

PM4-FX

Frequency/Pulse
Process Monitor/Controller

Operation and Instruction Manual

Frequency/Rate/Tacho

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Introduction

This manual contains information for the installation and operation of the PM4 Monitor. The PM4 is a general purpose frequency monitor which may be configured to accept inputs within the range of 0 to 100KHz. The instrument may be push button calibrated/scaled to display the input, directly in frequency or in engineering units. A standard inbuilt relay provides an alarm/control function, an optional 2nd relay, retransmission and excitation voltage may also be provided.

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

The remote contact closure input may be used to provide any one of the following group of functions: Peak Hold, Display Hold, Peak Memory (max), Valley memory (min), No Program Access or Setpoint Only Access.

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

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

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

Read This First

Your new PM4 monitor has been supplied factory configured (unless otherwise specified), as follows:

Input:	With internal 5V pull up resistor
Calibration:	Directly in frequency units (Hz)
Relay 1 Low Setpoint:	Off
Relay 1 High Setpoint:	1000
Relay 1 Status:	High Alarm
Relay 1 Hysteresis:	1
Relay 1 Trip Time:	0
Relay 1 Action:	N/O (ie, de-energised when no alarm)
Decimal Point:	None
Display Rounding:	1
Digital Filter:	2 (range 0-8. ie, 0=min & 8=max)
Remote Input:	Set to "NONE" (see section on remote input)

2.1 Options (when fitted)

Relay 2:	(same settings as Relay 1)
Retransmission Type:	4 to 20mA standard (0-1V & 0-10V by link selection)
Retransmission Low:	0000
Retransmission High:	1000
Excitation Voltage:	Isolated ± 12 VDC (=24V) or ± 5 V (=10V) internal link selection

2.2 Input/output configuration

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

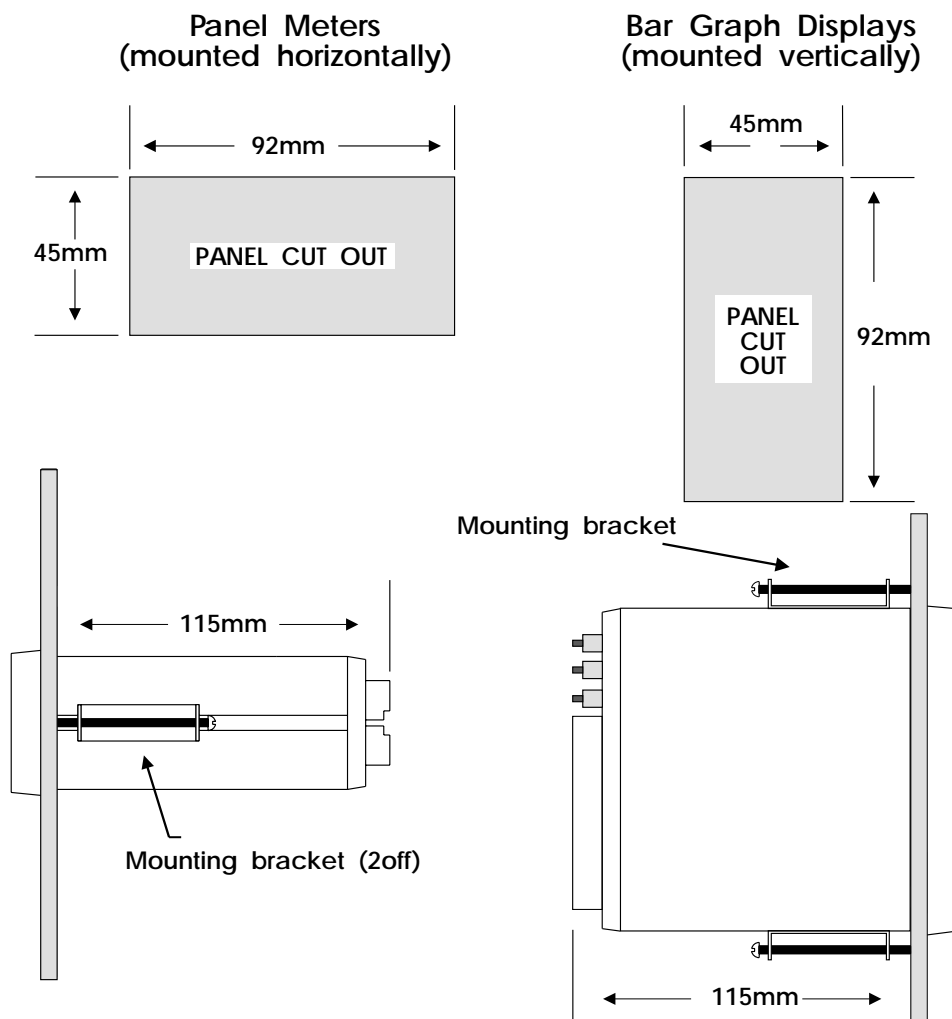
- Remove plug-in input terminal(s).
- Unscrew 4 x 2g self tapping screws from back cover.
- Remove back cover.
- Loosen earth screw.
- Slide out the printed circuit board.
- Configure PCB links as shown in section "Hardware Configuration".
- Slide printed circuit board back into the instrument case.
- Make sure the earth screw is tightened.
- Refit and secure back cover and plug-in terminals.

Mechanical Installation

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

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

Hint: use the elastic band provided to hold the mounting bracket in place whilst tightening securing screws.

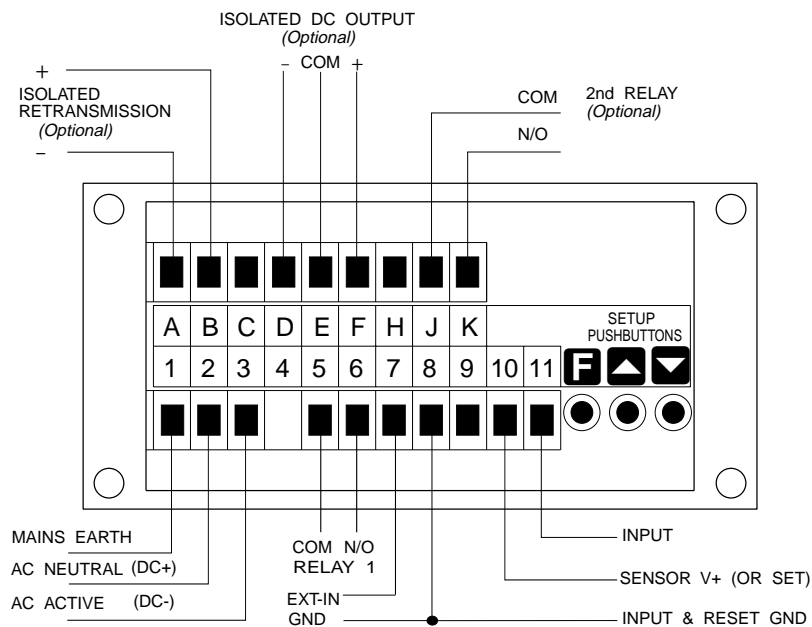


Side view of mounting panel

Electrical Installation

The PM4 Panel Meter is designed for continuous operation and no power switch is fitted to the unit. It is recommended that an external switch and fuse be provided to allow the unit to be removed for servicing.

