Panel Meter Model PM6-TR
Operation and Instruction Manual

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1 Introduction

1.1 General description

This manual contains installation and operation information for model PM6-TR monitor. Model PM6-TR can be set to display rate/frequency or total from pulse inputs. The displayed output may be scaled to read in engineering units to suit the application. A remote switch can be used to toggle between rate and total display if required. The default display can be set to show rate or total, see **dFlt dISP** function on page 20.

The rate display is scaled using the **rAtE ,nPt** and **rAtE SCLE** functions. The total is scaled using the **totl ,nPt** and **totl SCLE** functions. Refer to these functions for further details and to the "Examples" section 5.27.

Unless otherwise specified at the time of order your PM6-TR has been factory set to a standard configuration. This configuration can be easily changed by the user. All changes to configuration and scaling are made via three push buttons located at the rear of the unit, see chapter 5, page 15. Chapter 5 details all of the setup functions, read this chapter and record your settings for each function in the space provided in the function tables, chapter 4 starting on page 13.

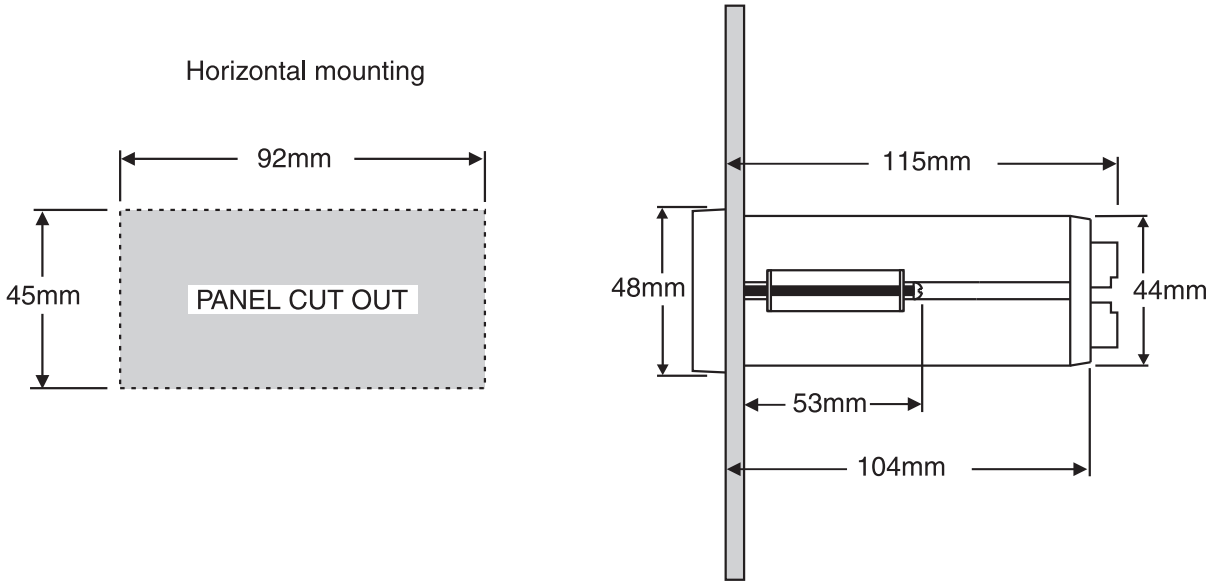
Functions **Lo FrEq** and **HI SH FrEq** and **Lo totl** and **HI SH totl** allow visual warnings of under or over rate/frequency or total by either flashing the display value on or off or showing the error message **-or-**.

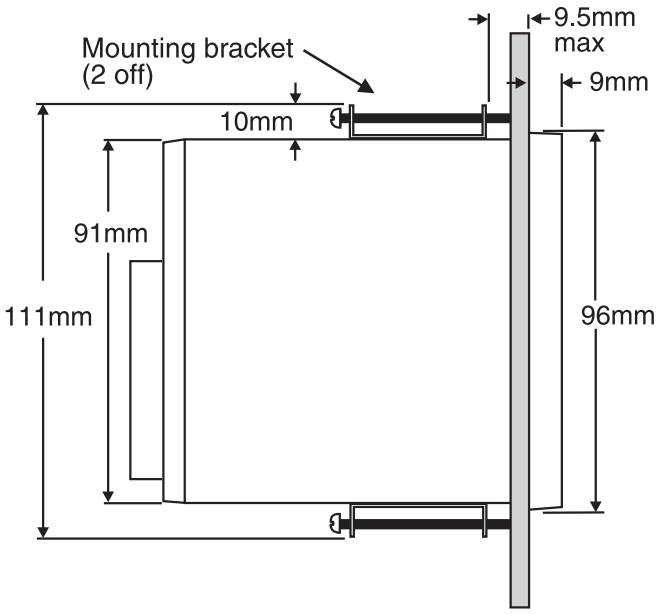
The PM6 series instruments are designed for high reliability in industrial applications. The display can be set to switch brightness between two levels via an external switch for day/night level switching etc. The PM6 range of instruments are monitor only devices and contain no outputs. Other ranges of instruments are available to suit a wide range of instrumentation needs.

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 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.





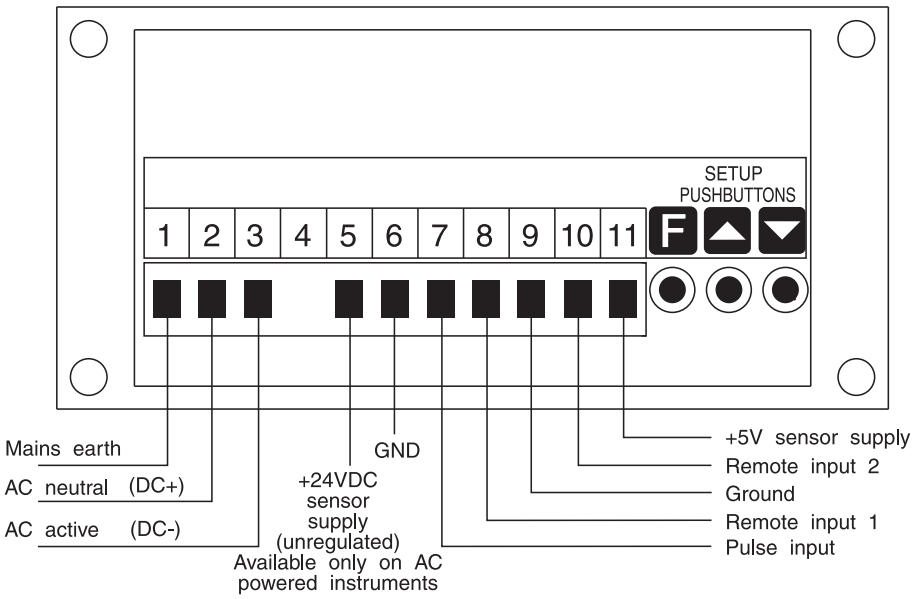
3 Electrical installation

3.1 Electrical installation

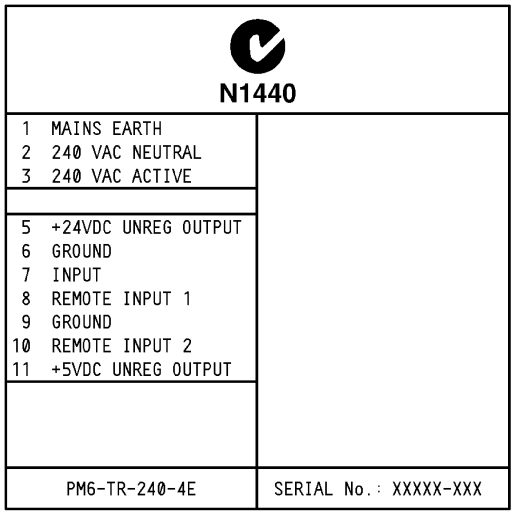
The PM6 Panel Meter is designed for continuous operation and no power switch is fitted to the unit. It is recommended that an external switch and fuse be provided to allow the unit to be removed for servicing.

