PM4-ML

Manual Loading Station
Operation and Instruction Manual

Outputs 4-20mA, 0-1V or 0-10V

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1 Introduction

This manual contains information for the installation and operation of the PM4-ML Manual Loading Station. The PM4-ML is an versatile instrument which may be configured to transmit a manually controlled analog output of DC volts (0-1v or 0-10v) or 4 to 20mA. The instrument may be calibrated to display the output in engineering units. A standard inbuilt relay provides an alarm/control function, an optional 2nd relay and excitation voltage may also be provided.

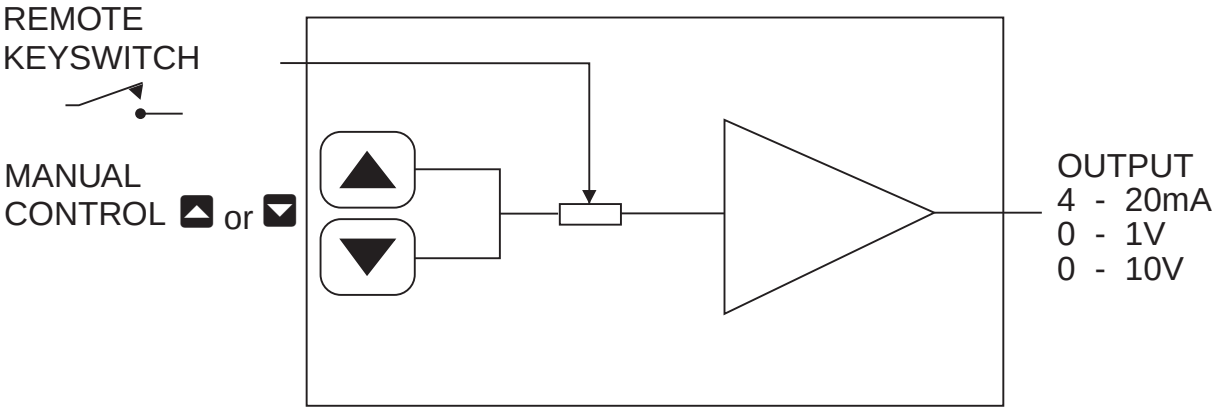
Two display models are available - the combined bar graph and digital display model provides a graphic representation of the output signal whilst providing an accurate digital display. The 5 digit model has front panel setpoint alarm LEDs to show the status of the setpoint relays. The programmable display rounding function may be set to provide a coarse or fine control of the output to suit the requirements of the user.

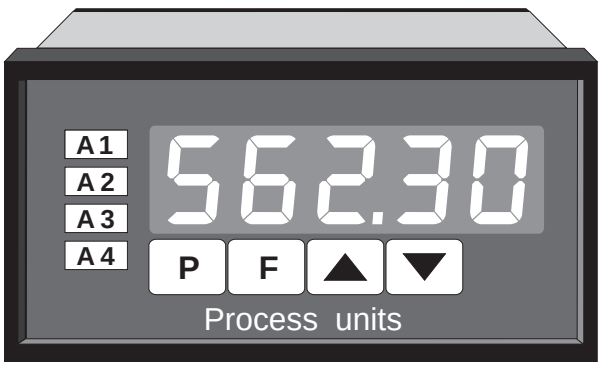
A keyswitch may be utilised to inhibit the operation of the keypads by unauthorised personnel.

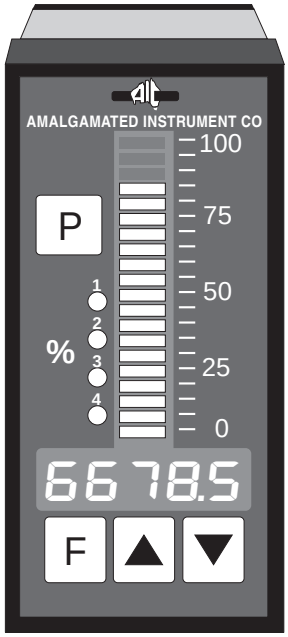
Unless otherwise specified at the time of order, your PM4 has been factory set to a standard configuration. Like all other PM4 series instruments the configuration and calibration is easily changed by the user. Initial changes may require dismantling the instrument to alter PCB links, other changes are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

Full electrical isolation between power supply, 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 or control devices.

