LD5/LE5 Models: I8, V8 and IV4
8 Channel DC Current/Voltage Monitor

Operation and Instruction Manual

Table of Contents

1 Introduction

This manual contains information for the installation and operation of the following instrument models:

Model	Inputs	
LD5–I8	8 x 4-20mA	
LD5–V8	8 x DC Volts (±1 to ±64VDC)	
LD5–IV4	4 x 4-20mA, 4 x DC Volts (±1 to ±64VDC)	
LE5–I8	8 x 4-20mA	With Ethernet and Datalogging
LE5–V8	8 x DC Volts (±1 to ±64VDC)	With Ethernet and Datalogging
LE5–IV4	4 x 4-20mA, 4 x DC Volts (±1 to ±64VDC)	With Ethernet and Datalogging

Features

Signal inputs - All of these models have 8 input channels.

- The LD5/LE5–I8 has eight 4-20mA inputs.

- The LD5/LE5–V8 has eight DC voltage inputs with independently configurable ranges from ±1 to ±64VDC.

- The LD5/LE5–IV4 has four 4-20mA inputs (Channels 1 to 4) and four DC voltage inputs (Channels 5 to 8) with independently configurable ranges from ±1 to ±64VDC.

The LE5 version of each model has the same inputs as the LD5 version but has the optional Ethernet communications and 16MB data logger memory fitted.

Digital inputs - Four digital inputs are provide for remote inputs. Each input can be assigned on of the available functions e.g. Peak hold, display hold etc. Use the `r.i nP` functions to set the remote input operations. Input types can be voltage free switches or switched voltages up to 24VDC depending on type chosen in the function settings for each input.

Outputs - note optional outputs are available in set combinations only, not all optional outputs can be supplied in one unit. The LE5 version models include Ethernet communications and Datalogging capabilities.

Alarms and relays - 4 relays are fitted as standard an extra 4 relays are optionally available. The first 4 relays comprise of 3 off form A relays and 1 off form C relay. The optional extra 4 relays comprise of 4 off form A relays. All relays are rated at 240VAC, 5A into a resistive load. Alarms 1 and/or 2 using relays 1 and 2 can be allocated as PI control relays if required (pulse width or frequency PI control).
Using the `AL 1` to `AL 8` functions up to 8 alarms can be set (low and/or high alarms) and each alarm can be allocated to one or more relays. The relays can be set to automatically reset when out of alarm condition or to latch requiring the operator to push the front **F** button (where fitted) to allow the relay to reset when out of alarm condition. The **P** button and/or a remote input can also be programmed to acknowledge a latching alarm thereby allowing it to reset when out of alarm condition. If a relay has been set to require acknowledgement with automatic reset and is in an activated condition an acknowledgement will reset the relay even if it is still in an alarm condition.

Relay operation - to enable a relay to operate several steps are required, below is a list showing the steps required to enable input 1 to use relay 1 to operate as a high alarm using alarm 1:

- At the `AL Count` function ensure that at least one alarm is enabled.

- At the **AL1Hi9h** function set the required high alarm and ensure that the **AL1Lo** function is set to **OFF**.

- Set the **AL1HYSt**, **AL1tri P** and **AL1rSt** as required.

- At the **AL1rLYS** function set **rLY1** to **On**.

- At the **AL1OPEr** function select **Hi.Lo**.

- At the **AL1Ch** function select **CH1**.

- Set **AL1Ltch**, **rL1rLY** and **rL1AcH** functions as required.

- Set the **rL1bool** function to **Or**.

Calibration

Functions are provided to allow calibration of each input channel. Refer to each function in the "Explanation of Functions" chapter for further details. A basic description of these functions is given below.

The **ınP ı** to **ınP8 U.CAL** functions allow each channel to be "uncalibrated". The uncalibration process overwrites any previous calibrations and returns the instrument to its default calibration.

The **ınP ı** to **ınP8 CAL ı** and **ınP ı** to **ınP8 CAL2** functions are the two calibration functions for each channel. **CAL ı** should be undertaken at a known input, typically an input for a zero display reading and **CAL2** should be undertaken at an input at least 10% of the full range higher than **CAL ı**.

The **ınP ı** to **ınP8 OFSt** function allows an adjustment across the whole range of the channels display reading. For example if it is discovered that the display reading is 2.0 high across the whole range then this function can be used to offset the reading back to the correct reading.

Analog output - Isolated single or dual analog outputs are optionally available in 12 bit (4-20mA only) or 16 bit (4-20mA, 0-1VDC or 0-10VDC). Analog outputs can be selected as retransmission or PI control outputs. Use the **rO ı** to **rO2** functions to set the analog output operation. Any channel or any calculation channel can be chosen for each analog output. The remote input connections on the main circuit board can be set to allow binary input selection of which channel or calculation channel is retransmitted, see the **r.ınP** function for further description of this mode and the Electrical Installation chapter for remote input wiring details.

Communications outputs - Isolated RS232, isolated RS485, USB and/or Ethernet are optionally available. The RS485 and RS232 outputs can be configured for ASCII or Modbus RTU or Modbus TCP (Ethernet only) operation.

Datalogging - on board 16MB data logger memory is supplied with the LE5 Ethernet option. The data logger option also includes PC software to allow viewing and downloading of logged data. One of the serial output options must also be fitted if the data logger is to be used.

Web page - a web page is optionally available and can be used on instruments fitted with the Ethernet plus datalogger options. The web page allows remote viewing of the scanning monitor readings and setup and if permission is allowed it will also allow some settings to be remotely changed.

Calculation channels

In addition to the 8 physical input channels up to eight "calculation" channels can be selected. These calculation channels are memory locations which hold the result of an available arithmetic operation. For example calculation channel 1 memory could be set to hold the value of the average of inputs 1, 3 and 5.

The value stored in the calculated channel memory can also be used in arithmetic operations with other inputs or calculated channels and can also be used as an alarm value to activate relays. For example the user could program relay 2 to active if the average from inputs 1, 3 and 5 exceeds 150 degrees.

Choose the calculation operation at the **CALC ı** to **CALC8 Func** function and the channels to which this function will apply at the **CALC ı** to **CALC8 ChAn SEL** functions.

If the optional serial output is fitted the calculation channel values will be transmitted following the input channels when "continuous" output mode is chosen.
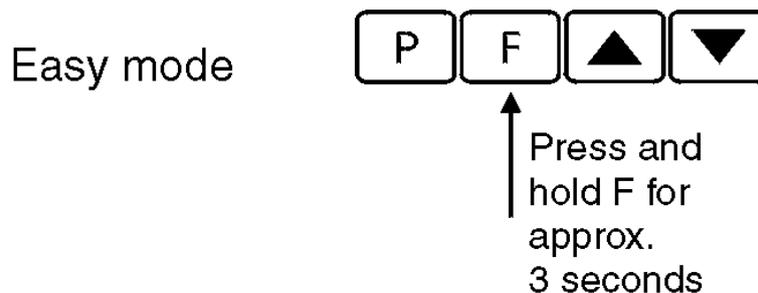
1.1 Accessing setup functions

The setup functions allow adjustment of the instruments operation functions. There are five different ways of accessing setup functions. Each mode allows a selection of access levels i.e. allows some choice of which functions are accessible.

As as summary the methods available are:

- **Easy mode** - this is the easiest access mode simply requiring the **F** button to be pressed for 3 seconds. This mode would normally be used to gain access to functions which require frequent adjustment.