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.

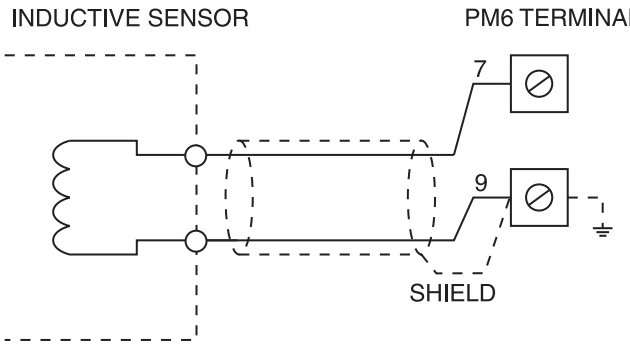
When power is applied the instrument will cycle through a display sequence indicating the software version and other status information, this indicates that the instrument is functioning. Acknowledgement of correct operation may be obtained by applying an appropriate input to the instrument and observing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



Instrument label (example)



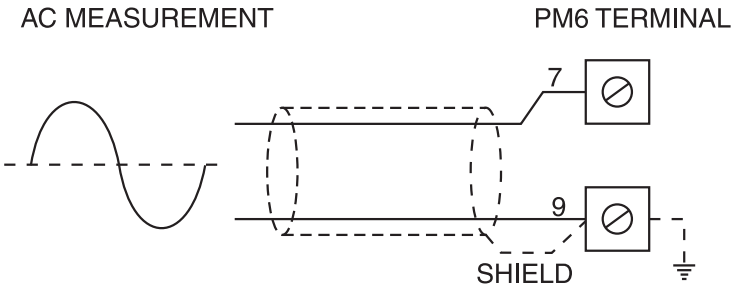
3.2 Input connection and internal link settings



Inductive sensor AC output (48V RMS max)
Typical internal link settings

LK1	BIAS	Out
LK2	HYS1	See notes
LK3	HYS2	See notes
LK4	LFRE	Out
LK5	DC	In
LK6	SL-	See notes
LK7	SL+	Out

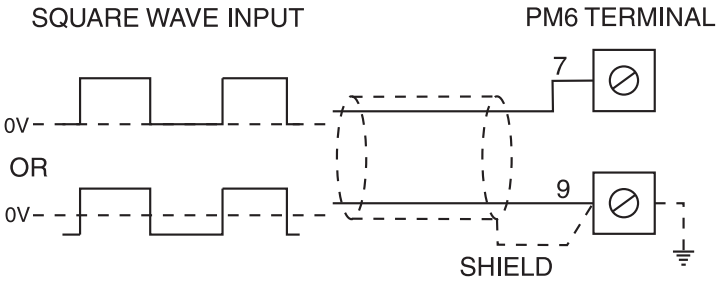
Notes: Inputs 100mV to 2.5V HYS2 (LK3) is **In**, HYS1 (LK2) is **Out**. Inputs above 2.5V HYS2 is **Out**, HYS1 is **In**. For inputs above 24V RMS SL- (LK6) is **Out**. The LFRE link (LK4) when **In** can be used to help filter out high frequency noise and contact bounce provided that the maximum input frequency of the pulse signal is less than 80Hz.



AC Input (48V RMS max)
Typical internal link settings

LK1	BIAS	Out
LK2	HYS1	See notes
LK3	HYS2	See notes
LK4	LFRE	Out
LK5	DC	See notes
LK6	SL-	See notes
LK7	SL+	Out

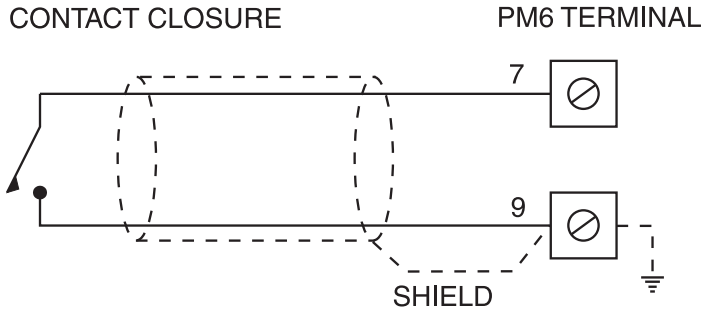
Notes: Inputs 100mV to 2.5V HYS2 is **In**, HYS1 is **Out**. Inputs above 2.5V HYS2 is **Out**, HYS1 is **In**. For inputs above 24V RMS SL- is **Out**. DC link LK5 should be **In** if the frequency will not be greater than 10Hz. The LFRE link (LK4) when **In** can be used to help filter out high frequency noise and contact bounce provided that the maximum input frequency of the pulse signal is less than 80Hz.



Square Wave Input (48V max)
Typical internal link settings

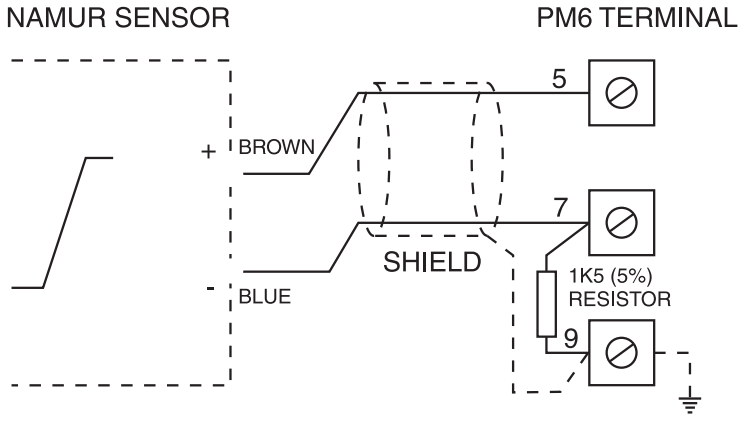
LK1	BIAS	See notes
LK2	HYS1	See notes
LK3	HYS2	See notes
LK4	LFRE	Out
LK5	DC	In
LK6	SL-	See notes
LK7	SL+	Out

Notes: Inputs 100mV to 2.5V HYS2 (LK3) is **In**, HYS1 (LK2) is **Out**. Inputs above 2.5V HYS2 is **Out**, HYS1 is **In**. For inputs above 24V SL- (LK6) is **Out**. BIAS link (LK1) should be **In** if the signal does not go below 0V. The LFRE link (LK4) when **In** can be used to help filter out high frequency noise and contact bounce provided that the maximum input frequency of the pulse signal is less than 80Hz.