The PM4 series of Panel Mount Monitors are designed for high reliability in industrial applications. The high brightness LED display provides good visibility, even in areas with high ambient light levels. The variety of output voltage and current ranges allows the PM4-ML to interface to most manual controlled actuators or slave devices.





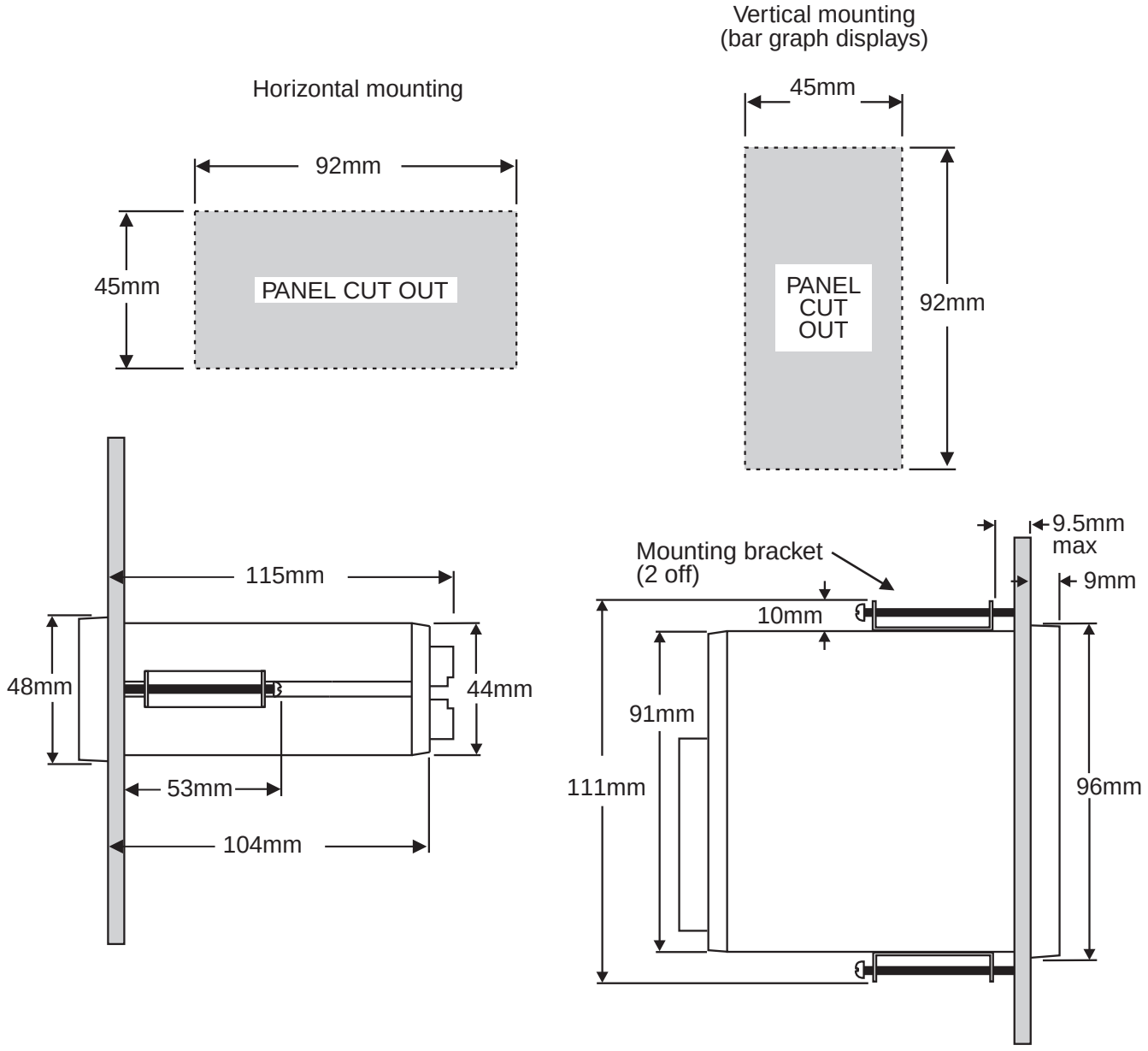


2 Mechanical Installation

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

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

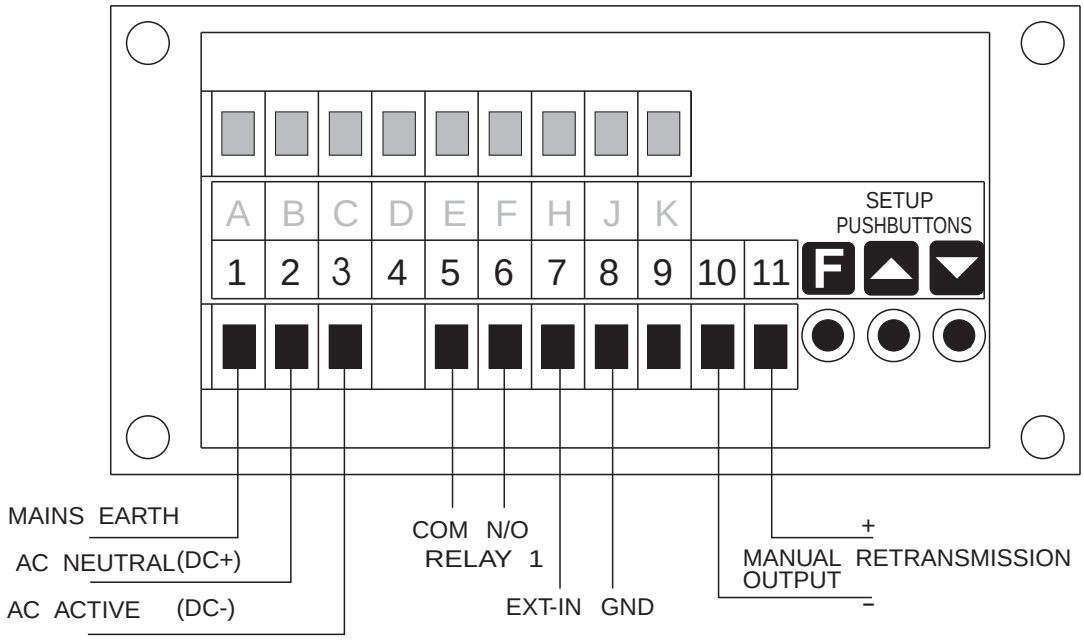
Hint: use the elastic band provided to hold the mounting bracket in place whilst tightening securing screws.



3 Electrical Installation

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

The terminal blocks are of the plug in type for ease of installation and allow for wires of up to 2.5mm^2 to be fitted. Connect the wires to the appropriate terminals as indicated below. Refer to other details provided in this manual to confirm proper selection of voltage, polarity and input type before applying power to the instrument. When power is applied the instrument will cycle through a display sequence, indicating the software version and other status information, this indicates that the instrument is functioning.



Instrument Rear Panel

1 CASE EARTH 2 240VAC NEUTRAL 3 240VAC ACTIVE	
5 RELAY 1 COM 6 RELAY 1 N/O	
7 EXTERNAL INPUT 8 GROUND	
9	
10 OUTPUT V/I -VE 11 OUTPUT V/I +VE	
PM4-ML-240-5E	SERIAL No.

Instrument data label (example)

4 Alarm Relays

The PM4-ML is provided with 1 alarm relay. An optional totally independent 2nd alarm relay may also be provided. 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 displayed units.

2 High trip point, adjustable in displayed units.

