Panel Meter Model PM6-IE
Operation and Instruction Manual

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

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1 Introduction

1.1 General description

This manual contains installation and operation information for model PM6-IE monitor. Model PM6-IE accepts inputs in the ranges 4 to 20mA, ± 20mA, ± 100mV, ± 1 Volt, ± 10 Volts or ± 100 Volts and may be scaled to read anywhere within the above ranges. The displayed output may be scaled to read in engineering units to suit the application.

The display can be set to operate in one of three basic modes selected at the **SLCt** function:

1. Standard linear display (**Stnd**)
2. Square root law display (**Sqrt**)
3. Lineariser with up to 16 points being available in a lineariser table (**tbLE**)

Unless otherwise specified at the time of order your PM6-IE has been factory set to a standard configuration. This configuration can be easily changed by the using the rear pushbuttons. All changes to configuration and scaling are made via three push buttons located at the rear of the unit, see chapter 5, page 12.

Functions **Lo di SP** and **Hi GH di SP** allow visual warnings of under or over level 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.

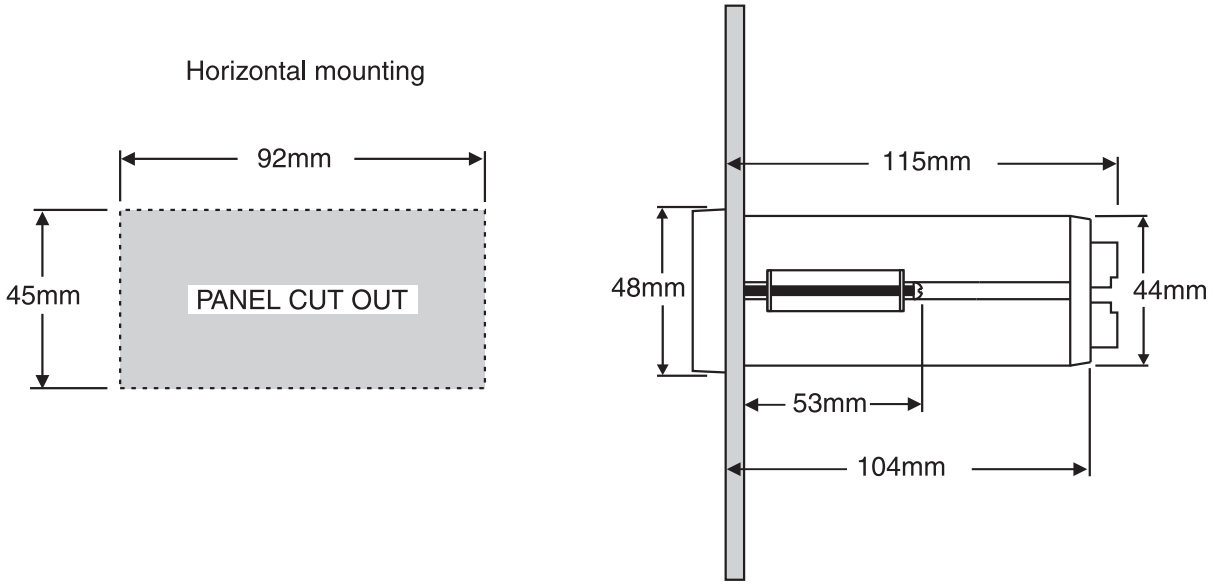
1.2 Basic setup

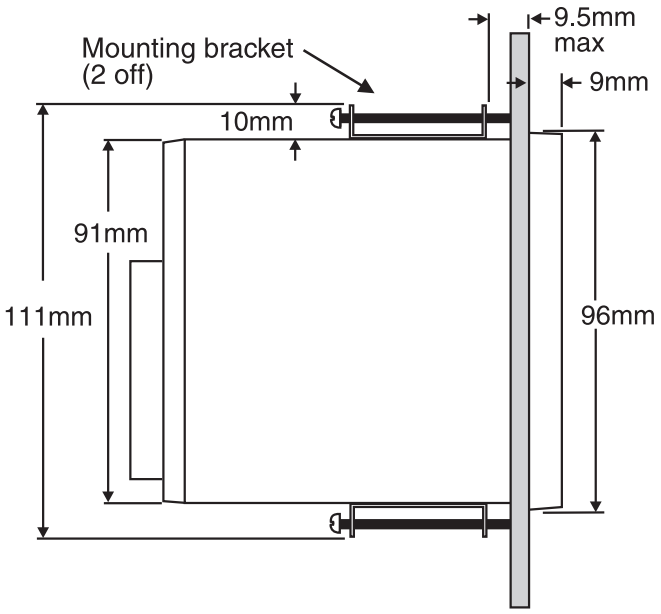
1. See chapter 5, page 12 for details of accessing and changing functions then follow the procedure for "Entering **CAL** Mode".
2. Go to the **inPt** function and select the input type required.
3. Go to the **SLCt** function and select the mode required.
4. Exit the setup functions by pressing and releasing the **F** button until the **FUNC End** message is seen.
5. Connect the sensor or input device to the rear terminals terminals, refer to chapter 3.
6. Access the setup functions as described in item 1 and set the required decimal point position at the **dCPt** function then calibrate the display using one of the methods described in chapter 6.
7. Check that the display is responding to changes in the input signal then consult the setup functions relevant to the operating mode chosen and make any further changes required to these functions including calibration if required.

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

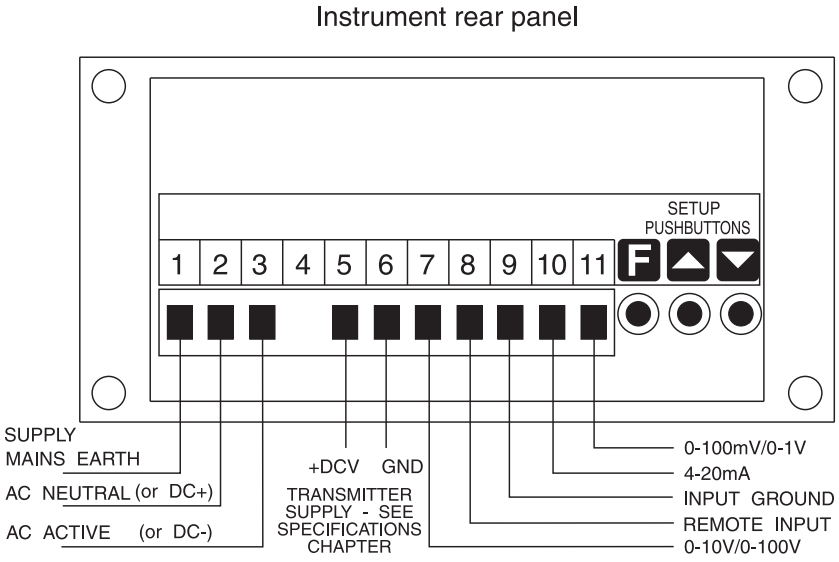
3.1 Electrical installation

The PM6-IE 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. Power supply type is fixed and factory configured.