Contact Closure Input
Typical internal link settings

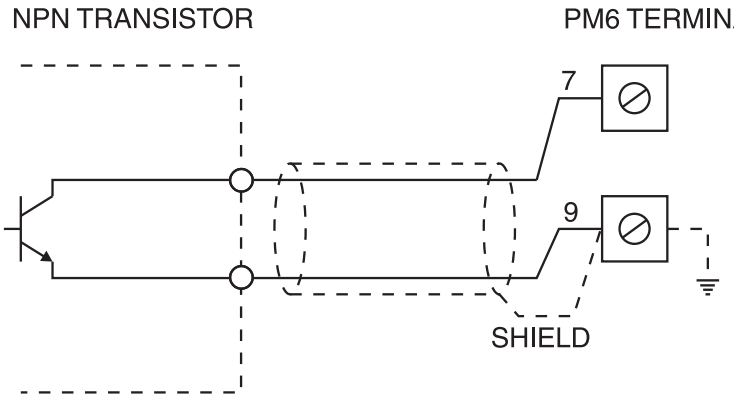
LK1	BIAS	In
LK2	HYS1	In
LK3	HYS2	Out
LK4	LFRE	In
LK5	DC	In
LK6	SL-	Out
LK7	SL+	In



Namur Sensor Input
External resistor required for this type of sensor as shown.
Typical internal link settings

LK1	BIAS	In
LK2	HYS1	In
LK3	HYS2	Out
LK4	LFRE	Out
LK5	DC	In
LK6	SL-	In
LK7	SL+	Out

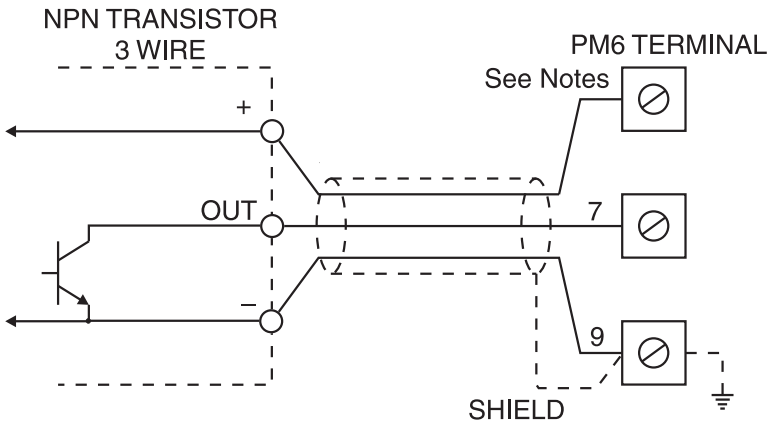
Notes: The LFRE link (LK4) when **In** can be used to help filter out high frequency noise and contact bounce provided that the maximum input frequency of the pulse signal is less than 80Hz.



2 Wire NPN Input
Typical internal link settings

LK1	BIAS	In
LK2	HYS1	In
LK3	HYS2	Out
LK4	LFRE	Out
LK5	DC	In
LK6	SL-	Out
LK7	SL+	In

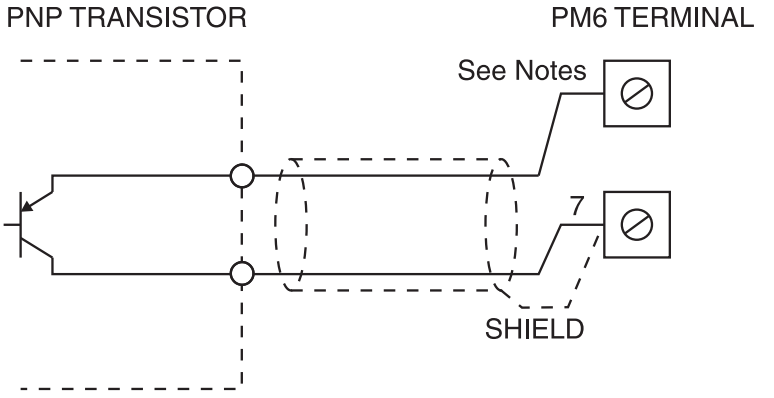
Notes: The LFRE link (LK4) when **In** can be used to help filter out high frequency noise and contact bounce provided that the maximum input frequency of the pulse signal is less than 80Hz.



3 Wire NPN Input
Typical internal link settings

LK1	BIAS	In
LK2	HYS1	In
LK3	HYS2	Out
LK4	LFRE	Out
LK5	DC	In
LK6	SL-	Out
LK7	SL+	In

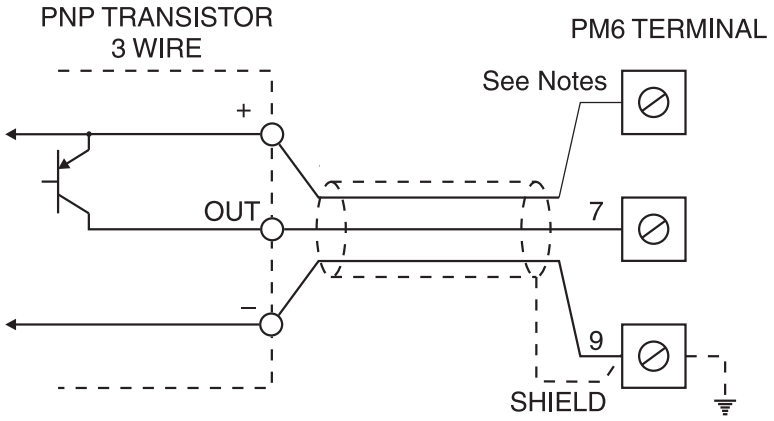
Notes: Use terminal 5 for 24V (20mA max) or terminal 11 for 5V (20mA max) or use external excitation. The LFRE link (LK4) when **In** can be used to help filter out high frequency noise and contact bounce provided that the maximum input frequency of the pulse signal is less than 80Hz.



2 Wire PNP Input
Typical internal link settings

LK1	BIAS	In
LK2	HYS1	In
LK3	HYS2	Out
LK4	LFRE	Out
LK5	DC	In
LK6	SL-	In
LK7	SL+	Out

Notes: Use terminal 5 for 24V (20mA max) or terminal 11 for 5V (20mA max) or use external excitation. The LFRE link (LK4) when **In** can be used to help filter out high frequency noise and contact bounce provided that the maximum input frequency of the pulse signal is less than 80Hz.