3 Alarm hysteresis, adjustable in displayed 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 displayed value is above the High Trip Point, or below the Low Trip Point, the alarm trip timer starts. This timer is reset if the displayed 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 displayed 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.

Alarm Low Setpoint (e.g. A1Lo)

The low setpoint may be programmed to operate the alarm relay when the displayed 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 ▲ and ▼ together at the required alarm low function e.g. A1Lo). 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.

Alarm High Setpoint (e.g. A1H)

The high setpoint may be programmed to operate the alarm relay when the displayed value exceeds the set value. If the high setpoint is not required, it may be set to OFF in the setup mode (by pressing ▲ and ▼ together at the required alarm high function e.g. A1H).

Alarm Hysteresis (e.g. A1HY)

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

Alarm Relay N/O or N/C Operation (e.g. A1n.o/A1n.c)

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 normally energised and is de-energised when an alarm condition is present. The N/C mode is useful for power failure detection.

Alarm Trip Time (e.g. A1tt)

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

Switching Inductive Loads

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

5 Explanation of Functions

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

FUNC mode (simple push button sequence) allows access to commonly set up functions such as alarm setpoints.

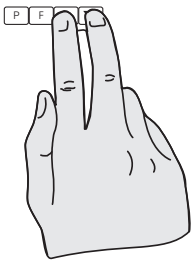
CAL mode (power up sequence plus push button sequence) allows access to all functions including calibration parameters.