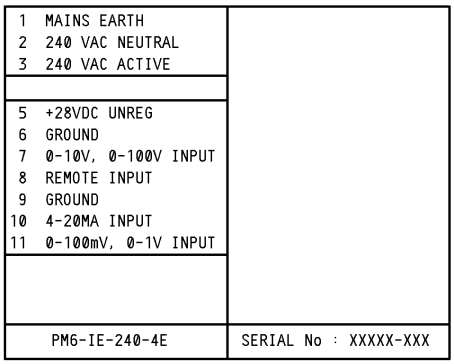
The plug in, screw type, terminal blocks allow for wires of up to 2.5mm^2 to be fitted. Connect the wires to the appropriate terminals as indicated below. Refer to connection details provided in this chapter to confirm proper selection of voltage, polarity and input type before applying power to the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

3.2 PM6 rear panel

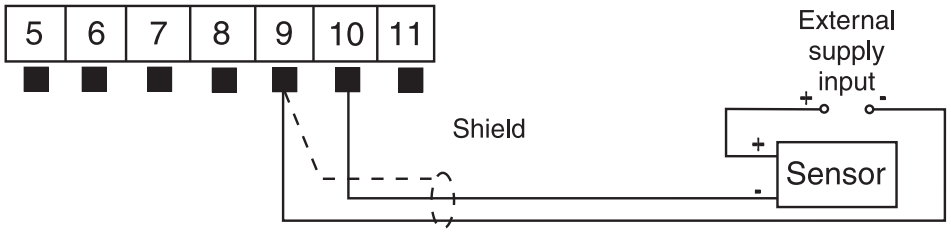


Instrument label example

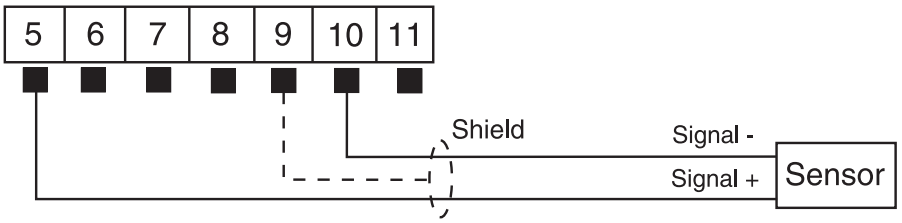


3.3 PM6 connection examples

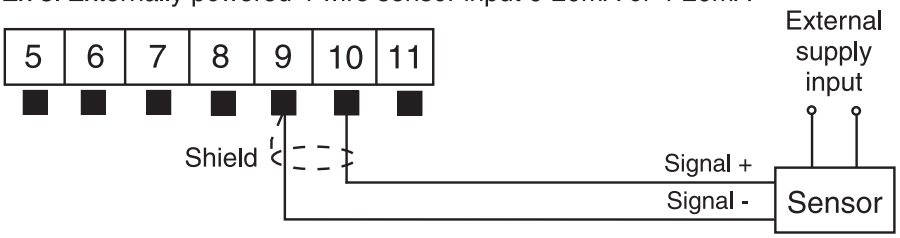
Ex 1. 2 Wire 4 to 20mA transmitter externally powered



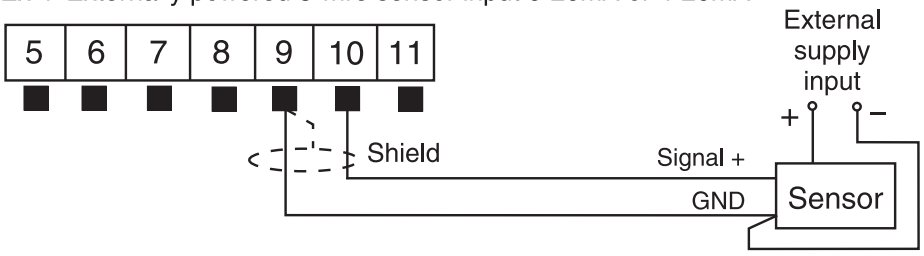
Ex 2. 2 Wire 4 to 20mA transmitter using 25mA max. Unregulated 18 to 24VDC transmitter supply (approx. 15VDC transmitter supply in isolated DC supply models)



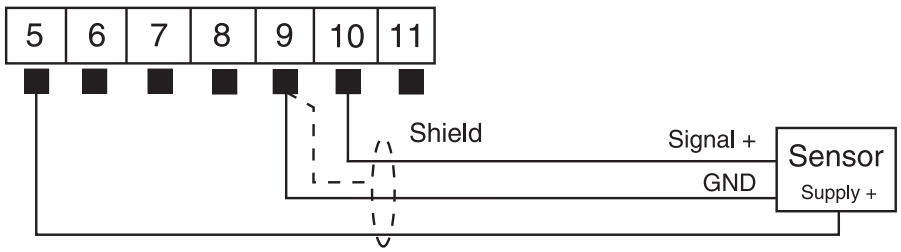
Ex 3. Externally powered 4 wire sensor input 0-20mA or 4-20mA



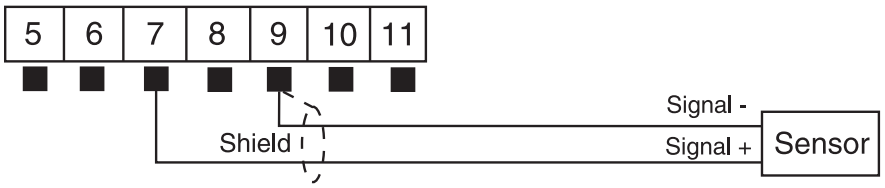
Ex 4. Externally powered 3 wire sensor input 0-20mA or 4-20mA



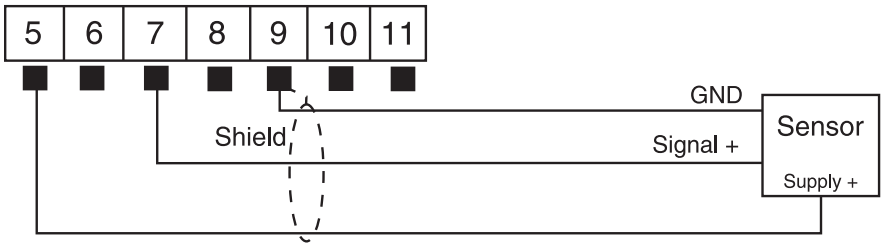
Ex 5. 3 Wire 4 to 20mA transmitter using 25mA max. unregulated 18 to 24VDC transmitter supply (approx. 15VDC transmitter supply in isolated DC supply models)



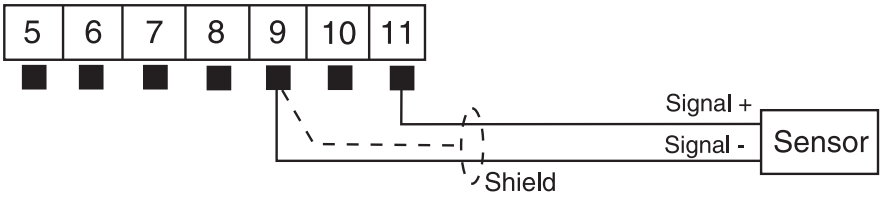
Ex 6. Direct input ±10VDC or ±100VDC



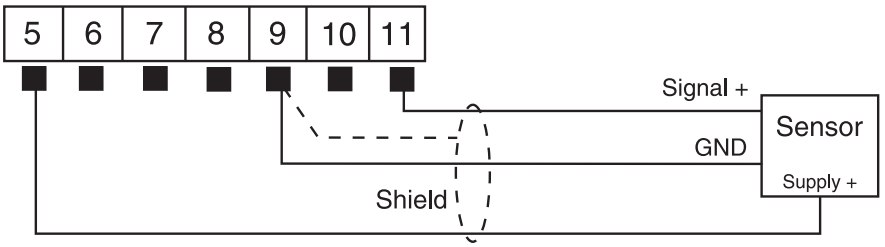
Ex 7. 3 Wire ±10VDC or ±100VDC output sensor using 25mA max. unregulated 18 to 24VDC transmitter supply (approx. 15VDC transmitter supply in isolated DC supply models)



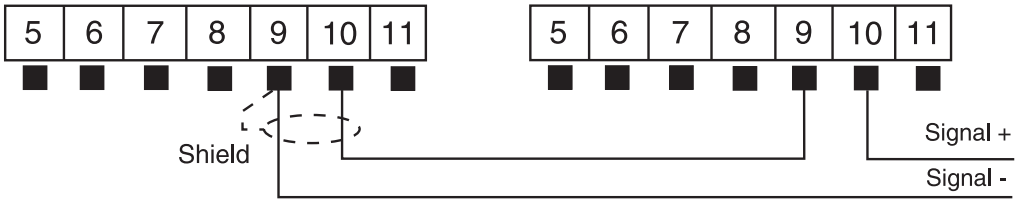
Ex 8. Direct input ±100mVDC or ±1VDC



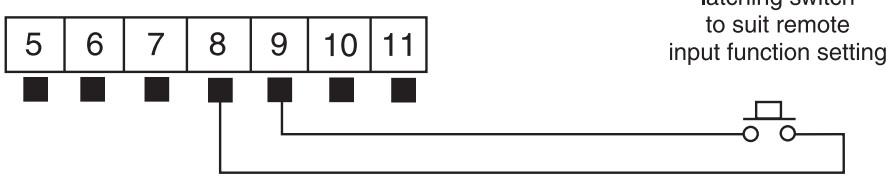
Ex 9. 3 Wire ±100mVDC or ±10VDC output sensor using 25mA max. unregulated 18 to 24VDC transmitter supply (approx. 15VDC transmitter supply in isolated DC supply models)



Ex 10. Two PM6-IE displays wired in series for 4-20mA input



Ex 11. Remote input wiring



4 Function tables - summary of setup functions

Note the order in which the functions are displayed may vary slightly depending on whether entry is made via FUNC or CAL mode.