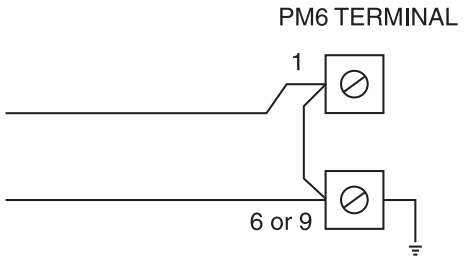
3 Wire PNP Input
Typical internal link settings

LK1	BIAS	In
LK2	HYS1	In
LK3	HYS2	Out
LK4	LFRE	Out
LK5	DC	In
LK6	SL-	In
LK7	SL+	Out

Notes: Use terminal 5 for 24V (20mA max) or terminal 11 for 5V (20mA max) or use external excitation. The LFRE link (LK4) when **In** can be used to help filter out high frequency noise and contact bounce provided that the maximum input frequency of the pulse signal is less than 80Hz.

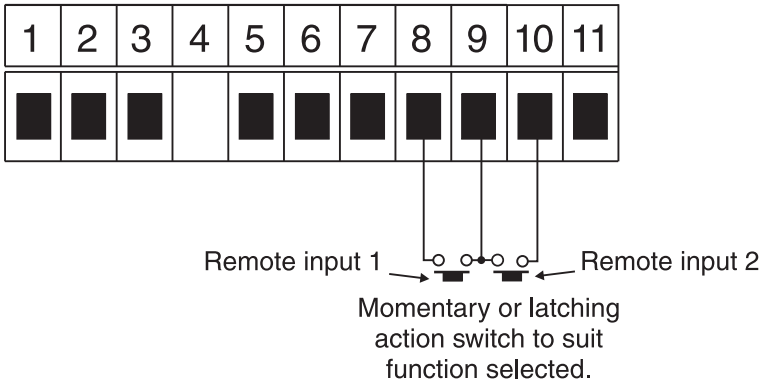
Wiring in cases of high interference

For environments with high electrical noise where interference with the signal input is occurring terminal 1 (mains earth or case earth) can be connected to GND terminals 6 or 9. In many cases this will reduce the interference. Note that this should only be done where the shield is not externally connected.



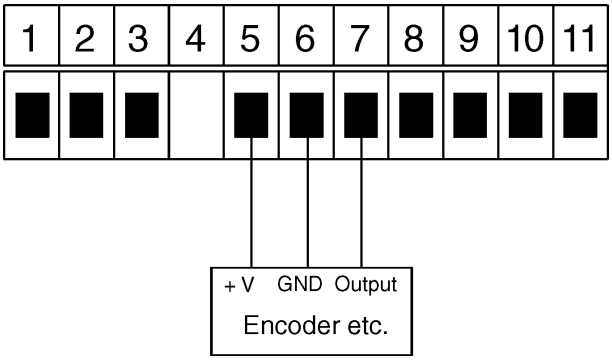
Remote inputs for totaliser reset etc.

Two remote inputs are provided as shown below. One or both of these can be used and the required operation selected at the **F.I nP** and **F.I n2** functions. One of these remote inputs can be used to reset the totaliser. Alternatively the **CLr totI** function can be used to clear the total. See functions 5.18 and 5.19 for description of remote input functions available. Note that if both remote inputs are used they should be set to different functions e.g. do not set both remote inputs to peak memory operation.



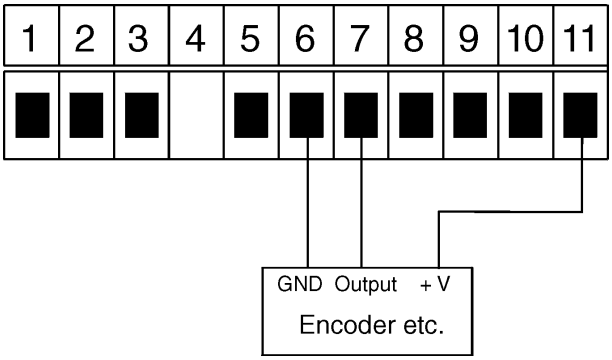
24VDC unregulated DC sensor supply

Connections for the unregulated 24VDC sensor supply are shown below. Note that this supply is only available in AC powered models. If a DC supply is used the output form these terminals will be approximately 12VDC. Maximum current 50mA.



5VDC unregulated DC sensor supply

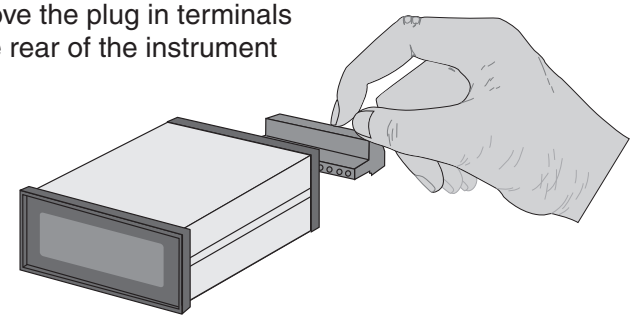
Connections for the 5VDC unregulated sensor supply are shown below. Maximum current 20mA.



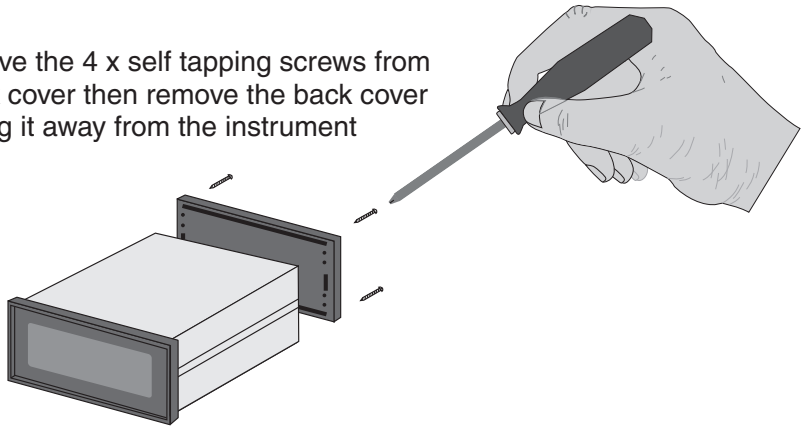
3.3 Input Output Configuration

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

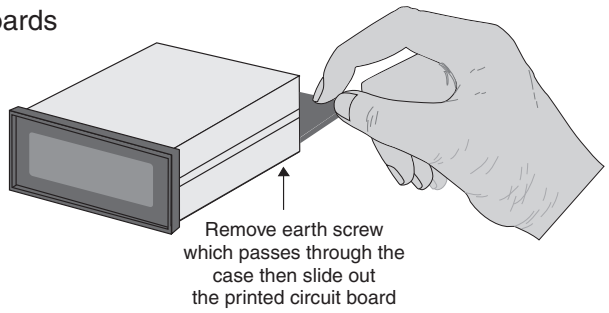
1. Remove the plug in terminals from the rear of the instrument