- **Remote input mode** - this uses the Easy method of access but also requires the use of a remote input switch.

- **PIN 1 mode** - this method allows a PIN to be set with access via PIN entry.

- **PIN 2 mode** - this method also requires a PIN and would generally be use to allow a higher access level than the first PIN.

- **Super Cal mode** - this method requires a power up procedure and will allow access to all functions.

These modes are explained in more detail below.

- **Easy mode** - Allows access to the level set by the function in the **ACCS** menu. By default the Easy access is set to **CAL** level allowing access to all setup functions.
  The Easy mode simply requires that the **F** button is held pressed until the message **FUNC** is seen followed by the first function message, this should take approximately 3 seconds. If the message **FUNC End** or no response is seen at this point it means that the access level has been set to **NONE**. The default access for this level is **NONE** so the access level will need to be changed if access via this method is required.

- **Remote input mode** - Allows access to the level set by the function in the **ACCS** menu. For example if the Remote input access is set to **CAL** level then access to all setup functions will be allowed when the selected remote input is closed.
  The remote input mode uses the same access method as the Easy mode but also requires that one of the available remote inputs is set to **ACCS** and that the selected remote input is activated i.e. shorted to GND. The default access for this level is **NONE** so the access level will need to be changed if access via this method is required.
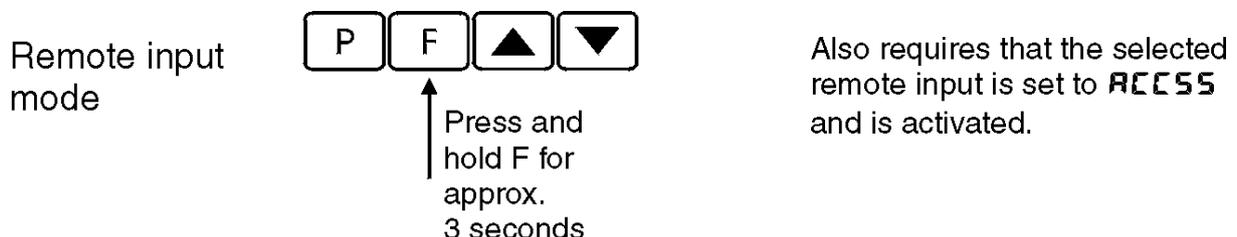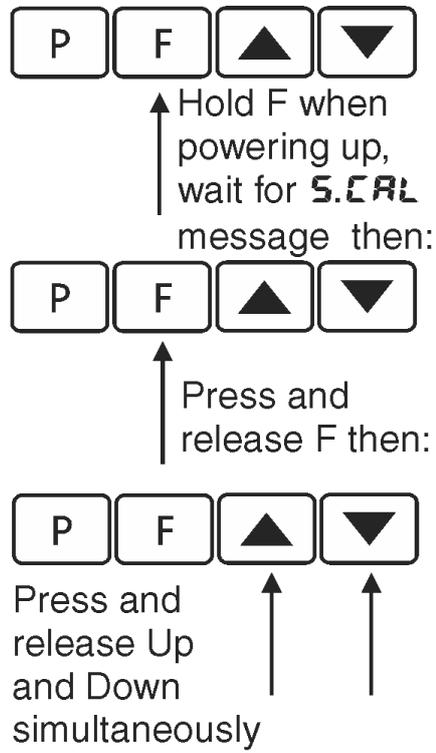
- **PIN 1 mode** - Allows access to the level set by the function in the **ACCS** menu.
  The PIN 1 mode requires the **F** button is pressed and released then within 2 seconds press the **▲** and **▼** buttons at the same time. The PIN can be set via the **Pın.1CodE** function in the **ACCS** menu. A setting of **0** disables the PIN which means that there is no need to enter the PIN. If the function has been set to a number other than **NonE** then the first function seen when entering via PIN 1 mode will be the function **CodE**. When this function is seen the PIN value set at the function must be entered via the **▲** or **▼** pushbuttons followed by pressing **F** to accept the PIN before the user can progress to the setup functions.

PIN 1
and
PIN 2
mode

| P || F || ▲ || ▼ |

Press and
release F then:

| P || F || ▲ || ▼ |

Press and
release Up
and Down
simultaneously

If a PIN has been set the message **CodE** will be seen. Use **▲** or **▼** to enter the PIN then press **F** to accept the PIN.
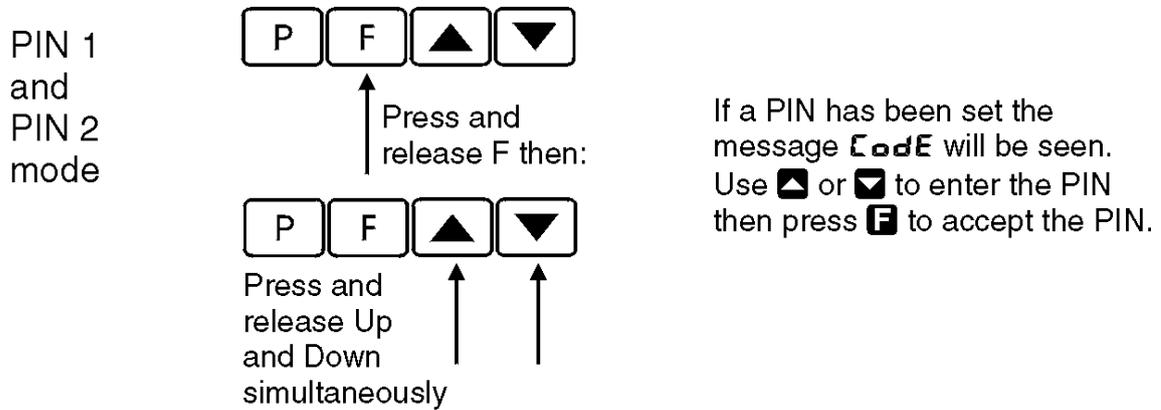
- **PIN 2 mode** - Allows access to the level set by the function in the **ACCS** menu.
  This method uses the same access method as PIN 1 mode above. A **Pın.2CodE** setting of **NonE** disables the PIN. If the or a function has been set to a number other than **NonE** then the first function seen when entering via PIN 1/PIN2 mode will be the function **CodE**. When this function is seen the PIN value set at the function can be entered for access to the level set at the **Pın.1ACCS** function or enter the PIN to gain access to the level set at the **Pın.2ACCS** function. A correct code will allow access to the functions at the selected level. An incorrect code will result in the **FUNC End** message being seen indicating that access to setup functions has been refused and the display will return to normal measurement mode.

- **Super Cal mode** - This method can be used to gain access to all functions. If a PIN has been set and forgotten use this method to access the PIN functions to check the settings. To access via Super Cal mode with the instrument switched off hold in the **F** button whilst the instrument powers up. Keep the button pressed until the **S.CAL** message is seen, you can then release the **F** button. Next press and release **F** then within 2 seconds press and release the **▲** and **▼** pushbuttons simultaneously.