4.1 Common functions

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

Display	Function	Range	Default	Your record	Ref/Page
drnd	Display rounding	1 to 5000	1		5.1 / 13
FLtr	Digital filter	0 to 8	2		5.2 / 13
br9t	Display brightness level	1 to 15	15		5.3 / 14
duLL	Display remote brightness switching	0 to 15	1		5.4 / 14

4.2 Standard mode or square root mode functions

Function table for standard mode or square root mode display i.e. SLCt function set Stnd or Sqrt
Functions in this table are available only in CAL mode or if ACCS is set to ALL

Display	Function	Range	Default	Your record	Ref/Page
dCPt	Decimal point	0, 0.1 etc.	0		5.5 / 14
InPt	Input type selection	4-20.0-20. 0-0.1.0-1. 0-10 or 0-100	4-20		5.6 / 14
CAL 1	First live input calibration scaling point	Any display value	n/a		5.7 / 15
CAL2	Second live input calibration scaling point	Any display value	n/a		5.8 / 15
CAL OFSt	Calibration offset	Any display value	n/a		5.9 / 15
SCLE En4	4mA input scale	Any display value	0		5.10 / 15
SCLE En20	20mA input scale	Any display value	1000		5.11 / 15
SCLE En0	0mA or 0V input scale	Any display value	0		5.12 / 15
SCLE P100	100mV input scale	Any display value	1000		5.13 / 16

SCLE En 1	1V input scale	Any display value	1000		5.14 / 16
SCLE En 10	10V input scale	Any display value	1000		5.15 / 16
SCLE En 100	100V input scale	Any display value	1000		5.16 / 16
UCAL	Uncalibrate	n/a	n/a		5.17 / 16
SLCt	Operation mode	Stnd.SPrt or tbl E	Stnd		5.18 / 17
r.I nP	Remote input function	NONE, P.HLd, d.HLd, Hi , Lo, dULL or ZERO	NONE		5.23 / 18
Lo dI SP	Low overrange visual warning limit value	Any display value or OFF	OFF		5.24 / 19
HI 9H dI SP	High overrange visual warning limit value	Any display value or OFF	OFF		5.25 / 19
dI SP	Display visual warning flashing mode	FLSH or -or-	FLSH		5.26 / 19
ACCS	Access mode	OFF.NONE or ALL	OFF		5.27 / 20

4.3 Lineariser functions

Function table for lineariser table display mode i.e. SLCt function set tbLE
Functions in this first table are available in FUNC or CAL mode.

Display	Function	Range	Default	Your record	Ref/Page
drnd	Display rounding	1 to 5000	1		5.1 / 13
FLtr	Digital filter	0 to 8	2		5.2 / 13
br9t	Display brightness level	1 to 15	15		5.3 / 14
dULL	Display remote brightness switching	0 to 15	1		5.4 / 14

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

Display	Function	Range	Default	Your record	Ref/Page
dCPt	Decimal point	0, 0.1 etc.	0		5.5 / 14
InPt	Input type selection	4-20.0-20. 0-0.1.0-1. 0-10 or 0-100	4-20		5.6 / 14

CAL 1	First live input calibration scaling point	Any display value	n/a		5.7 / 15
CAL2	Second live input calibration scaling point	Any display value	n/a		5.8 / 15
CAL OFSt	Calibration offset	Any display value	n/a		5.9 / 15
SCLE En4	4mA input scale	Any display value	0		5.10 / 15
SCLE En20	20mA input scale	Any display value	1000		5.11 / 15
SCLE En0	0mA or 0V input scale	Any display value	0		5.12 / 15
SCLE P 100	100mV input scale	Any display value	1000		5.13 / 16
SCLE En 1	1V input scale	Any display value	1000		5.14 / 16
SCLE En 10	10V input scale	Any display value	1000		5.15 / 16
SCLE En 100	100V input scale	Any display value	1000		5.16 / 16
UCAL	Uncalibrate	n/a	n/a		5.17 / 16
SLCt	Operation mode	Stnd.SQrt or tbl E	Stnd		5.18 / 17
tbl E PntS	Linearisers table points	2 to 16	2		5.19 / 17
SEt tbl E	Enter linearisers values	n/a	n/a		5.20 / 17
tbl E StOP	Linearisers table overrange operation	OFF or on	OFF		5.21 / 18
SCLE tbl E	Linearisers table rounding value	1.2.5. 10. 20.25.50. 100.200. 250.500 or 1000	1		5.22 / 18
r.I nP	Remote input function	NONE, P.HLd, d.HLd, Hi , Lo, duLL or ZEr0	NONE		5.23 / 18
Lo dI SP	Low overrange visual warning limit value	Any display value or OFF	OFF		5.24 / 19
HI 9H dI SP	High overrange visual warning limit value	Any display value or OFF	OFF		5.25 / 19
dI SP	Display visual warning flashing mode	FLSH or -or-	FLSH		5.26 / 19

ACCS	Access mode	OFF, NONE or ALL	OFF		5.27 / 20

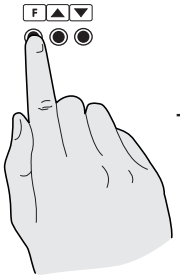
5 Explanation of functions

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.

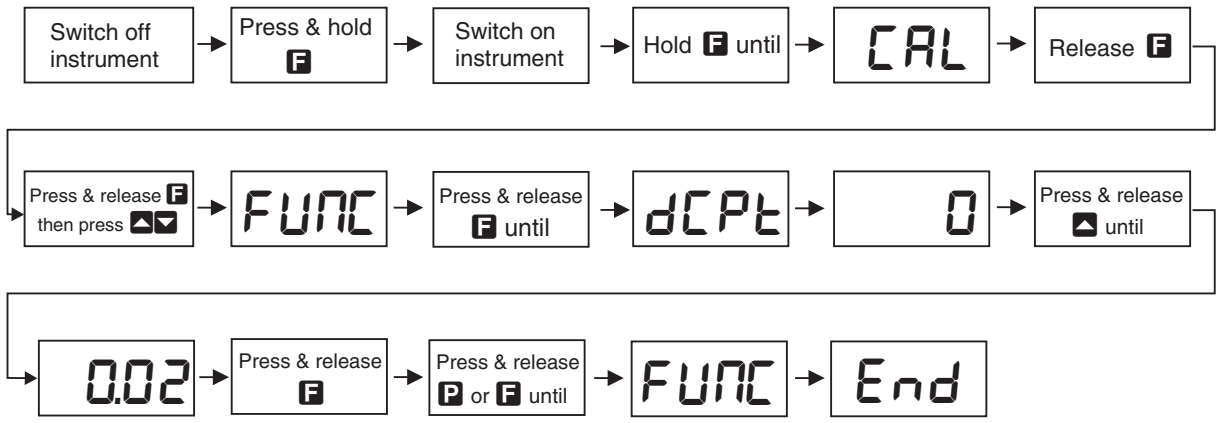
1. When the "wake up" messages have finished and the display has settled down to its normal reading press, then release the F button.

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 decimal point function dCPt from 0 to 0.02



Explanation of Functions

5.1 Display rounding

Display: drnd
Range: 1 to 5000
Default Value: 1

Displays and sets the display rounding value. This value may be set to 1 - 5000 displayed units. Display rounding is useful for reducing the instrument resolution without loss of accuracy in applications where it is undesirable to display to a fine tolerance. 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 display values will change in multiples of 10 only i.e. display moves from 10 to 20 to 30 etc.