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

Entering CAL Mode

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

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



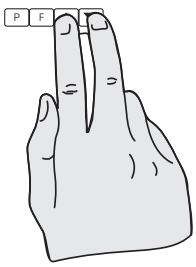
3. Within 2 seconds of releasing the F button press, then release the ▲ and ▼ buttons together. The display will now indicate FUNC followed by the first function.

Note: If step 1 above has been completed then the instrument will remain in this CAL mode state until power is removed. i.e. there is no need to repeat step 1 when accessing function unless power has been removed.

Entering FUNC Mode

No special power up procedure is required to enter FUNC mode.

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



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

A 1Lo (alarm 1 low setpoint)

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 A 1Lo setpoint value.

A 1H, (alarm 1 high setpoint)

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 A 1H, setpoint value.

A2Lo (alarm 2 low setpoint)

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.

A2H, (alarm 2 high setpoint)

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 A2H, setpoint value.

A 1HY (alarm 1 hysteresis [deadband])

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])

Sets the alarm 2 hysteresis limit (as per A 1HY).

A 1tt (alarm 1 trip time)

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.

A2tt (alarm 2 trip time)

Displays and sets the alarm 2 trip time (as per A 1tt).

A 1n.o or **A 1n.c (alarm 1 normally open or normally closed)**

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)**

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)

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

bAr¯ (bar graph display high value)

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

dSP_ (digital display/output low value)

Sets the minimum displayed value corresponding to the analog retransmission (4 to 20mA, 0-1V or 0-10V) lower value (4mA or 0V).

dSP¯ (digital display/output high value)

Sets the maximum displayed value corresponding to the analog retransmission (4 to 20mA, 0-1V or 0-10V) upper value (4mA or 0V).

drnd (display rounding)

Sets the display rounding value. This value may be set to 1 - 5000 displayed units. Display rounding is useful for reducing the instrument resolution, in applications where it is undesirable to display to a fine tolerance or to provide a coarser adjustment for the manual control. (example if set to 10 the instrument will display in multiples of 10).

dCPt (decimal point selection)

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).

dLAY (output ramp time)

Sets the time in seconds, over which the output will ramp from 0 to 100% when the ▲ or ▼ pushbutton is held down. For example, if this is set to 20 seconds, dSP_ is set to 0 and dSP¯ is set to 1000, then if the display value is changed from 0 to 200 the output will take 4 seconds to change from the 0 value to the value corresponding to 200.
Note: when dLAY is set to 0 the output will ramp at the maximum rate.

tYPE (output type 4-20mA, 0-1V or 0-10V)

This function allows the user to select the output mode required. The links on the circuit board must be changed to match this selection. The three selections are: 4-20, 0-1.0 and 0-10

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

6 Function table for fully optioned instrument

Initial display	Meaning of display	Next display	Default setting	Record Your Settings
A 1Lo	Alarm 1 Low Setpoint Value	Setpoint Value or OFF	OFF	
A 1H,	Alarm 1 High Setpoint Value	Setpoint Value or OFF	OFF	
A2Lo	Alarm 2 Low Setpoint Value	Setpoint Value or OFF	OFF	
A2H,	Alarm 2 High Setpoint Value	Setpoint Value or OFF	OFF	
A 1HY	Alarm 1 Hysteresis	Hysteresis Value in Measured Units	0	
A2HY	Alarm 2 Hysteresis	Hysteresis Value in Measured Units	0	
A 1tt	Alarm 1 Trip Time	No of Seconds before Relay 1 trips	0	
A2tt	Alarm 2 Trip Time	No of Seconds before Relay 2 trips	0	
A 1n.o or A 1n.c	Alarm 1 N/O or N/C	A 1n.o or A 1n.c	A 1n.o	
A2n.o or A2n.c	Alarm 2 N/O or N/C	A2n.o or A2n.c	A2n.o	
*bAr_	Bar Graph Low Reading	Value in Memory	0.0	
*bAr-	Bar Graph High Reading	Value in Memory	100.0	
dSP_	Display Reading Low Limit	Value in Memory	0.0	
dSP-	Display Reading High Limit	Value in Memory	100.0	
drnd	Display Rounding Selects Resolution	Value in Memory	0.1	
dCPt	Display Decimal Point	Decimal Pt Position (e.g. 0.1 or 0.02)	0.1	
Calibration functions - accessible via CAL mode only				
dLAY	Output Ramp Time	0 to 255 seconds	0	
tYPE	Output Type 4-20mA, 0-1V, 0-10V	4-20, 0-1.0 0-10	4-20	

Notes:
Functions (shaded) shown on this table will be displayed, only when those particular options are fitted.
Bar graph functions apply only to PM4-ML-XXX-BP model.