Super Cal
mode

| P | F | ▲ | ▼ |

↑ Hold F when
powering up,
wait for **S.CAL**
message then:

| P | F | ▲ | ▼ |

↑ Press and
release F then:

| P | F | ▲ | ▼ |

Press and
release Up
and Down
simultaneously

The setup functions are organised in blocks or sections e.g. all the settings for alarms are in the alarms sections e.g. **AL 1** block contains the alarm 1 functions. Once access to setup functions has been gained use the ▲ and ▼ buttons to select the section required then press **F** to enter this section and again us the ▲ and ▼ buttons to select the required function for alteration and press **F** to allow alteration of this function.

```
                                    ┌─────────────────┐
                                    │   Alarm setup   │
                                    │    functions    │
                                    │    e.g. AL 1    │
                                    └─────────────────┘
                                             ↓
                                    ┌─────────────────┐
                                    │   Relay setup   │
                                    │    functions    │
                                    │   e.g. rLY 1    │
                                    └─────────────────┘
                                             ↕
     Use ▲ or ▼ to move to         ┌─────────────────┐
     the section required then      │ Alarm configure │
     press F to access the          │ functions e.g.  │
     functions in that section.     │    AL Count     │
     Press P to escape the          └─────────────────┘
     section you are in or                   ↕
     press F at the End             ┌─────────────────┐
     function in the section.       │   Input setup   │
                                    │    functions    │
                                    │    e.g. In 1    │
                                    └─────────────────┘
                                             ↕
                                    ┌─────────────────┐
                                    │  Display setup  │
                                    │    functions    │
                                    │      diSP       │
                                    └─────────────────┘
                                             ↕
                                    ┌─────────────────┐
                                    │  Remote input   │
                                    │ functions e.g.  │
                                    │     r.inP       │
                                    └─────────────────┘
```
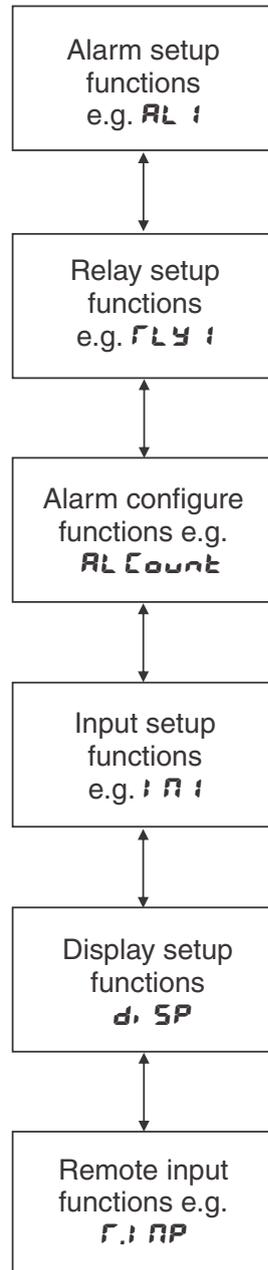
The example in the flowchart below shows the method using alarm 2 setup functions.

Alarm 2 setting section

Column	
`AL 2`	Press **F** to go to

To go to back to measurement display press **P** or use **▲** or **▼** to go to `End` then press **F**

To scroll through to other main sections press **▲** or **▼**

Use **▲** or **▼** to move between the alarm relay 1 settings

Settings for alarm 2

`Hi gh` — Followed by the setting — Press **F** to go to setting → Use **▲** or **▼** to adjust to any setting or press **▲** and **▼** together to disable and set to `OFF`. Press **F** to accept the change.

`Lo` — Followed by the setting — Press **F** to go to setting → Use **▲** or **▼** to adjust to any setting or press **▲** and **▼** together to disable and set to `OFF`. Press **F** to accept the change.

`HYSt` — Followed by the setting — Press **F** to go to setting → Use **▲** or **▼** to adjust, range 0 to 50000. Press **F** to accept the change.

`triP` — Followed by the setting — Press **F** to go to setting → Use **▲** or **▼** to adjust, range 0.0 to 6553.5. Press **F** to accept the change.

`rSt` — Followed by the setting — Press **F** to go to setting → Use **▲** or **▼** to adjust, range 0.0 to 6553.5. Press **F** to accept the change.

`rLYS` — Followed by the setting — Press **F** to go to setting → Use **▲** or **▼** to choose the required relay then use **F** to select `On` or `OFF`. Use **▲** or **▼** to until `End` is seen. Press **F** to accept the change.

`OPEr` — Followed by the setting — Press **F** to go to setting → Use **▲** or **▼** to choose `Hi.Lo` or `Ctrl` or `FrEq`. Press **F** to accept the change.

`trAiL` — Followed by the setting — Press **F** to go to setting → Use **▲** or **▼** to choose `SEt.P` or relay to trail. Press **F** to accept the change.

`Ch` — Followed by the setting — Press **F** to go to setting → Use **▲** or **▼** to choose the channel e.g. `CH 1`. Press **F** to accept the change.

`LAtch` — Followed by the setting — Press **F** to go to setting → Use **▲** or **▼** to choose `LAtch` or `Auto`. Press **F** to accept the change.

`End` — Press **F** or **P** to return to the beginning of the section
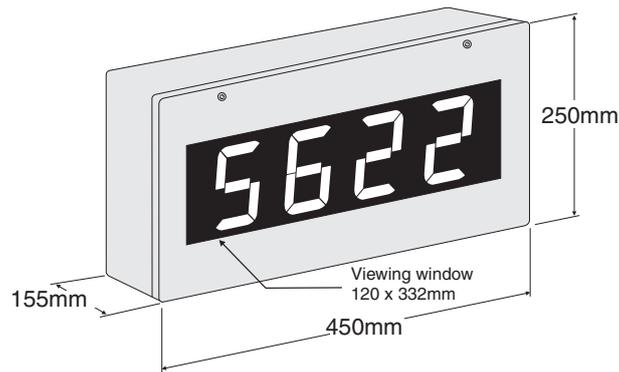
2 Mechanical installation

2.1 20mm, 38mm, 45mm, 57mm and 58mm LED

Surface mounting tabs are provided. An optional panel mount kit is available for these size displays. Panel cut out size is 240 x 130mm (-0.0mm / +0.5mm). Weight: All types 1.6kg approx.
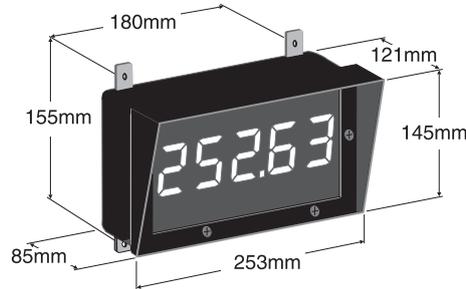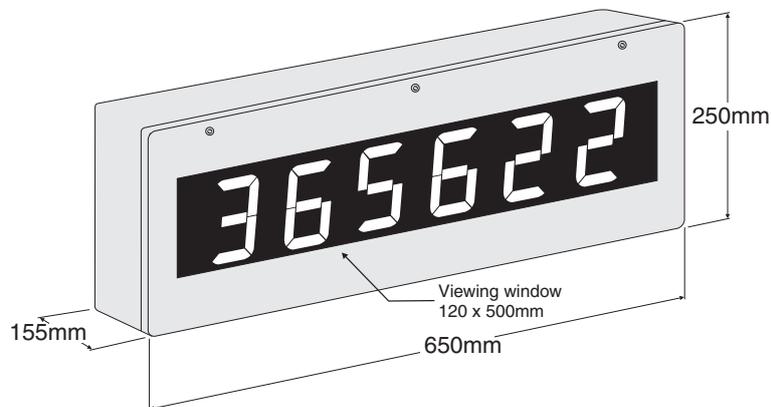