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

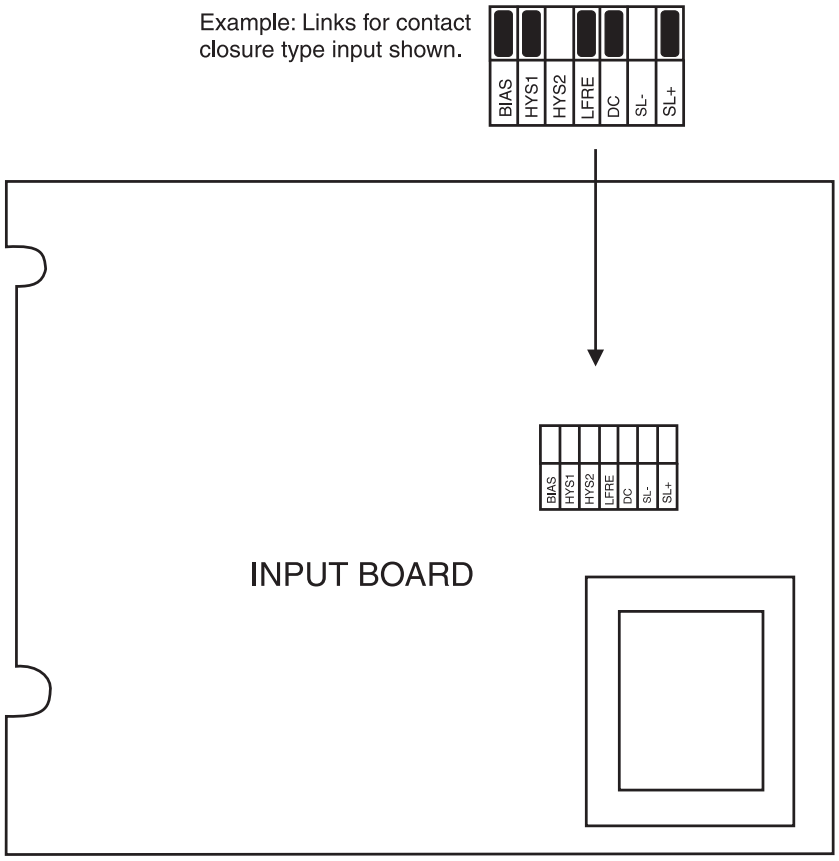
6. Replace the earth screw which passes through the case

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

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

3.4 Input range link selection

Dismantle the instrument as described in section Insert the links into the appropriate location on the pin header to suit the range required.



4 Function tables - summary of setup functions

Functions in this first table are available in FUNC or CAL mode

Display	Function	Range	Default	Your record	Ref/Page
brgt	Display brightness level	1 to 15	15		5.1 / 16
dull	Display remote brightness switching	0 to 15	1		5.3 / 17
drnd	Display rounding	1 to 5000	1		5.2 / 16
FLtr	Digital filter	0 to 8	2		5.4 / 17

Functions in this second table are available in CAL mode only

Display	Function	Range	Default	Your record	Ref/Page
tout	Frequency display timeout seconds	1 to 255	1		5.5 / 17
FrEq rnge	Frequency range	none, 10, 100 or 5000	none		5.6 / 18
inPt Edge	Input edge	rise or FALL	rise		5.7 / 18
rAtE dCPt	Frequency/rate display decimal point	0 to 0.003	0		5.8 / 18
rAtE inPt	Frequency input	1 to 9999	1		5.9 / 18
rAtE SCLE	Frequency scale	1 to 9999	1		5.10 / 19
totl dCPt	Total decimal	0 to 0.003	0		5.11 / 19
totl inPt	Total input	1 to 9999	1		5.12 / 19
totl SCLE	Total scale	1 to 9999	1		5.13 / 19
totl rAP.F	Total wrap around operation	StOP or 2Ero	StOP		5.14 / 20
CLr totl	Clear total	n/a	n/a		5.15 / 20
dFlt dISP	Default display	rAtE or totl	rAtE		5.16 / 20
c.rSt	Total reset input	Lo, Hi , LoE or HiE	Lo		5.17 / 20

r.1 nP	Remote input 1 function	nonE, P.HLd, d.HLd, Hi , Lo, duLL, di SP or 2Er0	nonE		5.18 / 21
r.1 n2	Remote input two (external input) function	nonE, P.HLd, d.HLd, Hi , Lo, duLL, di SP or 2Er0	nonE		5.19 / 22
Lo FrEq	Low rate visual warning limit value	Any display value or OFF	OFF		5.20 / 22
Hi 9H FrEq	High frequency/rate visual warning limit value	Any display value or OFF	OFF		5.21 / 22
rAtE di SP	Rate display visual warning flashing mode	FLSH or -or-	FLSH		5.22 / 23
Lo totl	Low total visual warning limit value	Any display value or OFF	OFF		5.23 / 23
Hi 9H totl	High total visual warning limit value	Any display value or OFF	OFF		5.24 / 23
totl di SP	Total display visual warning flashing mode	FLSH or -or-	FLSH		5.25 / 23
ACCS	Access mode	OFF ,nonE or ALL	OFF		5.26 / 24

5 Explanation of functions

The PM6 setup and calibration/scaling functions are configured through a push button sequence. The three push buttons located at the rear of the instrument are used to alter settings. Two basic access modes are available:

FUNC mode (simple push button sequence) allows access to common set up functions such as display brightness.

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

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.

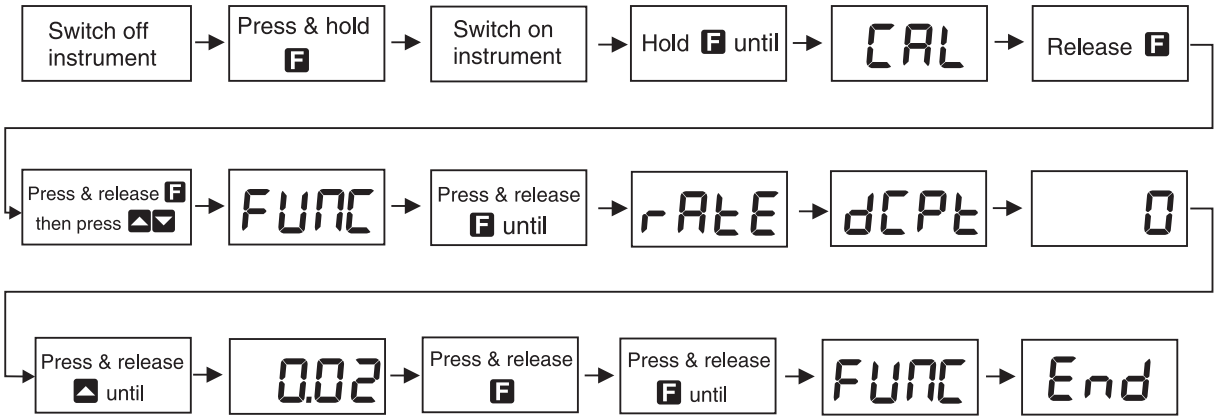
1. When the "wake up" messages have finished and the display has settled down to its normal reading press, then release the F button.

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.

Once CAL or FUNC mode has been entered and the first function is displayed step through the functions by pressing and releasing the F push button until the required function is reached. For most setup functions the function name is displayed followed by the function setting and the function name will then flash briefly once every 8 seconds as a reminder of the function being viewed. Changes to functions are made by pressing the ▲ or ▼ push button (in some cases both simultaneously) when the required function is reached. When the required function has been changed continue pressing and releasing the F button until the FUNC End message is seen and the

display returns to normal measurement display. Changes to function settings will not be saved into memory unless either the **FUNC End** message is reached or if the panel meter has automatically reverted back to normal measurement display. The display will automatically revert back to normal display approximately 5 minutes after **CAL** or **FUNC** mode entry. See the flow chart example of changing a function below.