The terminal blocks allow for wires of up to 1.5mm to be fitted. Connect the wires to the appropriate terminals as indicated below. Refer to other details provided in this manual to confirm proper selection of voltage, polarity and input type before applying power to the instrument. When power is applied the instrument will cycle through a display sequence, indicating the software version and other status information, this indicates that the instrument is functioning. Acknowledgment of correct operation may be obtained by applying an appropriate input to the instrument and observing the resultant reading.



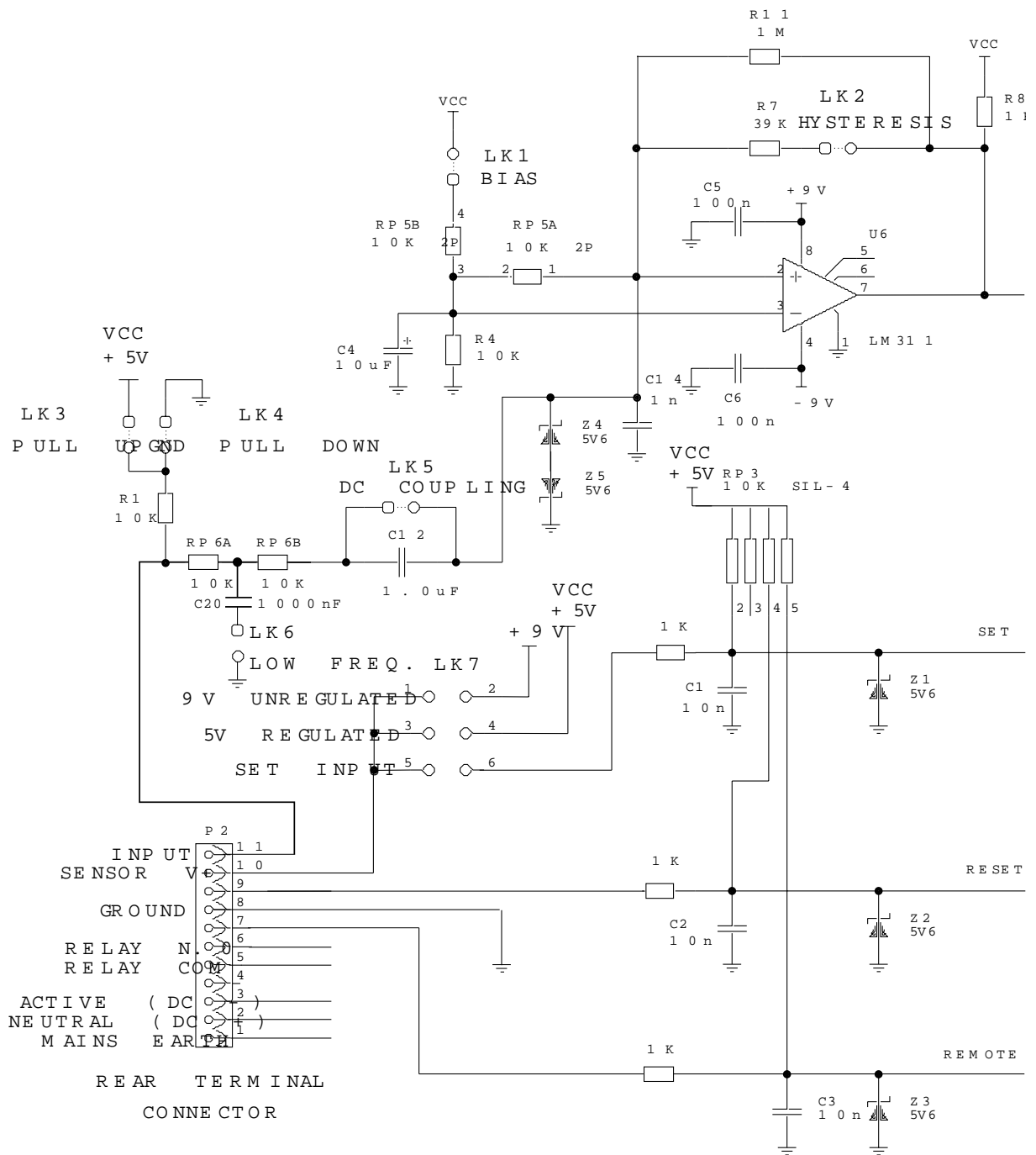
Instrument Rear Panel

1	MAINS EARTH	OPTIONAL OUTPUTS
2	240VAC NEUTRAL	
3	240VAC ACTIVE	A OUTPUT V/I -
		B OUTPUT V/I ++
		C
5	RELAY 1 COM	D DC VOLTS O/P -
6	RELAY 1 N/O	E DC VOLTS O/P GND
7	EXT IN	F DC VOLTS O/P ++
8	GROUND	
9		H
10	SET OR SENSOR V+	J RELAY 2 COM
11	INPUT	K RELAY 2 N/O
MODEL No: PM4-FX-240-4E		SERIAL No:

Instrument Data Label (example)