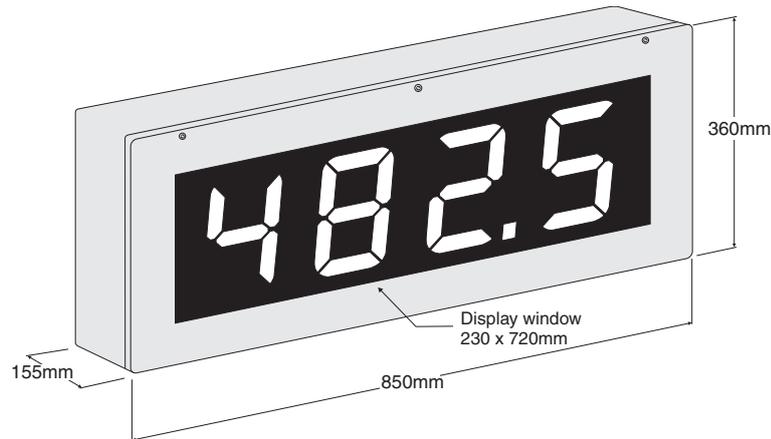## 2.2 100mm 4 digit LED

Weight 10kg - mounting brackets provided

2.3 100mm 6 digit LED

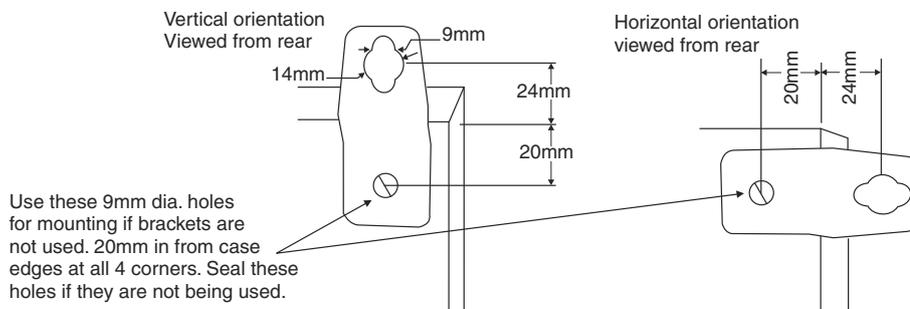Weight 13kg - mounting brackets provided

2.4   200mm 4 digit LED

Weight 13kg - mounting brackets provided

Display window
230 x 720mm

360mm

155mm

850mm

2.5   Cable entry and Mounting brackets

For 20 to 58mm display types no holes are pre drilled. For all 100mm and 200mm displays 3 off 20mm holes are drilled at the bottom of the case, these are fitted with 2 x IP65 grommets and 1 x air vent which allows moisture to exit the case but not enter.

Four mounting brackets are supplied for use with all 100mm and 200mm display metal case large digit displays. Diagrams below illustrate vertical and horizontal installation for mounting brackets. If mounting without the brackets is preferred then the 9mm dia. case holes provided for the brackets can be used as alternative mounting holes. Any rear holes not used for mounting should be sealed.


Vertical orientation
Viewed from rear

9mm

14mm

24mm

20mm

Use these 9mm dia. holes
for mounting if brackets are
not used. 20mm in from case
edges at all 4 corners. Seal these
holes if they are not being used.

Horizontal orientation
viewed from rear

20mm   24mm

3 Electrical Installation

The display is designed for continuous operation and therefore no mains/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. To install cables remove six front panel retaining screws. Remove front panel taking care not to damage the ribbon cable (ribbon cable joins the front display circuit board to the main circuit board). Connect power and input cables to the plug in terminal blocks located within the enclosure. The terminals are clearly labeled and unplug for ease of installation, please take care to connect them correctly. The terminal blocks allow for wires of up to 2.5mm^2 to be fitted (relays and power) and 1.5mm^2 for remote inputs. 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.

See the "LD5 Series Large Digit Display Output Addendum" booklet for wiring details of any optional outputs not covered in this instruction manual.
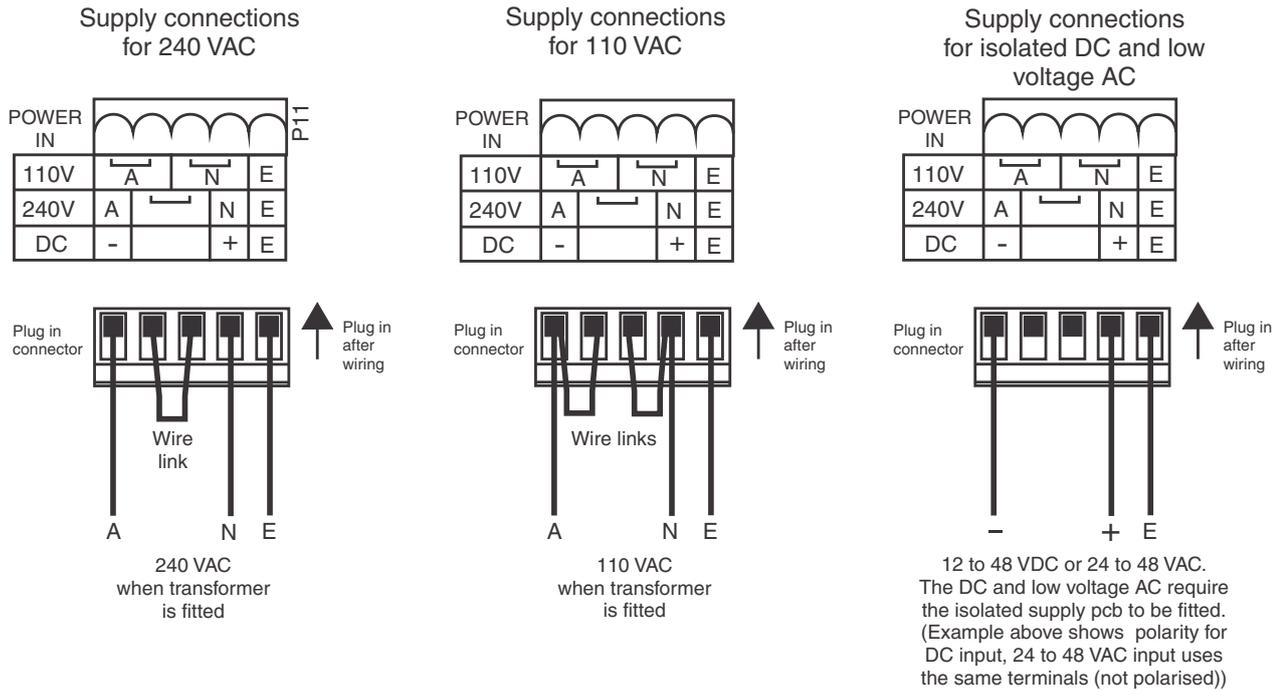
Input board layout
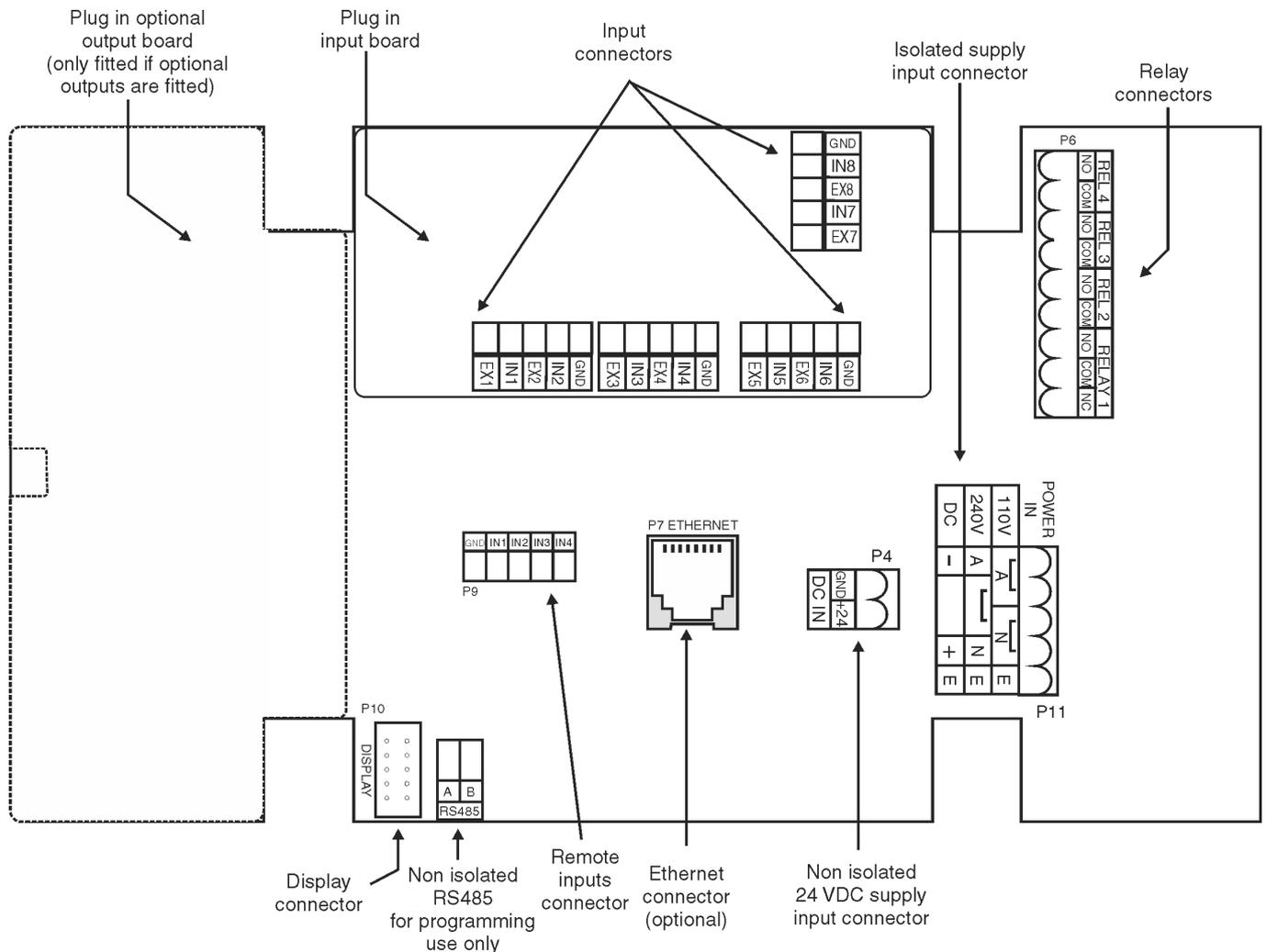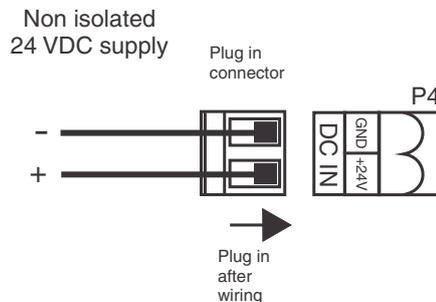
3.1 Power supply connections