5.2 Digital filter

Display: FLtr
Range: 0 to 8
Default Value: 2

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

5.3 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.

5.4 Display remote brightness switching

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

Displays and sets the level for remote input brightness switching, see r.1 nP function. When a remote input is set to dull the remote input can be used to switch between the display brightness level set by the brgt function 5.3 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.

5.5 Decimal point

Display: dcPt
Range: 0, 0.1 etc.
Default Value: 0

Displays and sets the decimal point. By pressing the ▲ or ▼ pushbutton at the dcPt function 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) or 0.003 (3 decimal places). Note if the decimal point is altered the display will need to be recalibrated.

5.6 Input type selection function

Display: inPt
Range: 4-20, 0-20, 0-0.1, 0-1, 0-10 or 0-100
Default Value: 4-20

This function is used to select the input type. Select from one of the following:

4-20 for 4-20mA input, 0-20 for ±20mA input, 0-0.1 for ±100mV input, 0-1 for ±1V input, 0-10 for ±10V or 0-100 for ±100V input. Note that the wiring may have to change if a different input type is selected. Refer to "Electrical installation" chapter 3.

5.7 First calibration scaling point

Display: CAL 1
Range: Any display value
Default Value: n/a

First scaling point for 2 point calibration scaling - See "Calibration" chapter, section 6.

5.8 Second calibration scaling point

Display: CAL2
Range: Any display value
Default Value: n/a

Second scaling point for 2 point calibration scaling - See "Calibration" chapter, section 6.

5.9 Calibration offset

Display: CAL OFSt
Range: Any display value
Default Value: n/a

Calibration offset - See section 6.4.

5.10 4mA input scale

Display: SCLE En4
Range: Any display value
Default Value: 0

4mA input scale value, use only as an alternative to CAL 1 and CAL2 calibration - See "Calibration" chapter 6.

5.11 20mA input scale

Display: SCLE En20
Range: Any display value
Default Value: 1000

20mA input scale value, use only as an alternative to CAL 1 and CAL2 calibration - See "Calibration" chapter 6.

5.12 0mA or 0V input scale

Display: SCLE En0
Range: Any display value
Default Value: 0

Seen only when the INPt function is set to 0-20.0-0. 1.0- 1.0- 10 or 0- 100. 0mA or 0V input scale value, use only as an alternative to CAL 1 and CAL2 calibration - See "Calibration" chapter 6.

5.13 100mV input scale

Display: SCLE P 100
Range: Any display value
Default Value: 1000

Seen only when the INPt function is set to 0-0.1. 100mV input scale value, use only as an alternative to CAL 1 and CAL2 calibration - See "Calibration" chapter 6.

5.14 1V input scale

Display: SCLE En 1
Range: Any display value
Default Value: 1000

Seen only when the INPt function is set to 0-1. 1V input scale value, use only as an alternative to CAL 1 and CAL2 calibration - See "Calibration" chapter 6.

5.15 10V input scale

Display: SCLE En 10
Range: Any display value
Default Value: 1000

Seen only when the INPt function is set to 0-10. 10V input scale value, use only as an alternative to CAL 1 and CAL2 calibration - See "Calibration" chapter 6.

5.16 10V input scale

Display: SCLE En 100
Range: Any display value
Default Value: 1000

Seen only when the INPt function is set to 0-100. 100V input scale value, use only as an alternative to CAL 1 and CAL2 calibration - See "Calibration" chapter 6.

5.17 Uncalibrate

Display: UCAL
Range: n/a
Default Value: n/a

Uncalibrate, resets calibration - See "Calibration" chapter, section 6.5 - required only when a calibration problem occurs and it is necessary to clear the calibration memory. At the UCAL function press the ▲ and ▼ buttons simultaneously. The message CAL CLr should be seen to indicate that the calibration memory has been cleared.

5.18 Operation mode selection

Display:	SLCt
Range:	Stnd, SQrt or tbl E
Default Value:	Stnd

This function is used to select the display operation mode. Select from one of the following:

- **Stnd** - standard input, in this operation mode the display operates as a linear display with 2 point calibration scaling.
- **SQrt** - square root law display. When the square root facility is used the scaled displayed value follows the square root of the percentage of the full scale input value. The upper and lower input limits are calibrated as normal using 2 point calibration since are the values to be displayed at the input limits.
  Note: It is essential that the display is recalibrated or rescaled whenever the square root function is turned on or off. The **CAL OFSt** function cannot be used when the display is used in square root mode.

  Example: For a 4–20mA input if you wish to display 0 at 4mA and 1000 at 20mA the square root function will calculate as follows:
  At 20mA (100%) the display will be **1000** i.e. $\sqrt{1} \times 1000$.
  At 16mA (75%) the display will be **866** i.e. $\sqrt{0.75} \times 1000$.
  At 12mA (50%) the display will be **707** i.e. $\sqrt{0.5} \times 1000$ and so on.
- **tbLE** - lineariser mode. In this mode the display can operate using up to 16 linearisers points. These points are entered into a table. Refer to chapter 7.

5.19 Lineariser table points

Display:	tbl EPnt S
Range:	2 to 16
Default Value:	2

This function is used to set the number of lineariser points to be set in the lineariser table. Note that the **SLCt** function must be set to **tbLE** to access this function. Refer to chapter 7 for full description.

5.20 Enter lineariser table values

Display:	SEt tbl E
Range:	n/a
Default Value:	n/a

This function is used to enter points into the lineariser table. Note that the **SLCt** function must be set to **tbLE** to access this function. Refer to chapter 7 for full description.

5.21 Lineariser table overrange operation

Display: tbl E StOP
Range: OFF or on
Default Value: OFF

Sets the display mode when values outside those set in the table are encountered. Note that the SLCt function must be set to tbLE to access this function. Refer to chapter 7 for full description.

5.22 Linearisер table rounding value

Display: SCLE tbl E
Range: 1.2.5. 10 .20.25.50. 100.200.250.500 or 1000
Default Value: 1

Sets the display rounding value for Y values entered into the lineariser table. Note that the SLCt function must be set to tbLE to access this function. Refer to chapter 7 for full description.

5.23 Remote input function

Display: r.1 nP
Range: nONE, P.HLd, d.HLd, Hi , Lo, duLL or 2Er0
Default Value: nONE

Remote input function - terminals 8 and 9 at the rear of the instrument are the remote input terminals. When these terminals are short circuited via a switch, relay, keyswitch etc. the instrument will perform the selected remote input function. A message will flash to indicate which function has been selected when the remote input pins are short circuited. The remote input functions are as follows:

- nONE - no remote function required i.e. activating the remote input has no effect.
- P.HLd - peak hold. The display will show the peak 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.
- d.HLd - display hold. The 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.
- Hi - peak memory. The peak value stored in memory will be displayed if the remote input terminals are short circuited, if the short circuit is momentary then the display will 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.
- Lo - valley memory. The minimum 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.

- **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.
- **ZERO** - zero display. This function allows the display to be zeroed using the remote input. When this function is used the display will show the message **ZERO** momentarily and the input at the time of the zero operation will now be displayed as **0** or **0.0** etc. depending on decimal point setting.

5.24 Low overrange visual warning limit value

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

Low overrange limit value - the display can be set to show an overrange message if the display value falls below the **Lo dI SP** setting. For example if **Lo dI SP** 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 **dI SP** function 5.26). 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.

5.25 High overrange visual warning limit value

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

High overrange limit value - the display can be set to show an overrange message if the display value rises above the **HI 9H dI SP** setting. For example if **HI 9H dI SP** 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 **dI SP** function 5.26). 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.

5.26 Display visual warning flashing mode

Display: **dI SP**
Range: **FLSH** or **-or-**
Default Value: **FLSH**

Display overrange warning flashing mode - this function is used in conjunction with the **Lo dI SP** and **HI 9H dI SP** functions. The **dI SP** function can be set to **FLSH** or **-or-**. If the display warning value set at the **Lo dI SP** or **HI 9H dI SP** function is exceeded and the **dI SP** function is set to **FLSH** then the display value will flash on and off every second as a visual warning. If the display warning value set at the **Lo dI SP** or **HI 9H dI SP** function is exceeded and the **dI SP** function is set to **-or-** then the **-or-** message will 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.