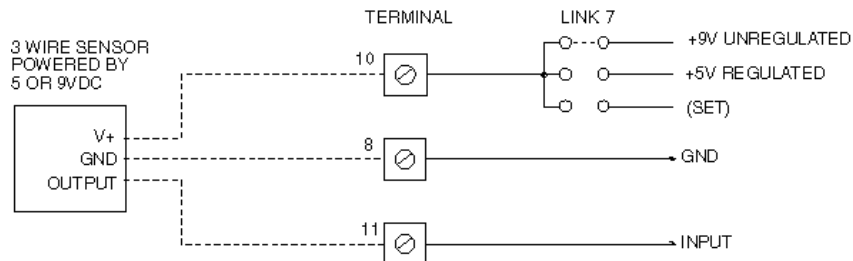
Input Circuit Diagram

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

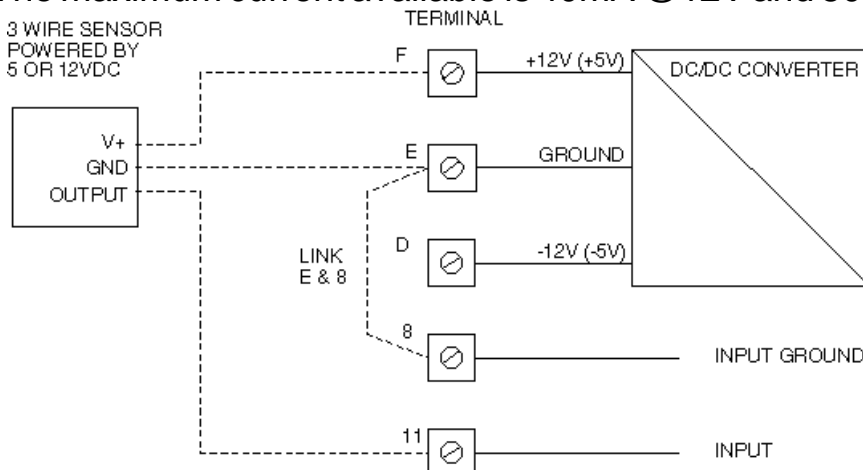


Transducer Power Supply

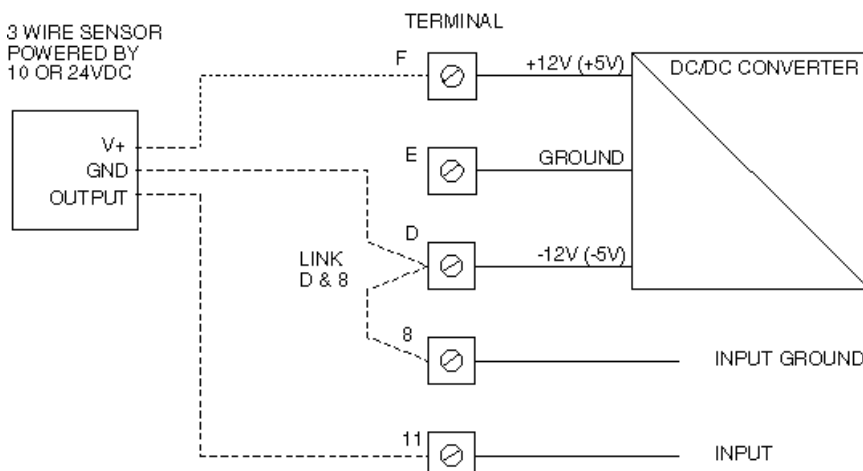
The standard internal power supply may be link selected to provide a regulated 5V or unregulated 9V (7 to 11V) to power the sensor. The maximum current available is 30mA. The standard power supply is suitable for sensors requiring less than 12V to operate.

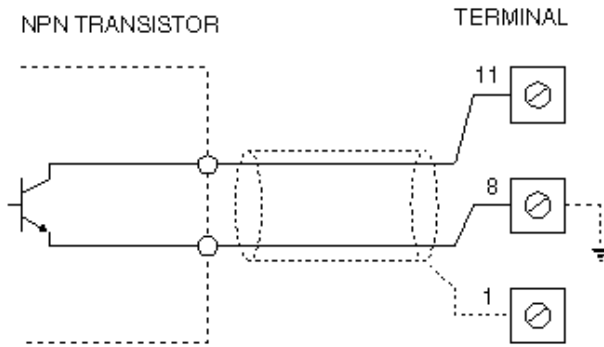


Sensors requiring a 12V (or 5V) DC power supply may be connected as shown below, provided the optional isolated DC output is fitted. It is necessary to link terminals E and 8 to couple the power supply and input grounds. The maximum current available is 40mA @ 12V and 80mA @ 5V.



Sensors requiring a 10V or 24V DC power supply may be connected as shown below, provided the optional isolated DC output is fitted. 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.



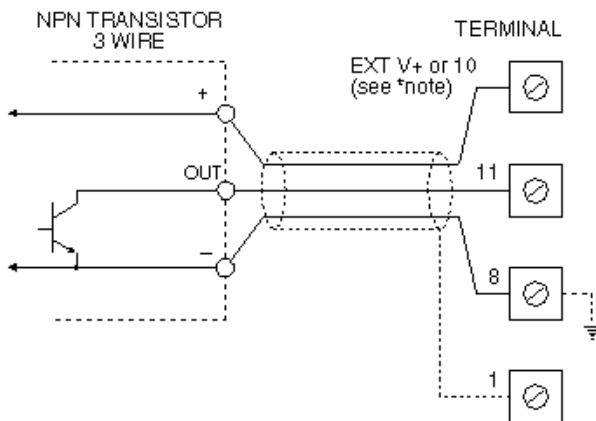


NPN Transistor

Typical Internal Link Settings

Bias Link 1. in
 Hysteresis . . . Link 2. in
 VCC up Link 3. in
 Ground Link 4. out
 DC couple . . . Link 5. in
 Low frequency . Link 6. out
 Supply V+. . . . Link 7. n/a

Note: The transducer may require an external DC supply. This may be provided from a remote power source or by a +5V or +9V unregulated DC output on terminal 10 (see "Transducer Power Supply"). An optional inbuilt isolated DC supply provides a 5V,10V,12V or 24V output.

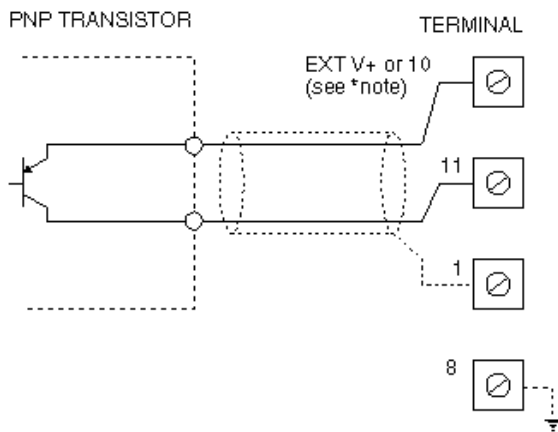


NPN Transistor 3 Wire

Typical Internal Link Settings

Bias Link 1. in
 Hysteresis . . . Link 2. in
 VCC up Link 3. in
 Ground Link 4. out
 DC couple . . . Link 5. in
 Low frequency . Link 6. out
 Supply V+. . . . Link 7. see note

Note: The transducer may require an external DC supply. This may be provided from a remote power source or by a +5V or +9V unregulated DC output on terminal 10 (see "Transducer Power Supply"). An optional inbuilt isolated DC supply provides a 5V,10V,12V or 24V output.

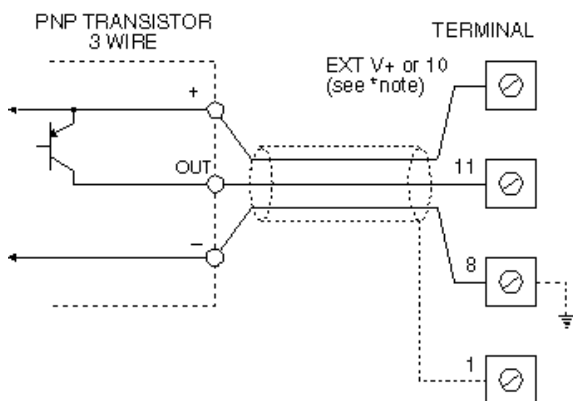


PNP Transistor

Typical Internal Link Settings

Bias Link 1. in
 Hysteresis . . . Link 2. in
 VCC up Link 3. out
 Ground Link 4. in
 DC couple . . . Link 5. in
 Low frequency . Link 6. out
 Supply V+. . . . Link 7. see note

Note: The transducer may require an external DC supply. This may be provided from a remote power source or by a +5V or +9V unregulated DC output on terminal 10 (see "Transducer Power Supply"). An optional inbuilt isolated DC supply provides a 5V,10V,12V or 24V output.



PNP Transistor 3 Wire

Typical Internal Link Settings

Bias Link 1. in
 Hysteresis . . . Link 2. in
 VCC up Link 3. out
 Ground Link 4. in
 DC couple . . . Link 5. in
 Low frequency . Link 6. out
 Supply V+. . . . Link 7. see note

Note: The transducer may require an external DC supply. This may be provided from a remote power source or by a +5V or +9V unregulated DC output on terminal 10 (see "Transducer Power Supply"). An optional inbuilt isolated DC supply provides a 5V,10V,12V or 24V output.

Alarm Relays

The PM4 is provided with 1 alarm relay. An optional totally independent 2nd alarm relay may also be provided (up to 7 relays are available on selected models). These are designated A1 and A2. Each alarm has the following parameters which may be set by the user:



1. Low trip point, adjustable in measurement units.
2. High trip point, adjustable in measurement units.
3. Alarm hysteresis, adjustable in measurement units.
4. Alarm trip time, adjustable in seconds.
5. N/O or N/C relay operation

The alarm operates in the following way:



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

When the alarm has tripped, the measured value is compared to the High Set Point less the Hysteresis value and the Low Set Point plus the Hysteresis value. If it is less than the High Set Point less the Hysteresis value and greater than the Low Set Point plus the Hysteresis value, the alarm is reset.