The power supply for the instrument is factory fitted and is of a fixed type. Check power supply type before connecting. Non isolated 24VDC supply instruments use the DC IN connector P4 shown on the diagram above. AC supply and isolated DC supply instruments use connector P11.

3.2 AC supply or isolated DC supply - for displays digits less than 100mm

Supply connections for 240 VAC

	A	N	E
110V	A	N	E
240V	A		N	E
DC	-		+	E

Plug in connector — Plug in after wiring

Wire link

A   N E

240 VAC when transformer is fitted

Supply connections for 110 VAC

	A	N	E
110V	A	N	E
240V	A		N	E
DC	-		+	E

Plug in connector — Plug in after wiring

Wire links

A   N E

110 VAC when transformer is fitted

Supply connections for isolated DC and low voltage AC

	A	N	E
110V	A	N	E
240V	A		N	E
DC	-		+	E

Plug in connector — Plug in after wiring

−   + E

12 to 48 VDC or 24 to 48 VAC. The DC and low voltage AC require the isolated supply pcb to be fitted. (Example above shows polarity for DC input, 24 to 48 VAC input uses the same terminals (not polarised))

3.3 Non isolated DC supply - for displays digits less than 100mm

24VDC ±10% non isolated DC supply connections.

Non isolated 24 VDC supply

Plug in connector

P4

DC IN   GND +24V

−

+

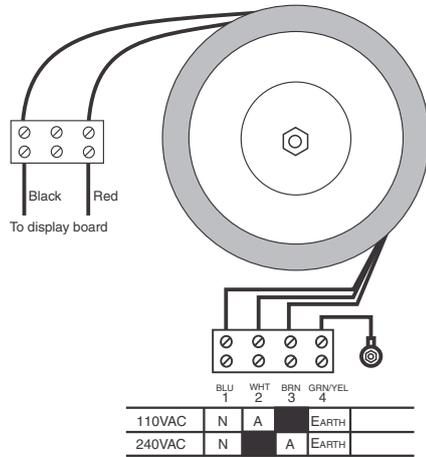Plug in after wiring

3.4 100mm and 200mm display power supplies

Optional isolated DC supply - 100mm and 200mm displays

Isolated DC supplies (12 to 24VDC) connect to the isolated supply pcb on the base board. AC supplies connect to the transformer primary on the base board inside the case. Supply type is factory configured.
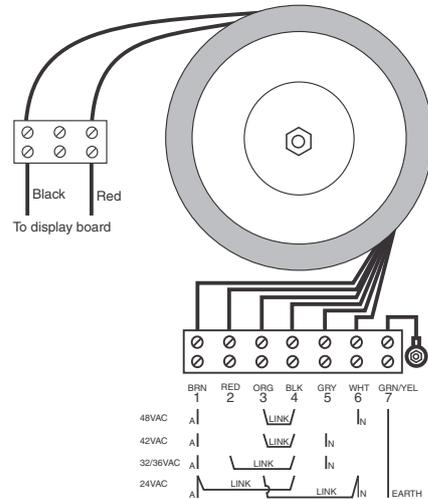
Optional isolated dc board
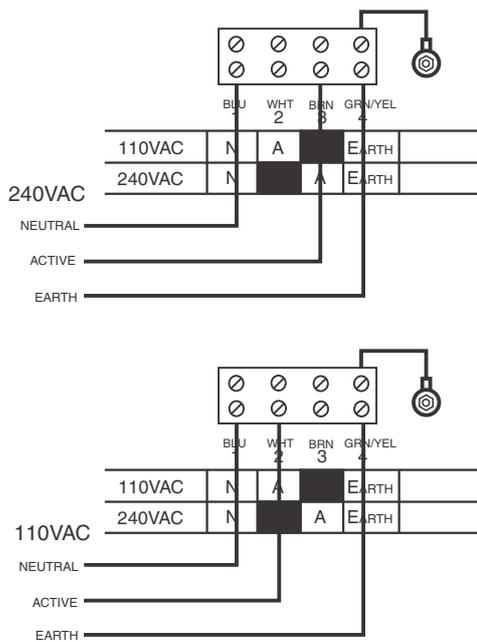(for use with 100mm & 200mm led
displays and 100mm
electromagnetic displays only)