Example: Entering **CAL** mode to change rate decimal point function **rAtE dCPt** from **0** to **0.02**



5.1 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.

5.2 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.

5.3 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 5.18 and r.1 n2 function 5.19. 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 5.1 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.

5.4 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. 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.

5.5 Frequency display timeout seconds

Display: tout
Range: 1 to 255
Default Value: 1

Displays and sets the timeout for the frequency display. If the input period is less than the tout setting the display will flash between the rate and zero or be stuck on zero. To avoid this select a value at this function which is higher than the period of the lowest expected frequency input. For example if the tout setting is set to 10 seconds then the previous rate display will be held for at least 10 seconds and will only revert to a zero display if no new input is seen during this 10 seconds.

5.6 Frequency range

Display: FrEQ rnGE
Range: nONE, 10, 100 or 5000
Default Value: nONE

Displays and sets maximum input frequency range. This function allows a maximum frequency range to be selected and frequencies higher than this will be rejected i.e. this function can be used to help eliminate false readings due to high frequency noise, contact bounce etc. Note: Internal link LK5 may also be used to help filter out contact bounce and high frequency noise if the signal input frequency is always below 80Hz, see section 3.2. Selections available for the FrEQ rnGE function are:

nONE - no filtering, accepts inputs up to 10kHz
10 - maximum input frequency of 10Hz
100 - maximum input frequency of 100Hz
5000 - maximum input frequency of 5kHz

5.7 Input edge

Display: InPt EdGE
Range: rISE or FALL
Default Value: rISE

Displays and sets the pulse input edge on which triggering will occur. If set to rISE then the rising edge of the input pulse will trigger the input. If set to FALL then the falling edge of the input pulse will trigger the input. This function can be useful if one of the edges provides a better switching input than the other e.g. if there is a long rise time in the pulse input but a sharp fall time then select FALL as this will give a more definite pulse transition.

5.8 Frequency/rate display decimal point

Display: rAtE dCPt
Range: 0 to 0.003
Default Value: 0

Displays and sets the decimal point position for the frequency/rate display. Note if this is altered it may be necessary to alter the rAtE SCLE function also.

5.9 Frequency input scaling factor

Display: rAtE, nPt
Range: 1 to 9999
Default Value: 1

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

5.10 Frequency scaling factor

Display: rAtE SCLE
Range: 1 to 9999
Default Value: 1

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

$$\text{Rate display} = \frac{\text{Input frequency (Hz)} \times \texttt{rAtE SCLE}}{\texttt{rAtE inPt}}$$

Example: To scale the display to read in RPM to one decimal place from an input which gives 10 pulses per revolution set rAtE dCPt to 0.1, set rAtE inPt to 10 and set the rAtE SCLE to 60.0 (since the input is measured in pulses per second (Hz) the rAtE SCLE is set to 60.0 i.e. 60 seconds in one minute).

5.11 Total display decimal point

Display: totl dCPt
Range: 0 to 0.003
Default Value: 0

Displays and sets the decimal point position for the total display. Note if this is altered it may be necessary to alter the totl SCLE function also.

5.12 Total input scaling factor

Display: totl inPt
Range: 1 to 9999
Default Value: 1

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

5.13 Total scaling factor

Display: totl SCLE
Range: 1 to 9999
Default Value: 1

Displays and sets the scaling factor to be used with the totl inPt 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 totl dCPt function. The display value is calculated in the following manner:

$$\text{Total display} = \frac{\text{Input pulses counted} \times \texttt{totl SCLE}}{\texttt{totl inPt}}$$

Example: To scale the display to count total kilolitres with 2 decimal place from an input which gives 1 pulse per litre (i.e. 1,000 pulses per kilolitre) set **totl dCPt** to **0.02**, set **totl 1nPt** to **1000** and set the **totl SCLE** to **1.00** (i.e. display will increment by 0.01 kilolitres for every 10 input pulses and by 1.00 kilolitres for every 1000 input pulses).

5.14 Total wrap around operation

Display: **totl rAP.F**
Range: **StOP** or **2Er0**
Default Value: **StOP**

Displays and sets the totaliser wrap around operation for displays at full scale. If **StOP** is selected the display will halt at **9999** or **999.9** etc. If **2Er0** is selected then the display will wrap around to zero i.e. will reset itself and start again at zero.

5.15 Clear total

Display: **CLr totl**
Range: n/a
Default Value: n/a

Allows the totaliser value to be cleared via the setup pushbuttons located at the rear of the instrument. To clear the totaliser press ⏶ and ⏷ simultaneously at this function. The message **CLrd** will be seen to indicate that the total memory has been cleared resetting the total to zero. See also the remote input functions **r.1 nP** and **r.1 n2** which can also be used, together with a remote voltage free contact closure, to clear the total.

5.16 Default display

Display: **dFlt dl SP**
Range: **rAtE** or **totl**
Default Value: **rAtE**

Displays and sets the default display. The default display selected is the one which will always appear on the display after power is applied. Select **rAtE** to have the rate display as the default display. Select **totl** to have the total display set as the default display. The display can also be set to change from the default display via the one of the remote inputs **r.1 nP** function 5.18 or **r.1 n2** funciton 5.19 or can be toggled between displays via the ⏶ or ⏷ pushbuttons. When the display is changed to the non default display a message will flash every 8 seconds e.g. **rAtE** to indicate that the alternate display is being viewed.

5.17 Total reset input

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

Displays and sets the reset input for the total display. Remote input 1 or 2 can be programmed to act as the reset input by setting the **r.1 nP** or **r.1 n2** function to **2Er0**. The reset input is held high by an internal 5VDC, this can be pulled to ground via a voltage free contact. The reset input can be set to operate from an input level or and input edge. Settings available are as follows:

- **Lo** - a low level (short circuit to GND) will reset the display (if the level is held low the display will not totalise)
- **Hi** - a high level (open circuit) will reset the display (if the level is held high the display will not totalise)
- **LoE** - the total will reset on a low going edge transition only
- **Hi E** - the total will reset on a high going edge transition only

5.18 Remote input 1 function

Display: **r.1 nP**
Range: **nonE**, **P.HLd**, **d.HLd**, **Hi** , **Lo**, **duLL**, **di SP** or **2Er0**
Default Value: **nonE**