5.27 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.

5.28 Returning to normal measure mode

When the calibration has been completed it is advisable to return the instrument to the normal mode (where calibration functions are less likely to be tampered with). To return to normal mode, turn off power to the instrument, wait a few seconds and then restore power.

5.29 Error messages

SPAN Err - calibration span error. Live inputs used at CAL 1 and CAL2 too close in value. Recalibrate using inputs further apart in value. If you are certain that the inputs are far enough apart but still see the SPAN Err message then ignore the message and continue with the two point calibration. At the end of the calibration check to see if the display calibration is correct and if not recalibrate using the same inputs.

Unstable display - if the display is not stable the usual cause is either that the input signal is unstable or that the calibration scaling was incorrectly attempted. If the calibration scaling was unsuccessful then uncalibrating the display at the UCAL function should return the display to stable readings but the previous calibration scaling values will be lost. If the display is still not stable after uncalibrating then check the input for stability and noise.

Display shows "- - - -" - this message indicates that the input signal is higher than the range selected e.g. higher than 20mA .

Display shows "-or-" - this message indicates either that the number is too big to display e.g. above 9999 or that the di SP function has be set to -or- and either the Lo di SP or HI 9H di SP limits have been exceeded.

Display value flashes on and off - this indicates that di SP function has be set to FLSH and either the Lo di SP or HI 9H di SP limits have been exceeded.

Display shows NO ACC - this indicates that the ACCS function has been set to NONE blocking entry to FUNC mode. Enter functions via CAL mode to gain entry to functions and if required change the ACCS function setting.

6 Calibration

The instrument can be calibrated via a two point live input calibration method using functions **CAL 1** and **CAL2**. An alternative method allows display scaling without live inputs. The functions used for this alternative method will vary depending on the input range selected at the **1 nPt** function. For example for a 4–20mA input the **SCLE En4** and **SCLE En20** functions can be used. Each of these methods and other calibration scaling function are described in this chapter.

In order to gain access to the calibration functions you must be in **CAL** mode or have the **ACCS** function set to **ALL**, refer to Chapter 5, page 12 which shows the method of entering **CAL** mode.

Note that if the linear iser table is turned on at the **SLCt** function then when calibrating one decimal point will be displayed automatically irrespective of the **dCPt** function setting.

6.1 Live signal input calibration

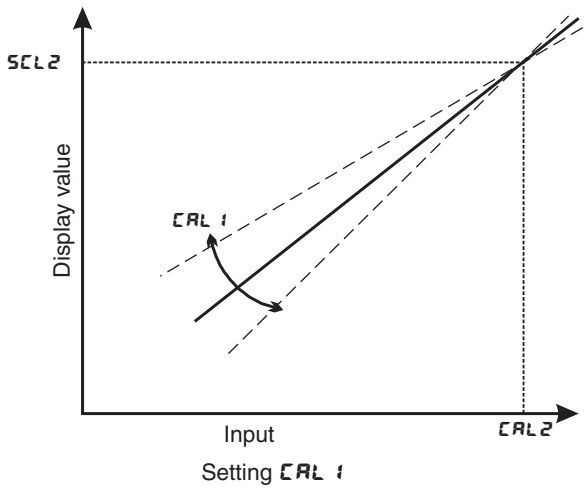
CAL 1 and **CAL2** - The functions **CAL 1** and **CAL2** are used together to scale the instruments display, values for both **CAL 1** and **CAL2** must be set when using this scaling method. The **CAL 1** function sets the first calibration point for live input calibration. When using this method different signal level inputs must be present at the input terminals for **CAL 1** and **CAL2**. Note: **CAL 1** and **CAL2** can be set independently.

The procedure for entering the first scaling point **CAL 1** is as follows:

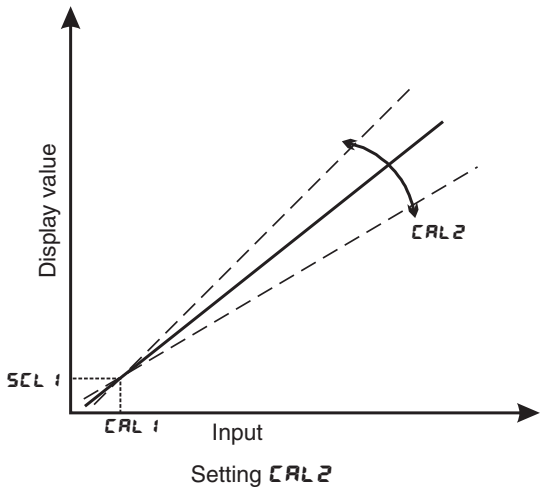
a. Ensure that an input signal is present at the input terminals, this will usually be at the low end of the signal range e.g. 4mA.

b. At the **CAL 1** function press ▲ and ▼ simultaneously then release them. The display will show the live input value. Do not be concerned at this stage if the live input display value is not what is required. It is important that the live input value seen is a steady value, if not then the input needs to be investigated before proceeding with the scaling.

c. Press then release the **F** button. The display will indicate **SCL 1** followed by a value. Use the ▲ or ▼ button to change this value to the required display value at this input. e.g. if 4mA was input and the required display at 4mA was **0** then ensure **0** is entered at **SCL 1**. Press the **F** button to accept changes. If the scaling has been accepted the **CAL End** message should be seen.



Setting **CAL 1**



Setting **CAL2**

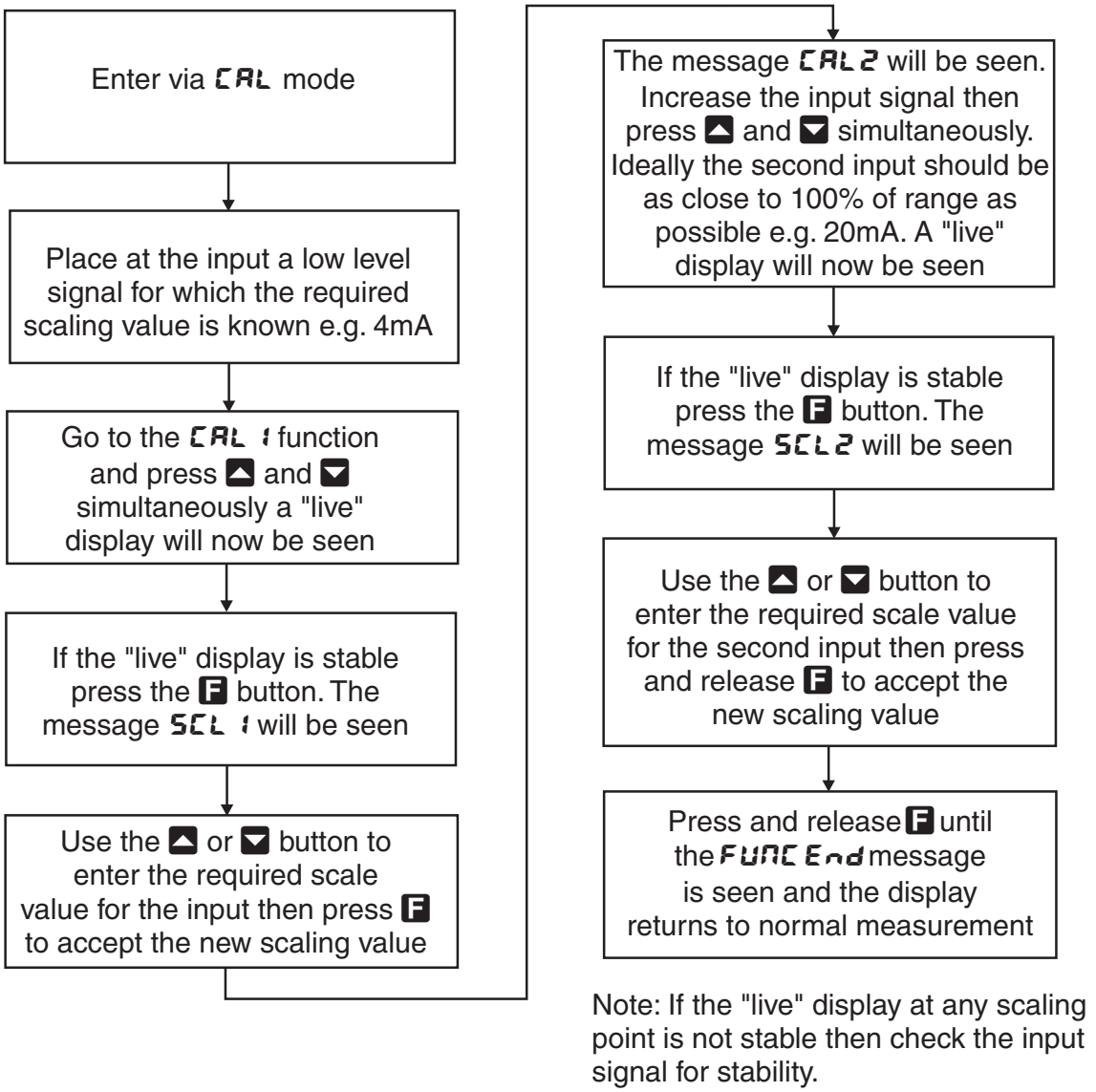
The procedure for entering the second scaling point CAL 2 is as follows:

a. Ensure that an input signal is present at the input terminals, this will usually be at the high end of the signal range i.e. close to 20mA or close to 100% of full scale for other input ranges. The change in input signal from the CAL 1 input must be at least 2mA or 10% of full scale for other input ranges.

b. At the CAL 2 function press ▲ and ▼ simultaneously then release them. The display will show the live input value. Do not be concerned at this stage if the live input display value is not what is required. It is important that the live input value seen is a steady value, if not then the input needs to be investigated before proceeding with the scaling.

c. Press then release the F button. The display will indicate SCL 2 followed by a value. Use the ▲ or ▼ button to change this value to the required display value at this input. e.g. if 20mA was input and the required display at 20mA was 500 then ensure 500 is entered at SCL 2. Press the F button to accept changes. If the scaling has been accepted the CAL End message should be seen.

Example - Flow chart showing scaling using two live inputs



Note: If the "live" display at any scaling point is not stable then check the input signal for stability.

6.2 Alternative 0–20mA or 4–20mA scaling

This scaling method which uses functions **SCLE En4** (use **SCLE En0** if 0–20mA input is selected) and **SCLE En20** allows the display scale values for 4mA and 20mA to be directly entered without live input. When a sensor is subsequently connected a check for zero offset in the sensor should be made by viewing the display value at a point where the sensor output should be at 4mA output. A remote input zero or calibration offset can be used to adjust for any zero offset in the sensor, see **r.I nP** and **CAL OFSt** functions. If the slope of the sensor output is not correct then **CAL 1** and **CAL2** methods will have to be used.

SCLE En4 - 4mA input scaling without a live input - The instrument can be scaled for a 4–20mA input without a live input i.e. this is an alternative method to the **CAL 1** and **CAL2** method of scaling. To perform the first point (**En 4**) scaling simply press the ▲ and ▼ buttons simultaneously when the **SCLE En4** function is displayed. The display will now indicate a value. Use the ▲ or ▼ button to change this value to the display value required for a 4mA input. Press the **F** button to accept changes or the **P** button to abort the scaling. If the scaling has been accepted the **CAL End** message should be seen.

SCLE En20 - 20mA input scaling without a live input - this calibration method can be used with 4–20mA or 0–20mA inputs only. To perform the second point (**En 20**) scaling simply press the ▲ and ▼ buttons simultaneously when the **USEr En20** function has been reached. The display will now indicate a value. Use the ▲ or ▼ button to change this value to the display value required for a 20mA input. Press the **F** button to accept changes or the **P** button to abort the scaling. If the scaling has been accepted the **CAL End** message should be seen.

6.3 Alternative 0–100mV, 0–1V, 0–10V or 0–100V scaling

Used when the input type selected at the **InPt** function is set to **0-0. 1.0- 1.0- 10** or **0- 100**. This scaling method which uses the **SCLE En0** function allows the display scale values for 0mA or 0V to be directly entered without live input. When a sensor is subsequently connected a check for zero offset in the sensor should be made by viewing the display value at a point where the sensor output should be at 0mA or 0V output. A remote input zero or calibration offset can be used to adjust for any zero offset in the sensor, see **r.I nP** and **CAL OFSt** functions. If the slope of the sensor output is not correct then **CAL 1** and **CAL2** methods will have to be used.

SCLE En0 - 0mA or 0V input scaling without a live input - The instrument can be scaled for a 0–20mA, 0–100mV, 0–1V, 0–10V or 0–100V input without a live input i.e. this is an alternative method to the **CAL 1** and **CAL2** method of scaling. To perform the first point (**En 0**) scaling simply press the ▲ and ▼ buttons simultaneously when the **SCLE En0** function is displayed. The display will now indicate a value. Use the ▲ or ▼ button to change this value to the display value required for a 0mA or 0V input. Press the **F** button to accept changes or the **P** button to abort the scaling. If the scaling has been accepted the **CAL End** message should be seen.

SCLE P 100 - 100mV input scaling without a live input - this calibration method can be used with 0–100mV inputs only. To perform the second point scaling simply press the ▲ and ▼ buttons simultaneously when the function has been reached. The display will now indicate a value. Use the ▲ or ▼ button to change this value to the display value required for a 100mV input. Press the **F** button to accept changes or the **P** button to abort the scaling. If the scaling has been accepted the **CAL End** message should be seen.

SCLE En 1 - 1V input scaling without a live input - this calibration method can be used with 0–1V inputs only. To perform the second point scaling simply press the ▲ and ▼ buttons simultaneously when the function has been reached. The display will now indicate a value. Use the ▲ or ▼ button to change this value to the display value required for a 1V input. Press the F button to accept changes or the P button to abort the scaling. If the scaling has been accepted the **CAL End** message should be seen.

SCLE En 10 - 10V input scaling without a live input - this calibration method can be used with 0–10V inputs only. To perform the second point scaling simply press the ▲ and ▼ buttons simultaneously when the function has been reached. The display will now indicate a value. Use the ▲ or ▼ button to change this value to the display value required for a 10V input. Press the F button to accept changes or the P button to abort the scaling. If the scaling has been accepted the **CAL End** message should be seen.

SCLE En 100 - 100V input scaling without a live input - this calibration method can be used with 0–100V inputs only. To perform the second point scaling simply press the ▲ and ▼ buttons simultaneously when the function has been reached. The display will now indicate a value. Use the ▲ or ▼ button to change this value to the display value required for a 100V input. Press the F button to accept changes or the P button to abort the scaling. If the scaling has been accepted the **CAL End** message should be seen.

6.4 Offset calibration

CAL OFSt - Calibration offset - the calibration offset is a single point adjustment which can be used to alter the calibration scaling values across the entire measuring range without affecting the calibration slope. This method can be used instead of performing a two point calibration when a constant measurement error is found to exist across the entire range. To perform a calibration offset press the ▲ and ▼ buttons simultaneously at the **CAL OFSt** function. A "live" reading from the input will be seen, make a note of this reading. Press the F button, the message **SCLE** will now be seen followed by the last scale value in memory. Use the ▲ or ▼ button to adjust the scale value to the required display value for that input. For example if the "live" input reading was **50** and the required display value for this input was **70** then adjust the **SCLE** value to **70**. Press the F button to accept changes or the P button to abort the scaling. If the scaling has been accepted the message **OFSt End** should be seen.

6.5 Uncalibration

UCAL - Uncalibrate - used to set the instrument back to the factory calibration values. This function should only be used when calibration problems exist and it is necessary to clear the calibration memory. To clear the calibration memory press the ▲ and ▼ buttons simultaneously at the **UCAL** function. The message **CAL CLr** will be seen to indicate that the memory has cleared.

7 Setting up the lineariser

The four functions described in this chapter are used to set up the lineariser table. The lineariser is of the X,Y type with space for up to 16 points to be programmed and stored. All points are stored in flash memory and will be retained when power is removed. A table is provided in which you can make a permanent written record of the points entered.