E + IN −

Input DC 12-24V   CASE + −
                    EARTH

+ −

+ −   Output DC to
        display board
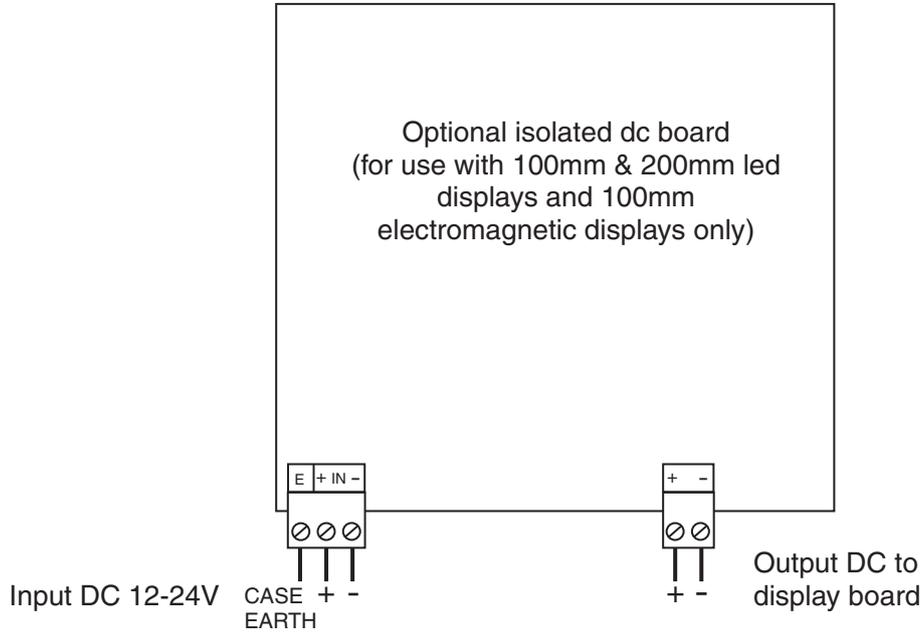
AC supplies - 100mm and 200mm displays. AC supplies connect to the transformer primary on the base board inside the case. Supply type is factory configured.

240 & 110VAC supplies.
For 100mm/200mm LED or 100mm
electromagnetic display types only.

Low voltage AC supplies.
For 100mm/200mm LED or 100mm
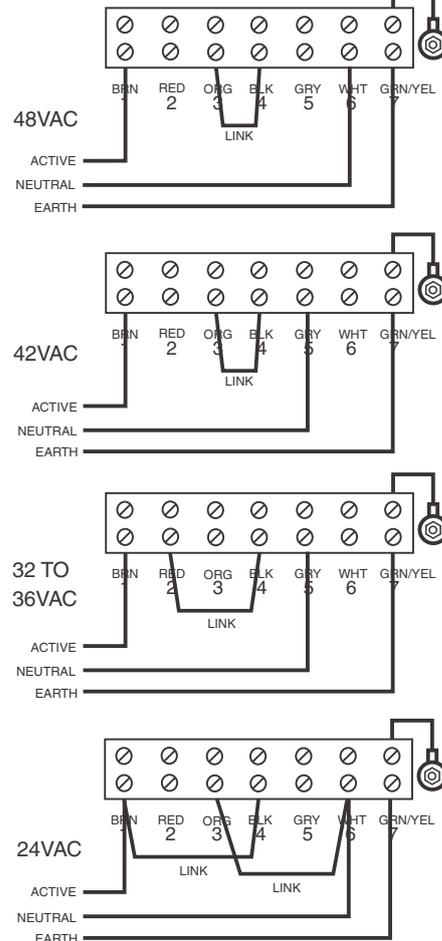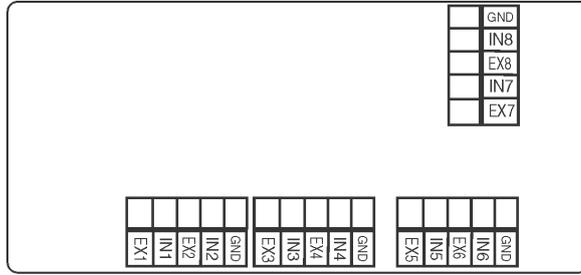electromagnetic display types only.

Black   Red

To display board

Black   Red

To display board

	BLU 1	WHT 2	BRN 3	GRN/YEL 4
110VAC	N	A		EARTH
240VAC	N		A	EARTH

	BRN 1	RED 2	ORG 3	BLK 4	GRY 5	WHT 6	GRN/YEL 7
48VAC	A		LINK			N	
42VAC	A		LINK			N	
32/36VAC	A		LINK			N	
24VAC	A		LINK		LINK	N	EARTH

Wiring examples 240VAC & 110VAC

Wiring examples low voltage AC

	BLU 1	WHT 2	BRN 3	GRN/YEL 4
110VAC	N	A		EARTH
240VAC	N		A	EARTH

240VAC
NEUTRAL
ACTIVE
EARTH

	BLU 1	WHT 2	BRN 3	GRN/YEL 4
110VAC	N	A		EARTH
240VAC	N		A	EARTH

110VAC
NEUTRAL
ACTIVE
EARTH

Important note: the 240V & 110V supplies use the same transformer, low voltage instruments use a different transformer. Do not use a low voltage transformer for 240V or 110V or vice versa.
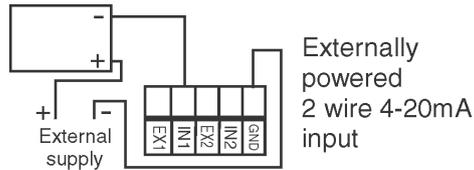
48VAC
BRN 1 RED 2 ORG 3 BLK 4 GRY 5 WHT 6 GRN/YEL 7
LINK
ACTIVE
NEUTRAL
EARTH

42VAC
BRN 1 RED 2 ORG 3 BLK 4 GRY 5 WHT 6 GRN/YEL 7
LINK
ACTIVE
NEUTRAL
EARTH

32 TO
36VAC
BRN 1 RED 2 ORG 3 BLK 4 GRY 5 WHT 6 GRN/YEL 7
LINK
ACTIVE
NEUTRAL
EARTH

24VAC
BRN 1 RED 2 ORG 3 BLK 4 GRY 5 WHT 6 GRN/YEL 7
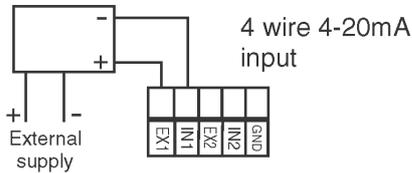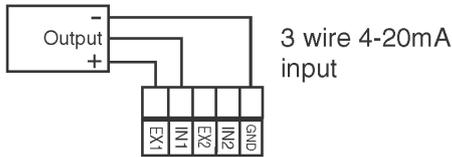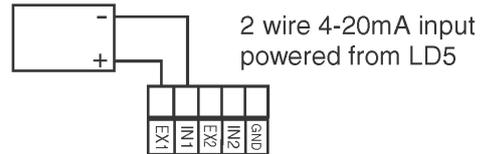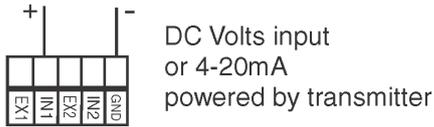LINK   LINK
ACTIVE
NEUTRAL
EARTH

3.5   Input connections

The input connectors are on a small pcb on top of the main pcb. Note confirm if the model supplied has 4-20mA or DC Volts signal inputs before wiring.