Remote input function - terminals 8 and 9 at the rear of the instrument are the remote input 1 terminals. When these terminals are short circuited via a switch, relay, keyswitch etc. the instrument will perform the selected remote input function. For settings other than **nonE**, **duLL** and **2Er0** 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 i.e. activating the remote input has no effect.
- **P.HLd** - frequency/rate peak hold. The display will show the peak rate value (highest positive value) only whilst the remote input terminals are short circuited i.e. the display value can rise but not fall whilst the input terminals are short circuited. The message **P.HLd** will appear briefly every 8 seconds whilst the input terminals are short circuited to indicate that the peak hold function is active. Note: the peak hold operates on the rate display only, if total is being viewed the display will change to the peak held rate value whilst the remote input is activated.
- **d.HLd** - frequency/rate display hold. The rate display value will be held whilst the remote input terminals are short circuited. The message **d.HLd** will appear briefly every 8 seconds whilst the input terminals are short circuited to indicate that the display hold function is active. Note: the display hold operates on the rate display only, if the total is being viewed the display will change to the held value whilst the remote input is activated. Whilst the rate display is held the totaliser will still be active and operating from the live input, not the held value.
- **Hi** - frequency/rate peak memory. The peak rate 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 indicate the peak memory value then return to normal measurement after 30 seconds. To reset the memory hold the remote input closed for 2 to 3 seconds or remove power from the instrument. The message **P Hi** will appear briefly every 8 seconds whilst the input terminals are short circuited to indicate that the peak memory function is active. Note: the peak memory operates on the rate display only, if the total is being viewed the display will change to the peak rate memory for 30 seconds after the remote input is activated.
- **Lo** - frequency/rate valley memory. The minimum rate value stored in memory will be displayed. The message **P Lo** will appear briefly every 8 seconds whilst the input terminals are short circuited to indicate that the peak memory function is active. Otherwise operates in the same manner as the **Hi** function described above. Note: the valley memory operates on the rate display only, if the total is being viewed the display will change to the valley rate memory for 30 seconds after the remote input is activated.

- **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 terminals, between the brightness level set at the **brGt** function and the brightness level set at the **dULL** function.
- **dI SP** - change display. The remote input can be used to toggle between the default display (set at the **dFlt dI SP** function) and the second display. e.g. if the default display is set to show rate then the remote input will toggle from the rate to the total display when activated.
- **2ERO** - zero the total. The remote input can be used to reset the total to zero. The **c.rSt** function sets the level required for reset.

5.19 Remote input 2 function

Display: **r.I n2**
Range: **nONE**, **P.HLd**, **d.HLd**, **Hi** , **Lo**, **dULL**, **dI SP** or **2ERO**
Default Value: **nONE**

Remote input two functions, operates in the same manner as the first remote input but uses terminals 9 and 10. Refer to **r.I nP** function 5.18 for description. Note: unless set to **nONE** it is essential that **r.I nP** and **r.I n2** are not set for the same function. If both remote inputs are activated at the same time remote input 1 will take priority.

5.20 Low frequency/rate visual warning limit value

Display: **Lo FrEq**
Range: Any display value or **OFF**
Default Value: **OFF**

Low frequency/rate limit value - the display can be set to show a visual warning if the frequency/rate display value falls below the **Lo FrEq** setting. For example if **Lo FrEq** is set to **50** then once the display reading falls below **50** the message **-or-** will flash on and off or the display value will flash on and off instead of the normal display units (see **rAtE dI SP** function 5.22). This message can be used to alert operators to the presence of an input which is below the low limit. If this function is not required it should be set to **OFF** by pressing the ▲ and ▼ buttons simultaneously at this function.

5.21 High rate visual warning limit value

Display: **HI 9H FrEq**
Range: Any display value or **OFF**
Default Value: **OFF**

High frequency/rate limit value - the display can be set to show a visual warning if the rate display value rises above the **HI 9H FrEq** setting. For example if **HI 9H FrEq** is set to **1000** then once the display reading rises above **1000** the message **-or-** will flash on and off or the display value will flash on and off instead of the normal display units (see **rAtE dI SP** function 5.22). This message can be used to alert operators to the presence of an input which is above the high limit. If this function is not required it should be set to **OFF** by pressing the ▲ and ▼ buttons simultaneously at this function.

5.22 Rate display visual warning flashing mode

Display: rAtE di SP
Range: FLSH or -or-
Default Value: FLSH

Rate display overrange warning flashing mode - this function is used in conjunction with the Lo rAtE and Hi 9H rAtE functions. The rAtE di SP function can be set to FLSH or -or-. If the value set at the Lo rAtE or Hi 9H rAtE function is exceeded and the rAtE di SP function is set to FLSH then the display value will continually flash on and off every second as a visual warning. If the value set at the Lo rAtE or Hi 9H rAtE function is exceeded and the rAtE di SP function is set to -or- then the -or- message will continuously flash on and off once a second as a visual warning. The warning flashes will cease and the normal display value will be seen when the value displayed is higher than the low limit and lower than the high limit.

5.23 Low total visual warning limit value

Display: Lo totl
Range: Any display value or OFF
Default Value: OFF

Low total limit value - the display can be set to show a visual warning if the total display value falls below the Lo totl setting. For example if Lo totl is set to 50 then once the display reading falls below 50 the message -or- will flash on and off or the display value will flash on and off instead of the normal display units (see totl di SP function 5.25). This message can be used to alert operators to the presence of an input which is below the low limit. If this function is not required it should be set to OFF by pressing the ▲ and ▼ buttons simultaneously at this function.

5.24 High total visual warning limit value

Display: Hi 9H totl
Range: Any display value or OFF
Default Value: OFF

High total limit value - the display can be set to show a visual warning if the total display value rises above the Hi 9H totl setting. For example if Hi 9H totl is set to 1000 then once the display reading rises above 1000 the message -or- will flash on and off or the display value will flash on and off instead of the normal display units (see totl di SP function 5.25). This message can be used to alert operators to the presence of an input which is above the high limit. If this function is not required it should be set to OFF by pressing the ▲ and ▼ buttons simultaneously at this function.

5.25 Total display visual warning flashing mode

Display: totl di SP
Range: FLSH or -or-
Default Value: FLSH

Total display overrange warning flashing mode - this function is used in conjunction with the Lo totl and Hi 9H totl functions. The totl di SP function can be set to FLSH or -or-.

If the value set at the LO rATE or HI GH rATE function is exceeded and the totl dISP function is set to FLSH then the display value will continually flash on and off every second as a visual warning. If the value set at the LO totl or HI GH totl function is exceeded and the totl dISP function is set to -or- then the -or- message will continuously flash on and off once a second as a visual warning. The warning flashes will cease and the normal display value will be seen when the value displayed is higher than the low limit and lower than the high limit.

5.26 Access mode

Display: ACCS
Range: OFF ,NONE or ALL
Default Value: OFF

Access mode - the access mode function ACCS has three possible settings namely OFF ,NONE and ALL. If set to OFF the function has no effect. 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 functions. If set to ALL then access to all functions, including calibration functions, can be gained via FUNC mode i.e. when set to ALL there is no need to power down to gain access to all functions.

5.27 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 InPt 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 15 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 InPt 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 InPt 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 15 to enter the setup functions via CAL mode.
2. Step through the functions by pressing and releasing F until the t.out function is seen.
3. Use the ▲ or ▼ push button to change the setting to a value greater than 5 seconds e.g. 8.
4. Step through the functions by pressing and releasing F until the rAtE InPt function is seen.
5. Use the ▲ or ▼ push button to change the setting to 1.
6. Press F, the function rAtE SCLE will appear followed by the previous input value.
7. Use the ▲ or ▼ push button to change the setting to 3600.
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 - 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 InPt to 767 and rAtE SCLE to 60.
- to display litres/hour set rAtE InPt to 767 and rAtE SCLE to 3600.
- to display kilolitres/hour set rAtE InPt to 7670 and rAtE SCLE to 36.