The X values for each point will actually be indicated as **P** (e.g. **P 1**, **P2** etc.) since the seven segment display cannot show an X. The **P** values are normally entered either as a percentage of full scale input or as a direct representation of the input signal e.g. for a 4-20mA input you could either enter 4mA = 0.0 and 20mA = 100.0 or 4mA = 4.0 and 20mA = 20.0. The value entered into the table must correspond with the initial calibration values (**CAL 1** and **CAL2** or **SCLE En4** and **SCLE En20**). For example if a 4-20mA input is initially scaled to read from 0.0 to 100.0 then you cannot enter these values as 4.0 to 20.0 in the table (without causing errors in the reading). The number of decimal points available for entering **P** values is 1 decimal place no matter what the **dCPt** function is set to. The Y values are indicated as **Y** e.g. **Y 1**, **Y2** etc. These **Y** values represent the display required for the given **P** value entered. For example if **P3** = **25.0** and **Y3** = **1500** then **1500** will be displayed whenever that input is present. **Y** values to be entered into the lineariser table must be either calculated or measured via a live input.

The number of decimal point places available for entering the **P** values is fixed at one decimal place. The number of decimal point places available for entering **Y** values will match the decimal places that the **dCPt** function is set to. Refer to the Example later in this chapter for an example of creating a lineariser table using live inputs.

The functions used to set the table are described in this chapter. The steps required to set up the lineariser are:

1. Calculate or measure the linearisers points required and enter them in the table provided in this chapter.
2. If display rounding is required for the table set this at the **SCLE tbl E** function.
3. Perform a 2 point calibration using **CAL 1** and **CAL2** or one of the alternative scaling methods e.g. **SCLE En4** and **SCLE En20** if a 4–20mA input is being used, see above for suggested units for calibration.
4. Set the number of linearisers points required at the **tbl E PntS** function.
5. Enter into the memory the **P** and **Y** points written in the table using the **SEt tbl E** function.
6. Decide if the **tbl E StOP** should be set to **on** or **OFF** and set this accordingly.

7.1 Table points (**tbl E PntS**) function

Displays and sets the number of points in the linearisers table. Up to 16 points can be selected. Select the number you require and enter that number of points. If you wish to increase or decrease the number of points then the **tbl E PntS** value can be changed at a later stage.

7.2 Set table (**SEt tbl E**) function

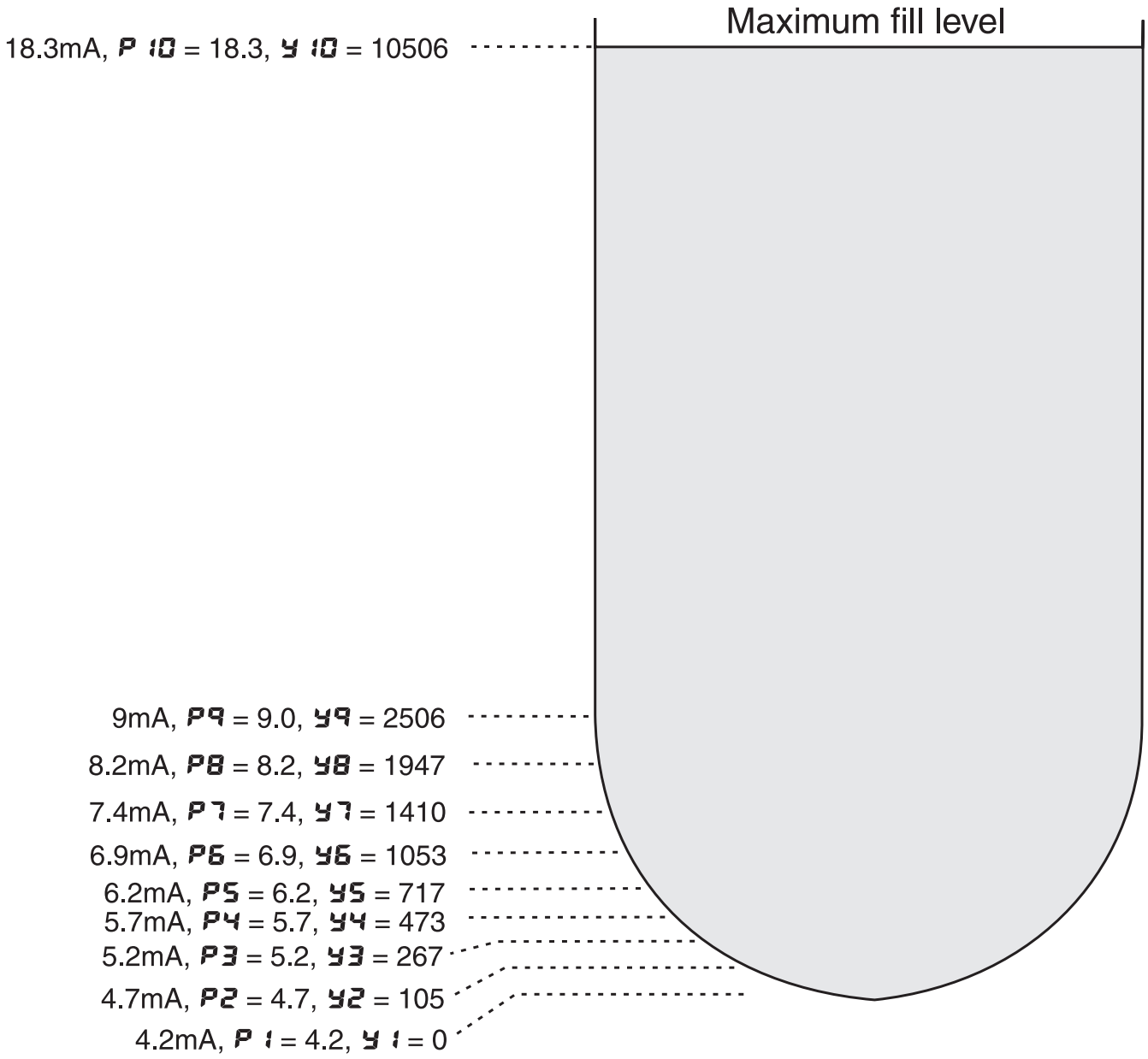
This function allows values to be entered into the linearisers table. Entries to the table do not need to be in any ascending or descending order since the instrument will automatically arrange the points in order at the end of the entry sequence. The procedure for entering points is:

1. At the SEt tbl E function press the ▲ and ▼ buttons simultaneously.
2. The display will show P 1 indicating the first linearising point followed by the first P value in memory, use the ▲ or ▼ button to adjust this to the required first input point value.
3. Press the F button, the display will indicate y 1 followed by the first y value in memory, again use the ▲ or ▼ button to make any changes to the value required.
4. Press the F button, the display will indicate P2 followed by the second P value in memory.

Repeat the process described in steps 3 and 4 until all points have been entered.

Example

A pressure transmitter with a 4–20mA output is installed near the base of an irregularly shaped tank, see diagram which follows, containing a liquid. The transmitter is connected to the display and 10 linearising points are required to measure the number of litres in the tank. The output from the transmitter will be linear between P9 and P10 since the sides of the tank are straight. Most of the lineariser points are concentrated on the non linear (curved) parts of the tank i.e. the parts of the tank in which the output from the transducer will not be linear.



The procedure used is as follows:

a All general functions are set as required i.e. display rounding etc.

b Use **CAL 1** and **CAL2** or **SCLE En4** and **SCLE En20** to scale the display to show 4mA = **4.0**, 20mA = **20.0**.

c The tank is emptied and the transmitter is connected to the display, the tank will need to be gradually filled whilst the lineariser table record is completed. Note that the reverse process is equally valid i.e. starting with a full tank and gradually emptying it.

d The first reading is taken from the display (4.2 in this case) with the tank virtually empty this represents a reading of zero litres. The lineariser table is filled in for the first point, **P 1** = **4.2**, **y 1** = **0**.

e The tank is now gradually filled and a flowmeter is used to measure the number of litres entering the tank. The panel meter reading will change as the tank is filled.

f The second reading is taken from the display (4.7 in this case), at this point 105 litres had been added to the tank. The lineariser table is filled in for the second point, **P2** = **4.7**, **y2** = **105**.

g Repeat the filling procedure until all 10 points are recorded, the results in this example are shown in the example diagram and table.

h The figures from the written table record now need to be transferred to the instruments lineariser table memory. Set the **tbl EPnt5** function to **10**.