8.1 Alarm Low Setpoint

The low setpoint may be programmed to operate the alarm relay when the measured value falls below the set value. If the low setpoint is not required, it may be set to OFF in the setup mode by pressing, then releasing,  and  simultaneously. The instrument is configurable for each relay to have a low and a high setpoint, so the relay may be triggered if the reading deviates outside of the setpoint limits.

8.2 Alarm High Setpoint

The high setpoint may be programmed to operate the alarm relay when the measured value exceeds the set value. If the high setpoint is not required, it may be set to OFF in the setup mode by pressing, then releasing,  and  simultaneously.

8.3 Alarm Hysteresis

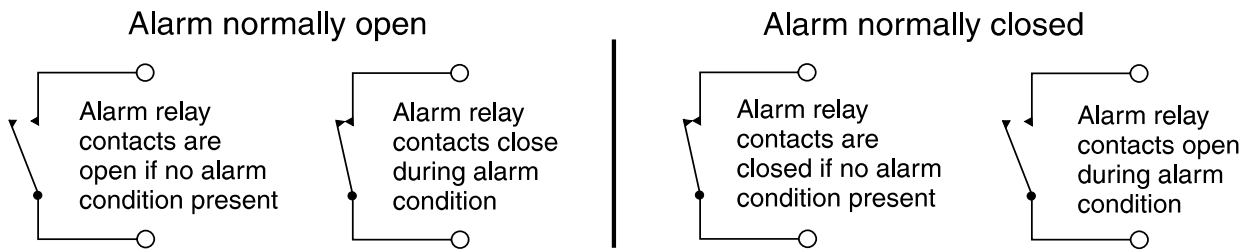
The hysteresis, or deadband, value is used to prevent too frequent operation of the alarm relay when the measured value stays close to the setpoint. The hysteresis value is common to the high and low relay action for each alarm.

Hysteresis Operation Examples:

If the alarm high setpoint is set to 100 and the alarm hysteresis is set to 10 then the alarm will trip when the display reading is above 100 and will not reset until the display reading falls below 90 (high setpoint minus the hysteresis value). Similarly if the alarm low setpoint is set to 50 and the alarm hysteresis is set to 10 then the alarm will trip when the display reading is below 50 and will not reset until the display value is above 60 (low setpoint plus hysteresis value).

8.4 Alarm Relay N/O or N/C Operation

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



8.5 Alarm Trip Time

The alarm trip time determines how long the measured value has to be above the high set point or below the low set point before the alarm relay is tripped. This can be used to prevent false alarms on noisy inputs. The value is set in seconds, with a range of 0 - 60 seconds. For normal operation a delay of three to five seconds is suitable.

8.6 Switching Inductive Loads

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

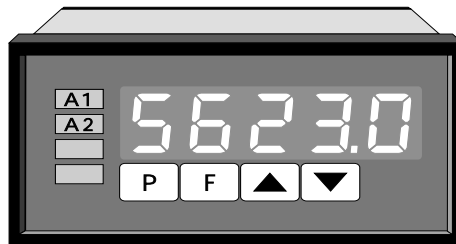
Digital Display Types

The full range of PM4 series display types is shown below. For most instruments in the range a full choice of display types is possible. However for some instruments certain display options are not suitable. Therefore choice with these types may be limited.

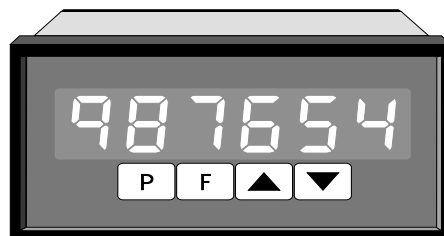
4 Digit LED



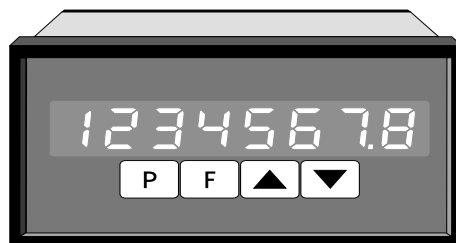
**5 Digit LED
with Keypad**



**6 Digit LED
with Keypad**



**8 Digit LED
with Keypad**



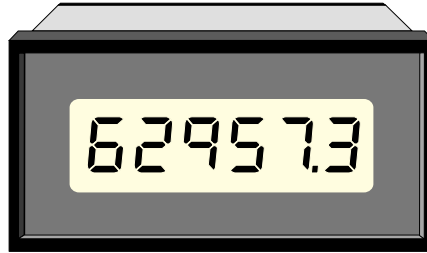
4 Digit LCD



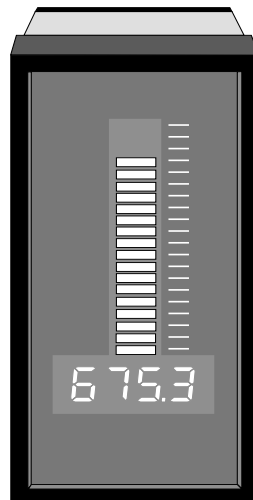
4½ Digit LCD



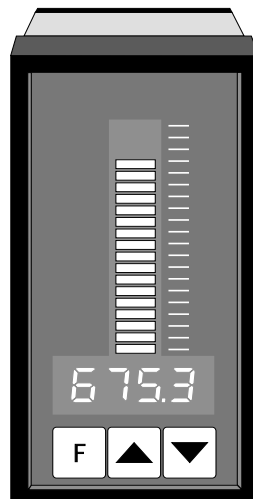
6 Digit LCD



**4 Digit LED
with 20 Segment
Bar Graph**



**4 Digit LED
with 20 Segment
Bar Graph
plus 3 way
keypad**



Output Options

The basic PM4 is provided with a single alarm relay output. Optional outputs may be provided as follows:

10 .1 Additional Alarm Relays

The 2nd alarm relay has the same programmable functions and specifications as the 1st (standard) alarm relay (note up to 6 extra relays are available for some models). The programming messages are automatically updated to include settings for the additional relay(s).

10 .2 Analog Retransmission

The isolated analog retransmission output may be user configured to give an output of 4-20mA, 0-1V or 0-10V without the need to recalibrate the instrument. Other output ranges may be provided (consult sections on hardware configuration). The output limits may be programmed to correspond to any points within the measuring range of the instrument. See REC_ and REC~ functions in the “Explanation of Functions” chapter for a description of setting up retransmission.

10 .3 DC Voltage Output

An isolated DC voltage output is available to power external transducers etc. The standard output is 12V (24V), the output may be changed to a 5V(10V) by a PCB link selector.

Note: where a 24V DC output is required connect between +12V and -12V (+5V and -5V for 10V outputs).

10 .4 RS232/RS485 Output

An RS232 or RS485 output is available with selectable parameters such as baud rate (300 to 9600), parity (none, even or odd) , number of data bits, alpha character select etc. Setup instructions for RS232/RS485 operation will be given either in a manual appendix or a manual addendum if this option is fitted.

Note: When this option is supplied the analog output is not available.