Input wiring examples - if shielded wire is used the shield can be connected to the GND terminal.

DC Volts input or 4-20mA powered by transmitter

2 wire 4-20mA input powered from LD5

3 wire 4-20mA input

4 wire 4-20mA input

Externally powered 2 wire 4-20mA input

Externally powered 3 wire 4-20mA input

The optional ethernet connection is via the RJ45 connector P7 on the main board.
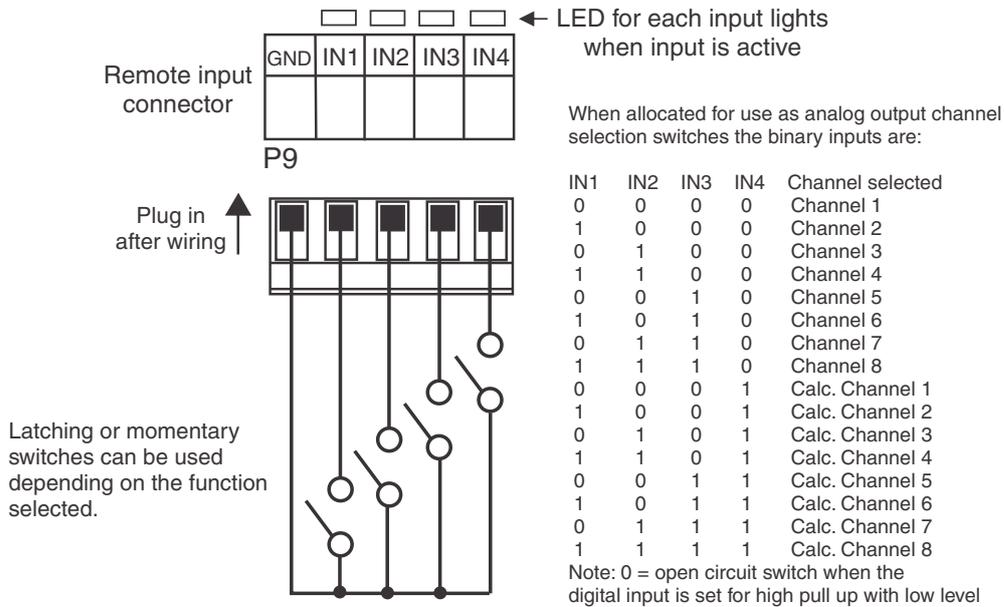
3.5.1   Non isolated RS485

The non isolated RS485 connections are on connector P12 at the bottom of the main board. This port is for use downloading program updates only.
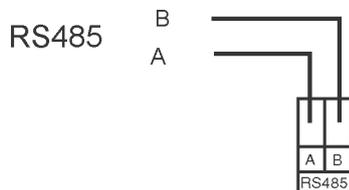
RS485

For RS485 the A terminal connects to other A terminal and the B terminal connects to other B terminals. Use twisted pair shielded cable for RS485.

3.5.2 Remote/Digital inputs

The digital inputs will accept voltage free contact closure inputs or up to 24VDC signal. The electrical configuration for these inputs is configured by digital input functions, see the **d.ın** section functions. The operation mode of the digital inputs are controlled by separate functions for each input, see the **r.ıпP** section functions. The electrical configuration for these inputs is configured by digital input functions, see the **d.ın** section functions. Wiring example showing voltage free contacts below. The table below shows the operation of the remote inputs when one or more of the remote inputs is set for analog output digital control (**r.SEl** mode).

Remote input connector P9

LED for each input lights when input is active

Plug in after wiring

Latching or momentary switches can be used depending on the function selected.

When allocated for use as analog output channel selection switches the binary inputs are:

IN1	IN2	IN3	IN4	Channel selected
0	0	0	0	Channel 1
1	0	0	0	Channel 2
0	1	0	0	Channel 3
1	1	0	0	Channel 4
0	0	1	0	Channel 5
1	0	1	0	Channel 6
0	1	1	0	Channel 7
1	1	1	0	Channel 8
0	0	0	1	Calc. Channel 1
1	0	0	1	Calc. Channel 2
0	1	0	1	Calc. Channel 3
1	1	0	1	Calc. Channel 4
0	0	1	1	Calc. Channel 5
1	0	1	1	Calc. Channel 6
0	1	1	1	Calc. Channel 7
1	1	1	1	Calc. Channel 8

Note: 0 = open circuit switch when the digital input is set for high pull up with low level

3.5.3 Relays 1 to 4

Relays 1 to 4 are rated at 240VAC 5A into a resistive road. Relay 1 is form C type. Relays 2,3 and 4 are form A type. These relays are fitted onto the main board when supplied. See the "LD5 Series Large Digit Display Output Addendum" for wiring details of optional relays 5 to 8.
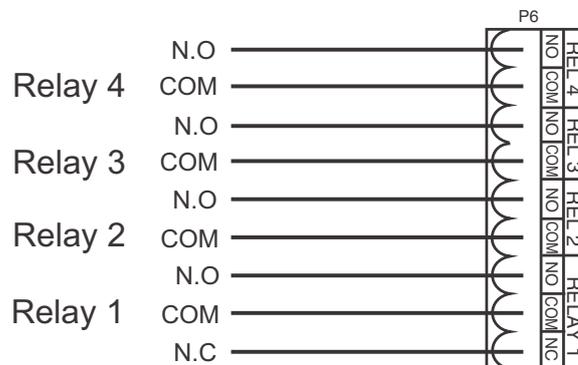
4 Function tables - summary of setup functions

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

Display messages shown are those which would appear on a 6 digit display, these display messages may in some cases vary slightly for other display types.

4.1 Configuration function table

Display	Function	Range	Default	Your record	Ref/Page
CONFIG CHAN Count	Number of input channels	**1, 2, 3, 4, 5, 6, 7, 8**	**8**		5.1 / 30
CONFIG CALC Count	Number of calculation channels	**0, 1, 2, 3, 4, 5, 6, 7, 8**	**0**		5.2 / 30
CONFIG AL Count	Set number of alarms	**0, 1, 2, 3, 4, 5, 6, 7, 8**	**2**		5.3 / 30
CONFIG SCAN dELAY	Set display rotation time per channel	**0** to **200** secs	**6**		5.4 / 31
CONFIG CH diSP	Channel display on/off - 6 digit displays only	**OFF** or **ON**	**On**		5.5 / 31

4.2 Alarm function table. Note: Relays are optional on this model

Display	Function	Range	Default	Your record	Ref/Page
AL 1 to **AL 8 HiGh**	High setpoint value for designated alarm relay	Any display value or **OFF**	**OFF**	See 4.13	5.6 / 31
AL 1 to **AL 8 Lo**	Low setpoint value for designated alarm relay.	Any display value or **OFF**	**OFF**	See 4.13	5.7 / 32
AL 1 to **AL 8 HYSt**	Alarm relay hysteresis (deadband)	**0** to **6553.5**	**1.0**	See 4.13	5.8 / 33
AL 1 to **AL 8 triP**	Trip time delay for the designated alarm relay	**0** to **6553.5** secs	**0.0**	See 4.13	5.9 / 33
AL 1 to **AL 8 rSt**	Reset time delay for the designated alarm relay	**0** to **6553.5** secs	**0.0**	See 4.13	5.10 / 34