7 Changing the Manual Output

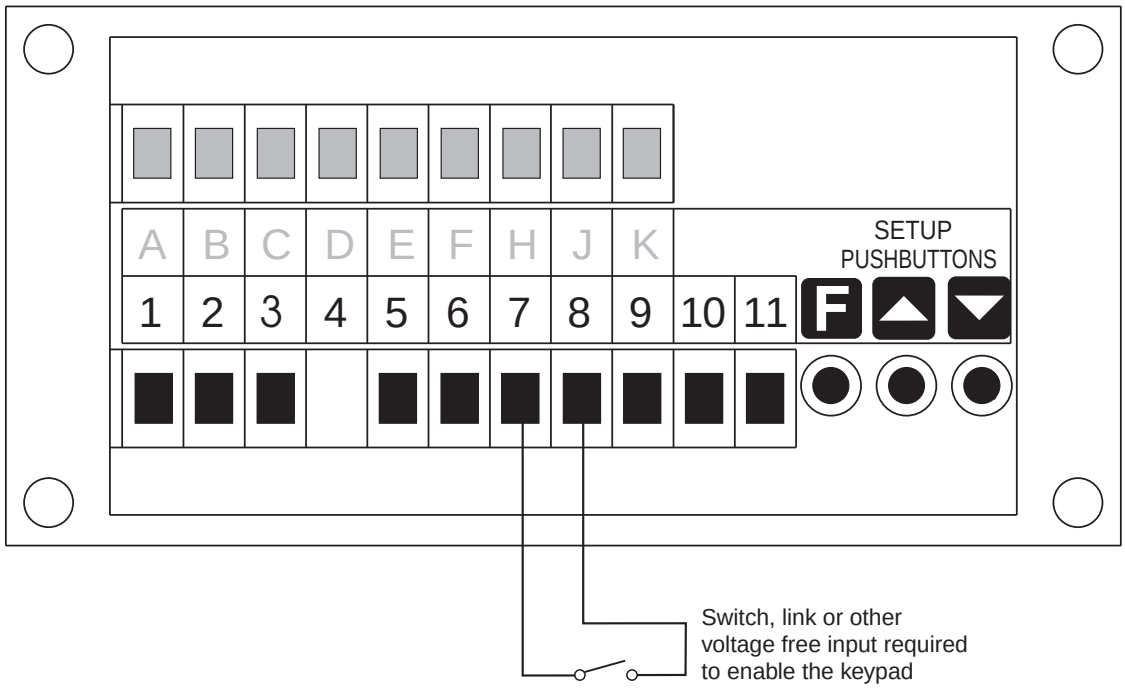
The manually controlled output is incremented or decremented by pressing the front panel ▲ and ▼ pushbuttons. Each time the ▲ or ▼ button is pressed the output is changed by 1 unit on the digital display. By holding the button down the display will ramp at the preset rate (the preset rate is set in the calibration function mode - see “Explanation of Functions”.

The operation of the ▲ and ▼ pushbuttons may be inhibited by operating a switch contact across the rear terminal 7 and 8. The switch may be a security key switch or simply a permanent wire link for less critical applications. When the contact is closed the keypads will operate when the contact is open the keypads will not function.

For applications where a coarser adjustment is more suitable the display rounding (**drnd**) function may be used to reduce the instrument resolution, thereby allowing the output to change in larger steps.

The digital display is used to indicate the exact level of the manually controlled output and may be user scaled to read directly in engineering units, eg: 0.0 to 100.0 % open or 0.0 to 9999.9 litres etc. The bar graph model also provides a graphical representation of the output level by the length of the LED bar.