Explanation of Functions

The PM4 setup and calibration functions are configured through a pushbutton sequence, as explained in “setting up the instrument” and “calibration”. Two levels of access are provided for setting up and calibrating - level 1 (simple pushbutton sequence) allows access to commonly set up functions, level 2 (power up sequence plus pushbutton sequence) allows access to calibration parameters. Note; certain functions relating to the optional retransmission output limits are only displayed when the retransmission option is fitted. Changes to the setpoints and other functions are made by pressing the ▲ and ▼ pushbuttons. Described below is a brief description of each function.

Set up functions (see also chapter titled “Setting up the instrument”).

To enter the set up mode, a simple pushbutton sequence is necessary (this prevents accidental alteration of settings). First press the **F** button and then (within 2 seconds) press both the ▲ and ▼ pushbuttons simultaneously. The display will now read FUNC thereby indicating that you have entered the Setup Function Mode. Each function may be accessed by pressing the **F** pushbutton to step through the functions as indicated below. Note; The **P** button (only on models with 4 x front panel pushbuttons) may be used to exit the function mode at any time and will abort the function currently displayed without accepting any changes to that function. This is useful for quickly exiting the function mode and as a means preventing accidental or unwanted changes to the functions.

A1Lo (alarm 1 low setpoint).

Displays and sets the alarm 1 low setpoint value. The low alarm setpoint may be disabled by pressing the ▲ and ▼ pushbuttons simultaneously. When the alarm is disabled the display will indicate OFF. Alarm 1 will trip when the displayed value is lower than the A1Lo setpoint value.



A1Hi (alarm 1 high setpoint).

Displays and sets the alarm 1 high setpoint value. The high alarm setpoint may be disabled by pressing the ▲ and ▼ pushbuttons simultaneously. When the alarm is disabled the display will indicate OFF. Alarm 1 will trip when the displayed value is higher than the A1Hi setpoint value.

A2Lo (alarm 2 low setpoint).

Displays and sets the alarm 2 low setpoint value. The low alarm setpoint may be disabled by pressing the ▲ and ▼ pushbuttons simultaneously. When the alarm is disabled the display will indicate OFF. Alarm 2 will trip when the displayed value is lower than the A2Lo setpoint value.

A2Hi (alarm 2 high setpoint).

Displays and sets the alarm 2 high setpoint value. The high alarm setpoint may be disabled by pressing the  and  pushbuttons simultaneously. When the alarm is disabled the display will indicate OFF. Alarm 2 will trip when the displayed value is higher than the A2Hi setpoint value.

A1HY (alarm 1 hysteresis [deadband]).

Displays and sets the alarm 1 hysteresis limit and is common for both high and low setpoint values. In the high alarm mode once the alarm is tripped the input must fall below the setpoint value minus the hysteresis value to reset the alarm. In the low alarm mode once the alarm is tripped the input must rise above the setpoint value plus the hysteresis value to reset the alarm. The hysteresis units are expressed in displayed engineering units.

A2HY (alarm 2 hysteresis [deadband])

Displays and sets the alarm 2 hysteresis (see details as per A1HY).

A1t t (alarm 1 trip time t ot I) or (relay trip time PASS).

When t ot I is selected, displays and sets the alarm 1 trip time and is common for both alarm 1 high and low setpoint values. The trip time is the delay before the alarm will trip. The alarm condition must be present continuously for the trip time period before the alarm will trip. This function is useful for preventing an alarm trip due to short non critical deviations from setpoint. The trip time is selectable over 0 to 60 seconds.

When PASS is selected this function sets the amount of time in 0.1 seconds that the relay will operate every time alarm relay 1 is tripped (range 0.0 to 25.5 seconds). In this mode the relay contacts will close when the relay is operated.

A2t t (alarm 2 trip time).

Displays and sets the alarm 2 trip time (other details as per A1t t).

A1n.o or A1n.c (alarm 1 normally open or normally closed)

Displays and sets the alarm relay 1 action to normally open (de-energised) or normally closed (energised), when no alarm condition is present.

A2n.o or A2n.c (alarm 2 normally open or normally closed)

Displays and sets the alarm relay 2 action to normally open (de-energised) or normally closed (energised), when no alarm condition is present.

BAr _ (bar graph display low value)

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

BAr ~ (bar graph high value).

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

rEC_ (recorder/retransmission output low value)

Displays and sets the analog retransmission (4 to 20mA, 0-1V or 0-10V) output low value (4ma or 0V) in displayed engineering units.



rEC~ (recorder/retransmission output high value).

Displays and sets the analog retransmission (4 to 20mA, 0-1V or 0-10V) output high value (20ma, 1V or 10V) in displayed engineering units.

drnd (display rounding) (operates in the function setup mode only).

Displays and sets the display rounding value. This value may be set to 0 - 5000 displayed units. Display rounding is useful for reducing the instrument resolution in the set up mode, allowing the display to change larger steps for faster setting of setpoints etc.

dCPt (decimal point selection).

Displays and sets the decimal point. By pressing the  or  pushbuttons the decimal point position may be set. The display will indicate as follows: 0 (no decimal point), 0.1 (1 decimal place), 0.02 (2 decimal places), 0.003 (3 decimal places).

FLt r (digital filter)

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

LRNg (measuring range lower limit)

Displays and sets the lowest accepted input frequency. This function is normally set to 0 where the lowest displayable frequency is 2Hz. For low rate applications a lower frequency limit may be selected e.g. 1 = 1 Hz, 2 = 0.5Hz and 3 = 0.25Hz.

Note: settings 1 to 3 will decrease the display and relay update rate.

SPFN (special function)

Displays and sets the special function input selection (see section on Remote Input Functions) . May be set to any one of the following: none NONE, peak hold PHLd, display hold dHLd, peak memory Hi , valley memory Lo, no program access no.AC or setpoint only access SP.AC. The selected special function is actuated by a remote contact closure between the terminals 7 (ext in) and 8 (gnd).

Calibration functions (see also chapter titled “Calibration/Scaling”).

To enter this mode a special “power up procedure must be followed” this procedure prevents accidental alteration of calibration and provides a degree of calibration security.

First, turn off the instrument power.

Then press and hold the **F** button whilst applying power to the instrument. The instrument will momentarily show CAL in the wake up message to let you know that the calibration level of the function mode is now accessible.

To enter into the calibration mode, you must now enter the function set up mode as described earlier in this chapter “entering the set up mode” and step through the functions until the display indicates Fr E9(frequency).

Fr E9 (input frequency used with scaling factor)

Scaling the PM4-FX involves entering the ratio between the input frequency and the scaling factor. The displayed value will indicate the SCL1 number when the input is at this frequency.

The equation used is as follows:

$$\frac{\text{Input Frequency (Hz)} \times \text{''SCL1''}}{\text{''FrEq ''}}$$

This allows the PM4-FX to be scaled in RPM etc.

For example: if the input is 50Hz and this corresponds to 3000 RPM, Fr E9 would be entered as 50 and SCL1 as 3000.

Note: since these factors are entered as a ratio, they may be entered as the lowest common denominator.

ie: in the above example Fr E9 may be entered as 1 and SCL1 entered as 60.