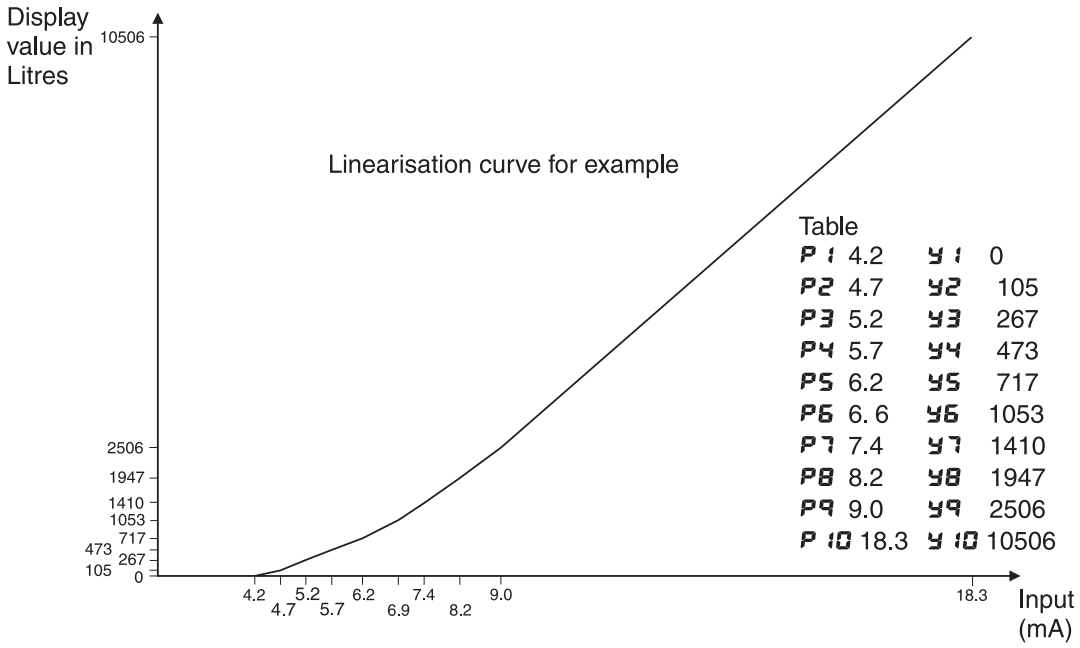
i At the **SEt tbl E** function press the ▲ and ▼ button simultaneously. The display will show **P 1** followed by a number, use the ▲ or ▼ button to change this number to **4.2**.

j Press then release the **F** button. The display will indicate **y 1** followed by a number. Use the ▲ or ▼ button to change this to **0**.

k Press, then release, the **F** button. The display will indicate **P2** followed by a number. Use the ▲ or ▼ button to change this to **4.7**.

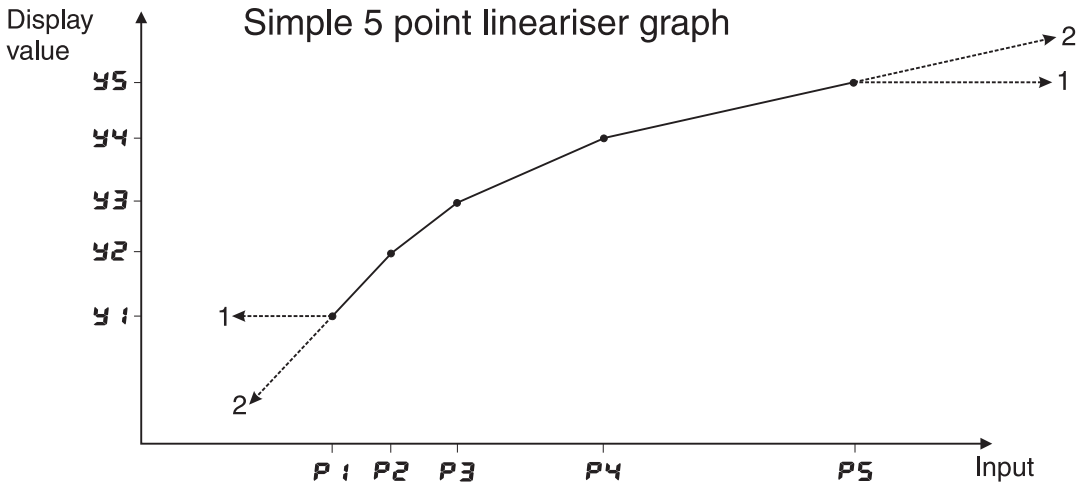
l Repeat the process until all the **P** and **y** values have been entered.

Continue pressing then releasing the **F** button until the **FUNC End** message is seen and the display returns to measurement mode.


Display value in Litres
10506
2506
1947
1410
1053
717
473
267
105
0
Linearisation curve for example
Table
P 1 4.2 y 1 0
P2 4.7 y2 105
P3 5.2 y3 267
P4 5.7 y4 473
P5 6.2 y5 717
P6 6. 6 y6 1053
P7 7.4 y7 1410
P8 8.2 y8 1947
P9 9.0 y9 2506
P 10 18.3 y 10 10506
4.2
4.7
5.2
5.7
6.2
6.9
7.4
8.2
9.0
18.3
Input (mA)

7.3 Table stop (tbl E StOP) function

This function sets the mode in which the instrument will behave when a value is input which is higher than the largest value entered in the table or lower than the smallest value entered in the table. Refer to the graph above. If set to on then the display value will remain equal to the nearest table entry value. For example if the lowest table entry is made at 8mA and the display indicates 500 at this value then any input lower than 8mA will also cause the display to indicate 500. If set to OFF then the display value will continue to change when an input outside the table limits is encountered. The instrument will extrapolate the reading using the slope of the previous pair of points.



Arrows labelled "1" show the effect of tAbl StOP function = on
Arrows labelled "2" show the effect of tAbl StOP function = OFF

7.4 Scale table (SCLE tbl E) function

This function allows a rounding value to be set for y entries. Options provided are 1.2.5. 10. 20.25.50. 100.250.500 or 1000. For example if the rounding value is set to 25 then the y entries will jump in steps of 25 i.e. 0.25.50.75 etc. (or 0.00.0.25 etc. depending on decimal place setting). This rounding factor is useful in that it allows the speeding up of entries into the table, it does not cause the final display value to jump in steps. Use the drnd function if you wish to cause the final display value to also jump in these steps. The SCLE tbl E function can also be used to extend the range of the values which can be entered into the table which is limited to $\pm 32,000$ with the SCLE tbl E function set to 1.

8 Specifications

8.1 Technical specifications

Input type:	4 to 20mA or ±20mA or ±100mVDC or ±1VDC or ±10VDC or ±100VDC selectable via pushbutton function setting and wiring Input is isolated from power supply. Transmitter supply GND and input GND are common
Impedance:	65Ω approx. for mA input, 1MΩ for voltage input
ADC resolution:	15 bit plus sign
Decimal points:	Programmable 0, 1, 2 or 3 decimal point places
Accuracy:	0.1% of full scale when calibrated ±50ppm/^{o}C, ± 1 display digit
Sample Rate:	2 samples per second
Display update:	2 times per second
Transmitter supply:	AC supply models - unregulated 24V (typical 18 - 24V) at 25mA max. DC supply models typically 15V unregulated at 25mA max.
Ambient temperature:	-10 to 50^o C
Humidity:	5 to 95% non condensing
Display:	4 digit 20mm,
Power supply:	AC 240V, 110V or 24V or DC isolated wide range 12 to 48VDC Note: supply type is factory configured
Power useage:	AC supply 2VA + transmitter current DC supply typically 25mA @ 24VDC + transmitter current or 50mA @ 12VDC plus transmitter current

8.2 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)

9 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.