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 15 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 InPt 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 of continue pressing and releasing F until the FUNC End message is seen and the display returns to normal measurement mode.

Example - Rotapulse flow sensor scaling

The "Rota pulse" paddle wheel flow meter (this sensor model is commonly used as an input rate/total displays) outputs approx. 36.5 pulses per linear metre flow of liquid in a pipe. In this example we will assume that the pipe internal diameter is 50mm (25mm or 0.025m radius).

The steps to calculate the scaling of the meter for this example are as follows:

1. Calculate the area of the pipe in square metres:

$$\text{Area} = \pi \times r^2 = \pi \times 0.025^2 = 0.00196\text{m}^2$$

2. Calculate the volume of a 1m length of pipe:

$$\text{Volume} = \text{Area} \times \text{Length} = 0.00196 \times 1 = 0.00196\text{m}^3$$

3. For every 36.5 pulses we therefore have 0.00196 cubic metres of liquid or 1.96 litres of liquid (there are 1000 litres in one cubic metre). For a litres/sec display we could therefore have scaling factors of **rAtE1 nPt = 3650** and **rAtE SCLE = 196**.

The table below shows typical rate scaling factors for this flowmeter. Note that the examples in the table can be reduced to smaller numbers as long as the ratio between the two numbers are the same. The scaling factors above are approximate and will vary depending on pipe size and installation conditions. A calibration should be carried out to determine the correct scaling for any installation where accuracy is required

Rate table for Rota Pulse flow meter with 36.5 pulses per metre flow				
Pipe dia.	Litres/sec	Litres/min	Litres/hour	m^3/hr
25mm	rAtE1 nPt=3650 rAtE SCLE=49	rAtE1 nPt=365 rAtE SCLE=295	rAtE1 nPt=365 rAtE SCLE=17640	rAtE1 nPt=36500 rAtE SCLE=1764
40mm	rAtE1 nPt=3650 rAtE SCLE=126	rAtE1 nPt=365 rAtE SCLE=756	rAtE1 nPt=365 rAtE SCLE=45360	rAtE1 nPt=365 rAtE SCLE=45
50mm	rAtE1 nPt=3650 rAtE SCLE=196	rAtE1 nPt=365 rAtE SCLE=1176	rAtE1 nPt=365 rAtE SCLE=70560	rAtE1 nPt=365 rAtE SCLE=71
80mm	rAtE1 nPt=3650 rAtE SCLE=503	rAtE1 nPt=365 rAtE SCLE=3018	rAtE1 nPt=365 rAtE SCLE=181080	rAtE1 nPt=365 rAtE SCLE=181
100mm	rAtE1 nPt=3650 rAtE SCLE=785	rAtE1 nPt=365 rAtE SCLE=4710	rAtE1 nPt=365 rAtE SCLE=282600	rAtE1 nPt=365 rAtE SCLE=281
150mm	rAtE1 nPt=365 rAtE SCLE=177	rAtE1 nPt=365 rAtE SCLE=10620	rAtE1 nPt=365 rAtE SCLE=637200	rAtE1 nPt=365 rAtE SCLE=637

The table below shows typical total scaling factors for this flowmeter. Note that the examples in the table can be reduced to smaller numbers as long as the ratio between the two numbers are the same. The scaling factors above are approximate and will vary depending on pipe size and installation conditions. A calibration should be carried out to determine the correct scaling for any installation where accuracy is required

Total table for Rota Pulse flow meter with 36.5 pulses per metre flow		
Pipe dia.	Litres	Kilolitres or m^3
25mm	tot1 1 MPt = 74316 tot1 SCLE = 1000	tot1 1 MPt = 74316 tot1 SCLE = 1
40mm	tot1 1 MPt = 29029 tot1 SCLE = 1000	tot1 1 MPt = 29029 tot1 SCLE = 1
50mm	tot1 1 MPt = 18579 tot1 SCLE = 1000	tot1 1 MPt = 18579 tot1 SCLE = 1
80mm	tot1 1 MPt = 7257 tot1 SCLE = 1000	tot1 1 MPt = 7257 tot1 SCLE = 1
100mm	tot1 1 MPt = 4645 tot1 SCLE = 1000	tot1 1 MPt = 4645 tot1 SCLE = 1
150mm	tot1 1 MPt = 2064 tot1 SCLE = 1000	tot1 1 MPt = 2064 tot1 SCLE = 1

5.28 Fault finding

- Total stuck on 9999 or 999.9 etc. - total needs to be reset, see r.1 nP, r.1 n2, totl rAP.F and CLr totl functions for the various methods of resetting the total.
- Display value flashing or showing -or- - check the Lo FrEq, Hi FrEq, Lo totl and Hi totl function settings. If -or- message is seen on the rate display it means that the rate value is beyond the 4 digit display range i.e. less than -1999 or greater than 9999. Check the rate scaling and adjust to suit the 4 digit display range if possible.
- Display will show rate but total stuck on 0 - check the c.rSt function setting to see if the total is being constantly reset e.g. if c.rSt is set to Hi the totaliser will be constantly reset unless there is a short circuit across the remote input selected for zeroing the display.
- Display not responding to input pulses for rate or total - check that the input link settings and wiring match the sensor type starting at page 6.
- Display shows no ACCS message when trying to access functions - enter setup functions via CAL mode (see page 15) and check the ACCS function setting.
- Display flashes between the rate value and zero - see t.out function.

6 Specifications

6.1 Technical specifications

Total/Rate input:	Link selectable for various sensor types, see section 3.2. Maximum input voltage is 48VDC or RMS with appropriate link settings.
Totaliser functions:	Scaleable up count totaliser.
Ratemeter functions:	Scaleable rate display.
Accuracy:	0.01% for rate indication
Impedance:	Approx. 10kΩ (depends on internal link settings)
Max. count rate:	10kHz
Memory retention:	Battery backed totaliser memory
Totaliser reset:	Contact closure (or 5V control voltage) using remote input 1 or remote input 2 connectors with the selected remote input function set to **ZERO**.
Ambient temperature:	LED -10 to 50^o C
Humidity:	5 to 95% non condensing
Display:	4 digit 20mm red led
Power Supply:	AC 240V, 110V or 24V 50/60Hz or DC isolated wide range 12 to 48V. Note: supply type is factory configured.
Transmitter supply:	24VDC unregulated 50mA max. (available on AC supplies only) or 5V unregulated 20mA max. DC supply models typically 15V unregulated at 25mA max.
Power Consumption:	AC supply 4 VA max, DC supply typically 60mA at 12VDC and 30mA at 24VDC. Add to these figures any current taken from the transmitter supply.

6.2 Physical Characteristics

Bezel Size:	DIN 48mm x 96mm x 9mm
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 (AC supply model) or 300gms (DC supply model)

7 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 au 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.