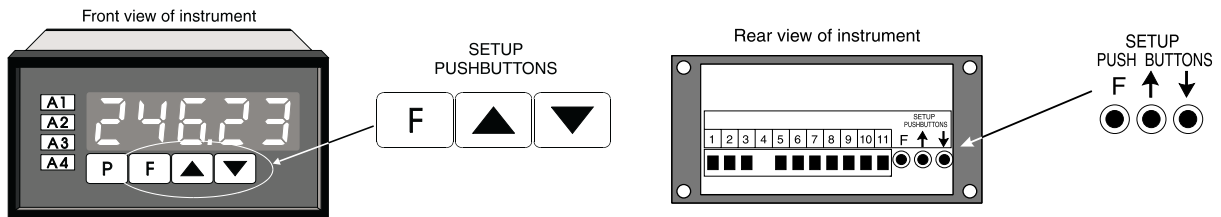
SCL1 (scaling factor used with input frequency)

Enter the scale value as per the examples above (see also examples in chapter titled “Calibration/Scaling”).

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

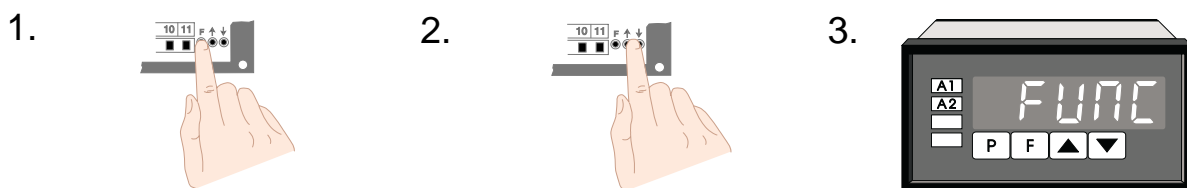
Setting up the Instrument

Setting up and calibrating the PM4 is extremely easy, since most functions are changed or viewed by pressing the pushbuttons. The instruments may have rear accessible pushbuttons, some versions also have front panel keypads which perform the same functions. Note: some initial configuring may require dismantling the instrument to alter selection links (see sections on hardware configuration).



12.1 Step 1 - Entering the Function Setup Mode

To enter the setup mode a simple pushbutton sequence is necessary (this prevents accidental alteration of settings). First press, then release, the **F** button and then (within 2 seconds) press, then release, both the **▲** and **▼** buttons simultaneously. The display will now read FUNC



indicating that you have entered the Function Setup Mode.



12.2 Step 2 - Stepping through the settings


The display of FUNC is followed by the first setup message A1Lo (Alarm 1 Low setting). As with all other messages the first display lets you know which parameter will be affected when changes are made. Each time the **F** button is pressed and released another setup parameter is displayed (see "Function Table" for list of functions). After the last function the display returns to the normal process display.

12.3 Step 3 - Making changes to the settings

Whilst still in the Function Setup Mode, press the **F** button until you reach the parameter you wish to change. Initially the display will indicate the particular function (e.g. A1Hi), this will be followed by a display showing the current status of that setting (e.g. 50.0). The setting may now be changed by pressing the **▲** or **▼** pushbutton until the desired value is displayed. You may then proceed through the functions until you reach the

next function that you wish to change or until you exit the function mode.

Note 1: Remember the alarm relays may be configured to have **both** a high and a low setting. If the relay is required to trip at only one point (e.g. A1Hi high alarm only) turn off **the unwanted setpoint by selecting the unwanted setting (e.g. A1Lo)** and press the  and  pushbuttons simultaneously. The display will now indicate OFF confirming that Alarm Relay 1 will only trip when the display value is higher than the setpoint value.

Note 2: Instruments with front panel pushbuttons have an additional button (P button). Pressing this button in the setup or calibrate mode exits the current function leaving it unchanged. This is useful for aborting a current function or a method of quickly exiting the function mode by stepping to the next function and then pressing the  button.

Function table for fully optioned instrument

Initial display	Meaning of display	Next display	Record Your Settings
A1Lo	Alarm 1 Low Setpoint Value	Setpoint Value or OFF	
A1Hi	Alarm 1 High Setpoint Value	Setpoint Value or OFF	
*A2Lo	Alarm 2 Low Setpoint Value	Setpoint Value or OFF	
*A2Hi	Alarm 2 High Setpoint Value	Setpoint Value or OFF	
A1Hy	Alarm 1 Hysteresis	Hysteresis Value in Measured Units	
*A2Hy	Alarm 2 Hysteresis	Hysteresis Value in Measured Units	
A1t t	Alarm 1 Trip Time	No of Seconds before Relay 1 trips	
*A2t t	Alarm 2 Trip Time	No of Seconds before Relay 2 trips	
A1n.o or A1n.c	Alarm 1 Action N/O or N/C	A1n.o or A1n.c	
*A2n.o A2n.c	Alarm 2 Action N/O or N/C	A2n.o or A2n.c	
*BAr _	Bar Graph Low Reading	Value in Memory	
*BAr ~	Bar Graph High Reading	Value in Memory	
*rEC _	Recorder Output Low Limit	Value in Memory	
*rEC ~	Recorder Output High Limit	Value in Memory	
dr nd	Display Rounding Selects Resolution	Value in Memory	
dCPt	Display Decimal Point	Decimal Pt Position (e.g. 0.1 or 0.02)	
FLt r	Digital Filter (Range 0 to 8)	0 to 8 (8=most filtering)	
LRNg	Measuring Range Lower Limit	0=2Hz 1=1Hz 2=0.5Hz 3=0.25Hz	Note: Settings 1-3 decrease the display and relay update rate. The normal setting is 0. Settings 1-3 are used for lower frequency measurements.
SPFN	Special Function via Remote Input Terminals	NONE PHI d dHI d Hi Lo no.AC SP.AC	
Fr Eq	Frequency Scaling/Calibration	See section on calibration	
SCL1	Frequency Scaling/Calibration	See section on calibration	

Note: Functions (*) (shaded) shown on this table will be displayed, only when these particular options are fitted.

Remote Input Functions

The PM4 remote input allows the operation of a special function via a voltage free contact to the instrument terminal block (terminals 7 and 8). The input is either a bi-state contact closure (toggle switch, PLC or other external switch) or a momentary pushbutton contact. The instrument may be configured to perform any **one** of the following functions:

- None
- Peak Hold
- Display Hold
- Peak Memory (Max)
- Valley Memory (Min)
- No Program access
- Setpoint Access Only

NONE (None)

This function is selected when none of the special functions are required. If a remote pushbutton is used with this function selected, the button behaves in the same way as the **P** button which is used with some front panel pushbutton versions (used to toggle display between temperature and pH on PM4-PH instruments for example).

PHLd (Peak Hold)

This function displays and holds the peak reading, when the contact input is closed. When the contact is open the display indicates the live reading.

dHLd (Display Hold)

The display hold function is similar to peak hold, except that the held reading is the value displayed when the switch contact is closed.

Hi (Peak Memory)

The peak memory (max) is displayed when the pushbutton contact is closed momentarily. The display is returned to the normal display after 20 seconds (note: for instruments with a front panel **P** button only, pressing **P** button returns display to normal). To reset the peak memory the button must be held closed for 1 to 2 seconds.

Lo (Valley Memory)



The valley memory (min) operates in a similar way to the peak memory.

no.AC (No Program Access) Inhibits access to functions via pushbuttons and front panel keypads. The remote input requires a contact closure to allow access to functions. The switch input for this function is usually a keyswitch or wire link.