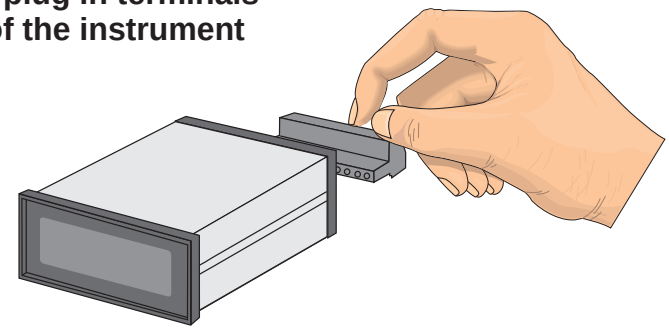
An keypad inhibit input is provided across terminals 7 & 8 at the rear of the PM4. If terminal 7 & 8 are open circuit the keypad will not function. Only when terminals 7 & 8 are short circuited via a switch, link or other voltage free input can the keypad be used to alter the output.



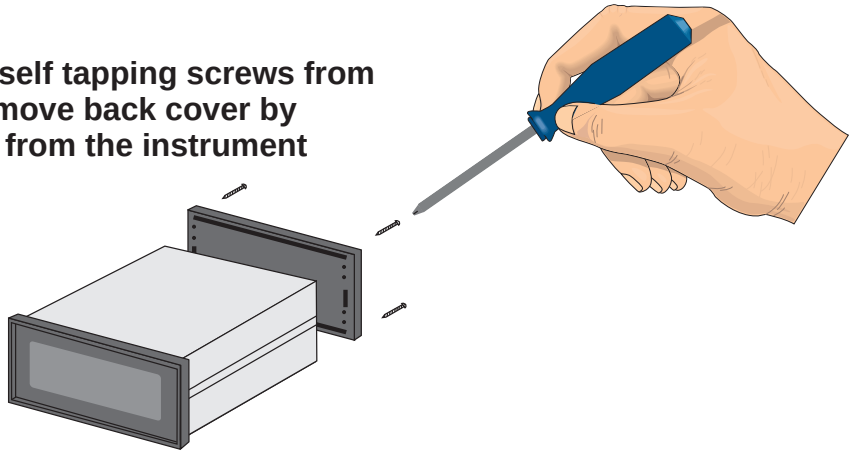
8 Input/Output Configuration

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

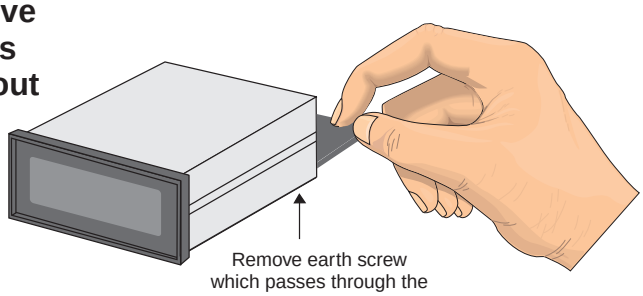
1. Remove the plug in terminals from the rear of the instrument



