the ▲ or ▼ push button to change the **toti dCPt** setting to **0. 1**. Press **F** to accept the change.
4. Step through the functions by pressing and releasing **F** until the **toti 1nPt** 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 **toti 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 of continue pressing and releasing **F** until the **FUNC End** message is seen and the display returns to normal measurement mode.

5.64 Error messages

Display shows -or- - this message indicates either that the number is too big to display e.g. above **9999** on a 4 digit display. For a totaliser display this message indicates that the total is too large to display and the total will need to be reset.

Display shows nO ACC - this indicates that the **ACCS** function has been set to **nOnE** or the **r.1 nP** function has been set to **no.Ac** blocking entry to **FUNC** mode. Enter functions via **CAL** mode to gain entry to functions and if required change the **ACCS** or **r.1 nP** function setting.

Display shows nO SPAC - this indicates that the **r.1 nP** function has been set to **SP.Ac** blocking entry to alarm relay functions. Enter functions via **CAL** mode to gain entry to functions and if required change the **r.1 nP** function setting.

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 **FFEQ rnGE** and **t.out SECS** functions which can be adjusted to overcome this problem.

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.

6 Specifications

6.1 Technical specifications

Input:	Quadrature encoder A and B pulse inputs Maximum pulse input voltage is 24VDC with appropriate link settings.
Totaliser functions:	Scaleable up/down counter. Total and grand total memory.
Ratemeter functions:	Scaleable rate or scaleable average rate display
Impedance:	10kΩ
Max. input frequency:	2MHz 500kHz phase input
Memory retention:	Total/grand total memory retained for a minimum of forty days with power removed
Totaliser reset:	Contact closure (or 5V control voltage) across terminals 8 and 10. Grand total reset via contact closure across terminals 7 and 8. Note: **F.1 nP** function must be set to **9.rSt** if grand total reset operation is required.
Microprocessor:	HC68HC11 CMOS
Ambient temperature:	LED -10 to 60^o C, LCD -10 to 50^o 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 LCD Models: 4 digit 12.7mm, 6 digit 12.7mm
Power Supply:	AC 240V, 110V or 24V 50/60Hz or DC isolated wide range 12 to 48V. Note: supply type is factory configured.
Power Consumption:	AC supply 4 VA max, DC supply typically 60mA at 12VDC and 30mA at 24VDC for PM4 with no optional outputs, actual current drawn depends on display type and options fitted
Output (standard):	1 x relay, Form A, rated 5A resistive
Relay Action:	Programmable N.O.

6.2 Optional outputs

Extra Relays:	Same specs. as Relay 1 (up to 6 extra relays). Available as one, three or six extra relays.
Analog Retransmission:	12 bit isolated 4 to 20mA, 0 to 1V or 0 to 10V link selectable (single or dual analog output versions available). (4-20mA will drive into resistive loads of up to 800Ω)
Serial Communications:	Isolated RS232 or RS485
DC Voltage Output:	Isolated ±12V(24V) standard or ±5V(10V), 20mA max. at 24V, 40mA max. at 10 or 12V, 80mA max. at 5V.

6.3 Physical Characteristics

Bezel Size:	DIN 48mm x 96mm x 10mm
Case Size:	44mm x 91mm x 120mm behind face of panel
Panel Cut Out:	45mm x 92mm +1mm/-0mm
Connections:	Plug in screw terminals (max. 2.5mm^2 wire)
Weight:	400 gms basic model, 450 gms with option card

7 Guarantee and service

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

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

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

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

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

This product is designed and manufactured in Australia.