SP.AC (Setpoint Access Only)

Allows access to alarm setpoints only when keyswitch is open. Allows full access with the keyswitch closed. The switch input for this function is usually a keyswitch or wire link.

Selecting the remote input function

To select the required function, enter the setup mode in the usual way (see “setting up the instrument”) and step through the functions until you reach the display message SPFN (special function). Use the  and  buttons select the required function.

Effect of special functions on relays, bar graph and retransmissions.

The effect of the remote input function on the alarms, retransmission output and bar graph (when fitted) is programmable. You may for example require the retransmission output to follow the peak hold display instead of following the actual input. A function to select the effect on the alarms, retransmission and bar graph is provided. The following selections will appear after SPFN only when the instrument is set to the CAL (calibration mode). To enter the calibration mode see chapter on calibration.

AL1 (Alarm 1)

Select LI UE or SPFN (display or special function). LI UE selects the live input as the value to trigger the alarm 1. SPFN selects the special function value (peak, display hold, etc) as the value used to trigger alarm 1.

AL2 (Alarm 2)

as above but affects alarm 2.

bar (Bar Graph)

as above but affects bar graph.

rEC (Recorder (retransmission))

as above but affects the analog retransmission.

r232 (RS232 (retransmission))

as above but affects the RS232 retransmission (when fitted).

These functions will not appear if NONE is selected as the special function.

With functions requiring a latching switch (peak hold and display hold) the SPFN value will be used when the switch is ON and the display value when the switch is OFF.

Calibration / Scaling

To enter the calibration mode a special “power up procedure” must be followed. This procedure prevents accidental alteration of calibration and provides a degree of calibration security.

Preparing to initialise

Turn off instrument Power.

Initialising the calibration mode

Press and hold the **F** button whilst applying power to the instrument. The instrument will momentarily show CAL (during the wake up messages) to let you know that the calibration level of the function mode is now accessible.

Entering the calibration mode

To enter the calibration mode, you must enter the function set up mode as described in chapter “Setting up the Instrument” and then step through the functions until the display indicates Fr E9 (frequency).

Note: as you step through the functions take care not to accidentally alter the settings of the various functions.

Calibration (scaling)

Enter the calibration frequency value by pressing the ▲ or ▼ buttons. Now press the **F** button. The display will indicate SCL1 (scale 1) followed by the scale value in memory. Now press the ▲ or ▼ button to obtain the required scale (calibration) value. Press **F** the display will now return to the measure mode (with calibration access).

Note: Since scaling (calibrating) the instrument requires a ratio of input frequency to displayed units, it is only necessary to set the instrument to minimal relative numbers. For example in the table below, (where 0 to 100Hz is to display 0 to 100.0), the scaling could be set to 100 = 100.0, but it is faster and as accurate to set the scaling to 1 = 1.0.

Make sure the decimal point position is selected prior to scaling the instrument.

* See more examples next page.....

Calibration Examples	dCPt	Fr Eq	SCL 1
0 to 100Hz input to display 0 to 100	0	1	1
0 to 100Hz input to display 0 to 100.0	0.1	1	1.0
0 to 100Hz input to display 0 to 500.0	0.1	1	5.0
0 to 1KHz input to display 0 to 20.00	0.02	1	0.02
0 to 550Hz input to display 0 to 1500	0	55	150
0 to 20KHz input to display 0 to 20.00	0.02	20	.02

Example - RPM Display

The basic 1:1 calibration units for the PM4 are in Hz (pulses per second). In an application where a sensor produces 1 pulse per revolution, the display will be revolutions per second - therefore to display revolutions per minute a factor of 60 must be applied.

A rotating device produces 1 pulse per revolution
- to scale PM4 set Fr E9 to 1 and SCL1 to 60.

A rotating device produces 4 pulse per revolution
- to scale PM4 set Fr E9 to 4 and SCL1 to 60 (note: setting Fr E9 to 1 and SCL1 to 15 will produce the same results).

Example - Flow Rate Display

Flowmeters often produce an output frequency proportional to the rate of flow - using information provided by the manufacturer or from test results, the flow rate scaling may be configured as follows:

A turbine produces 767 pulses per litre
- to display litres per second set Fr E9 to 767 and SCL1 to 1.
- to display litres per minute set Fr E9 to 767 and SCL1 to 60.
- to display litres per hour set Fr E9 to 767 and SCL1 to 3600.

The numbers can be reduced to the lowest common denominator. eg; if the turbine produces 200 pulses per litre and the desired display is litres per minute, you could set Fr E9 to 200 and SCL1 to 60, but it would be simpler and as accurate to set Fr E9 to 20 and SCL1 to 6. (this number can be further simplified to Fr E9 10 and SCL1 to 3)

If it is required to display with a decimal place e.g. to 0.01 litres per minute, first set the decimal point to 2 places (0.02) and the set Fr E9 to 765 and CAL1 to 60.00.

Example - Rate Display

Producing a rate display e.g. "Bottles per Minute" uses the same procedure as setting flow rate (see above examples).

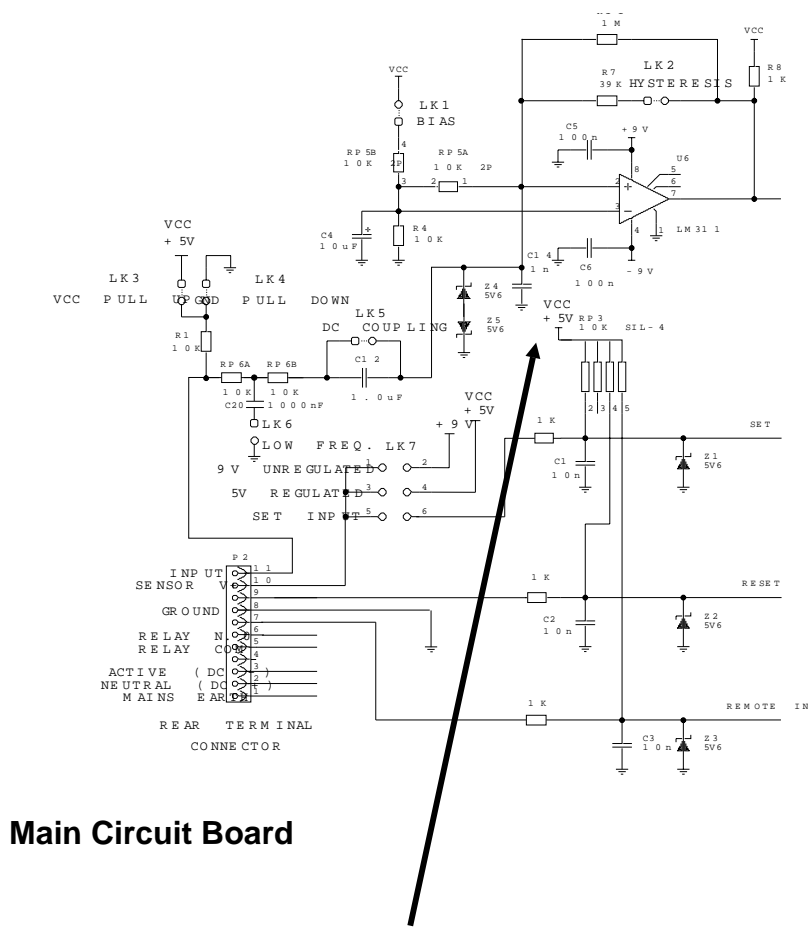
A proximity sensor produces 1 pulse each time an object passes - to display objects per minute set Fr E9 to 1 and SCL1 to 60.