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



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



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

5. Slide PCB back into the case

6. Replace the earth screw which passes through the case

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

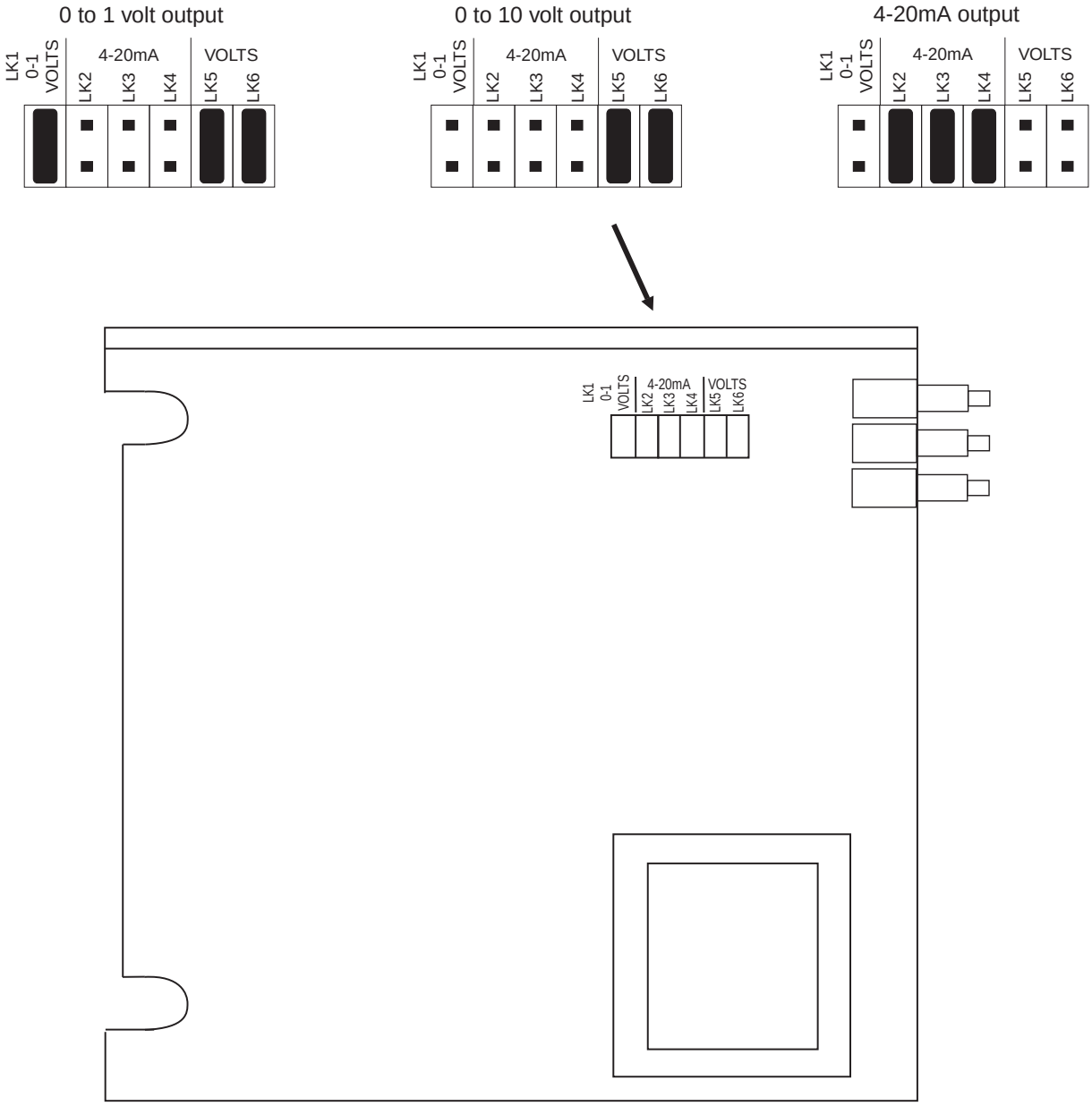
8. Plug the terminal strips back into the rear of the instrument

9 Hardware Configuration

9 .1 Selecting the output type

Dismantle the instrument as described in the "Input/Output Configuration" chapter. Insert the links into the appropriate location on the pin header to suit the range required.

Note: 0-10V output - not available for some models - consult supplier



Main Circuit Board

10 Specifications

10.1 Technical Specifications

Manual Control:	Front panel up / down keypads
Keypad Inhibit:	Contact closure across terminals 7 & 8 (voltage free)
Microprocessor:	MC68HC05C8 CMOS
Ambient Temperature:	-40 to 60^{O}C
Humidity:	5 to 95% non condensing
Display:	Model PM4-ML-XXX-5BP - 20 segment bar graph combined with 5 digit 7.6mm display+ 3 way keypad. Model PM4-ML-XXX-5E - 5 digit 14.2mm + status LEDs+ 4 way keypad.
Power Supply:	AC 240V, 110V or 24V 50/60Hz or DC isolated wide range 12 to 48V. Special supply types 32VAC, 48VAC 50/60Hz or DC isolated 50 to 110V also available. Note: supply type is factory configured.
Power Consumption:	AC supply 4 VA max, DC supply, consult supplier (depends on display type & options)
	Output (standard): 1 x relay, Form, A rated 5A resistive
Relay Action:	Programmable N.O. or N.C.
Analog Output:	4 to 20mA standard 0 to 1V and 0 to 10V link selectable 4 to 20mA output will drive into 1kΩ load maximum. Note: 0 to 10V range not available with DC powered models.

10.2 Output Options

2nd Relay:	Same specs as Relay 1
DC Voltage Output:	Isolated ±12V(24V) standard, ±5V(10V) link selectable.

10.3 Physical Characteristics

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

11 Guarantee and Service

The product supplied with this manual is guaranteed against faulty workmanship for a period of 2 years from the date of dispatch.

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

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

When returning the product for service or repair a full description of the fault and the mode of operation used when the product failed must be given.

In any event the manufacturer has no other obligation or liability beyond replacement or repair of this product.

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

This product is designed and manufactured in Australia.