Returning to the normal measure mode

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

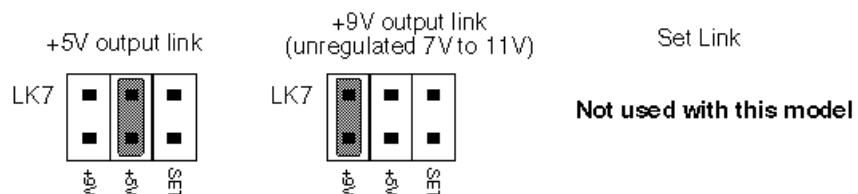
Configuring the input board

Selecting the input. Dismantle the instrument as described in section titled input/output configuration. Insert the links into the appropriate location on the pin header, to suit the application or input sensor (see also “Input Connection Details” and “Transducer Power Supply”).



Main Circuit Board

Sensor V+ Supply (non isolated)

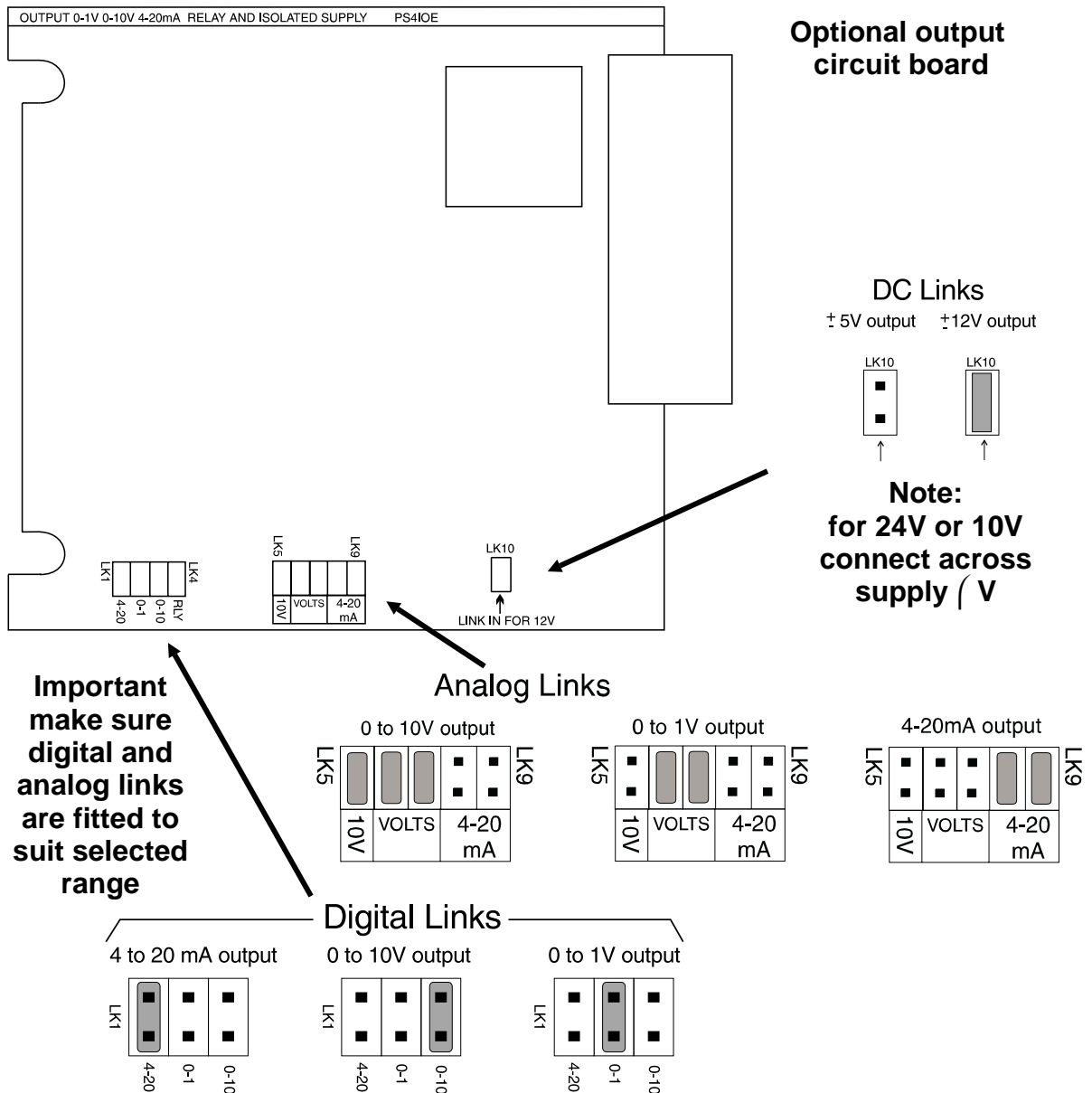


Configuring the output board

The optional output board is factory supplied with the necessary components for the output options required. Combinations of three output types are available:

- a/ 2nd relay output
- b/ Isolated analog retransmission (4-20mA, 0-1V or 0-10V)
- c/ Isolated DC Voltage output (to power transmitters etc)

PCB links are fitted to the circuit board to provide data to the microprocessor and to connect the electronic components for the correct output types. It may be necessary to alter the PCB links to change the analog output or the DC voltage output (see tables below) (to dismantle the instrument, see section titled "Input/output configuration") .



Specifications

Technical Specifications

Input Types:	Link selectable internal pull resistor, internal pull down resistor, biased input, DC input and 2v added hysteresis
Impedance:	10K Ω
Accuracy:	0.01% when calibrated
Sample Rate:	4 / sec nominal (1 / sec on low frequencies)
Measurement Method:	Reciprocal time period technique
Microprocessor:	MC1468HC05C8 CMOS
Ambient Temperature:	LED -10 to 60°C, LCD -10 to 50°C
Humidity:	5 to 95% non condensing
Display:	LED Models 4 digit 20mm, 5 digit 14.2mm + status LEDs + 4 way keypad. 6 digit 14.2mm + 4 way keypad LED Bar Graph 20 segment bar + 4 digit 7.6mm LCD Models 4 digit 12.7mm, 4½ digit 10.2mm
Transducer Power:	Link selectable +5V or +9V unregulated for other voltages use optional DC output
Power Supply:	AC 240V, 110V, 24V 50/60Hz DC 9 to 55V
Power Consumption:	AC supply 4 VA max, DC supply, consult AIC (depends on display type & options)
Output (standard):	1 x relay, Form, A rated 5A resistive
Relay Action:	Programmable N.O. or N.C.

Output Options

2nd Relay:	Same specs as Relay 1
Analog Retransmission:	4 to 20mA standard (0-20mA to special order) 0 to 1V and 0 to 10V link selectable
Serial Communications:	RS232 or RS485
DC Voltage Output:	Isolated $\pm 12V(24V)$ standard or $\pm 5V(10V)$.

Physical Characteristics

Bezel Size:	DIN 48mm x 96mm x 10mm
Case Size:	44mm x 91mm x 120mm behind face of panel
Panel Cut Out:	45mm x 92mm +1mm &- 0mm
Connections:	Plug in screw terminals (max 1.5mm wire)
Weight:	400 gms Basic model, 450 gms with option card