Display	Function	Range	Default	Your record	Ref/Page
AL 1 to **AL 8** **rLyS**	Relay selection **On** or **OFF**	**On** or **OFF**	**OFF**	See 4.13	5.11 / 34
AL2 to **AL8** **trAiL**	Alarm trailing or setpoint mode	**SEt.P**, **tL 1**, **tL 2**, **tL 3**, **tL 4**, **tL 5**, **tL 6**, **tL 7**	**SEt.P**	See 4.13	5.12 / 34
AL 1 to **AL2** **OPEr**	Relay operation mode	**Hi.Lo**, **Ctrl** or **FrEq**	**Hi.Lo**	See 4.13	5.13 / 35
AL 1 to **AL 8** **Ch**	Alarm input channel selection	**CH 1**, **CH2**, **CH 3**, **CH4**, **CH5**, **CH6**, **CH 7**, **CH 8**, **CC 1**, **CC2**, **CC 3**, **CC 4**, **CC 5**, **CC6**, **CC 7**, **CC8**	**CH 1**	See 4.13	5.14 / 36
AL 1 to **AL 8** **LAtch**	Alarm relay latching operation	**Auto**, **LAtch**, **A.bEEP**, **L.bEEP**	**Auto**	See 4.13	5.15 / 36

4.3 Relay PI function table. See separate Addendum booklet

Display	Function	Range	Default	Your record	Ref/Page
AL 1 to **AL 8** **SPAN**	Relay PI control span	Any display value	**100.0**	See 4.13	Addendum
AL 1 to **AL 8** **SEtP**	Relay PI control setpoint	Any display value	**100.0**	See 4.13	Addendum
AL 1 to **AL 8** **P.9**	Relay PI control proportional gain value	Any display value	**0.010**	See 4.13	Addendum
AL 1 to **AL 8** **i.9**	Relay PI control integral gain value	Any display value	**0.000**	See 4.13	Addendum
AL 1 to **AL 8** **i.H**	Relay PI control integral high limit value	**0** to **100.0** %	**0.000**	See 4.13	Addendum
AL 1 to **AL 8** **i.L**	Relay PI control integral low limit value	**0** to **100.0** %	**100.0**	See 4.13	Addendum
AL 1 to **AL 8** **bi.AS**	Relay PI control bias	**0** to **100.0** %	**50.0**	See 4.13	Addendum

Display	Function	Range	Default	Your record	Ref/Page
AL 1 to **AL 8** **duty SECS**	Relay PI control duty cycle	**0** to **6553.5** secs	**10.0**	See 4.13	Addendum
AL 1 to **AL 8** **on SECS**	Relay PI frequency control "on" time	**0** to **6553.5** secs	**1.0**	See 4.13	Addendum

4.4 Relay function table. Note: Relays are optional on this model

Display	Function	Range	Default	Your record	Ref/Page
rLY 1 to **rLY 17** **rLY**	Alarm relay x action to normally open (de-energised) or normally closed (energised)	**n.o**, **n.c**	**n.o**	See 4.13	5.17 / 37
rLY 1 to **rLY 17** **AcK**	Relay acknowledge	**OFF** or **On**	**OFF**	See 4.13	5.18 / 37
rLY 1 to **rLY 17** **bool**	Alarm relay Boolean logic operation	**Or**, **And**	**Or**	See 4.13	5.19 / 37

4.5 Input function table

Display	Function	Range	Default	Your record	Ref/Page
InP 1 to **InP 8** **d.Pnt**	Input channel decimal point selection	**0**, **0.1**, **0.02**, **0.003**	**0.1**		5.20 / 38
InP 1 to **InP 8** **d.rnd**	Input channel display rounding selection	**0.1** to **500.0**	**0.1**		5.21 / 38
InP 1 to **InP 8** **FILtr**	Input filter	**0**, **1**, **2**, **3**, **4**, **5**, **6**, **7**, **8**	**2**		5.22 / 38
InP 1 to **InP 8** **En4**	4mA display scale value	Any display value	**0**		5.23 / 39
InP 1 to **InP 8** **En20**	20mA display scale value	Any display value	**1000**		5.24 / 39
InP 1 to **InP 8** **rAnGE**	Maximum Input Voltage Range	**1**, **2**, **4**, **8**, **16**, **32**, **64**	**16**		5.25 / 39
InP 1 to **InP 8** **U.CAL**	Uncalibrate the input channel	n/a	n/a		5.26 / 40

Display	Function	Range	Default	Your record	Ref/Page
InP 1 to _InP 8_ _SCALE 1_	Input Scale Point 1	n/a	n/a		5.27 / 40
InP 1 to _InP 8_ _SCALE2_	Input Scale Point 2	n/a	n/a		5.28 / 40
InP 1 to _InP 8_ _CAL 1_	First calibration point for selected input	n/a	n/a		5.29 / 41
InP 1 to _InP 8_ _CAL2_	Second calibration point for selected input	n/a	n/a		5.30 / 41
InP 1 to _InP 8_ _OFSt_	Calibration offset	n/a	n/a		5.31 / 42
InP 1 to _InP 8_ _diSP_	Channel display on/off	_OFF_ or _On_	_On_		5.32 / 43
InP 1 to _InP 8_ _COPY to_	Copy channel settings to another channel	_nOnE_, _2_, _3_, _4_, _5_, _6_, _7_, _8_	_nOnE_		5.33 / 43

4.6 Calculated channel configure table

Display	Function	Range	Default	Your record	Ref/Page
CALC 1 to _CALC 8_ _Func_	Calculation channel function	_Hi_, _Lo_, _diFF_, _AUg_, _d.AUg_, _P.AUg_, _n.AUg_, _S.diFF_, _Add_, _PC 1_, _PC 2_, _Sub_, _Prod_, _div_, _SinE_, _CoS_, _r.AUg_, _F.AUg_	_Hi_		5.34 / 43
CALC 1 to _CALC 8_ _d.LoG_	Calculation channel data log	_OFF_ or _On_	_OFF_		5.35 / 45
CALC 1 to _CALC 8_ _diSP_	Calculation channel display on/off	_OFF_ or _On_	_OFF_		5.36 / 45
CALC 1 to _CALC 8_ _d.Pnt_	Calculation channel decimal point	_0_, _0.1_, _0.02_, _0.003_	_0_		5.37 / 46

Display	Function	Range	Default	Your record	Ref/Page
CALC 1 to CALC 8 d.rnd	Calculation channel display rounding	1 to 5000	1		5.38 / 46
CALC 1 to CALC 8 ChAn SEL	Calculation channel selection. Set each channel On or OFF	CH 1, CH2, CH 3, CH4, CH5, CH6, CH 7, CH 8, CALC 1, CALC 2, CALC 3, CALC 4, CALC 5, CALC 6, CALC 7, CALC 8	n/a		5.39 / 46
CALC 1 to CALC 8 A.cnt	Calculation channel fixed average count	1 to 128	4		5.40 / 47
CALC 1 to CALC 8 Arith SCALE	Calculation channel multiplication scale	Any display value	n/a		5.41 / 47
CALC 1 to CALC 8 Arith OFFSEt	Calculation channel offset value	Any display value	n/a		5.42 / 47
CALC 1 to CALC 8 Arith div	Calculation channel division	Any display value	n/a		5.43 / 47

4.7   Display function table

Display	Function	Range	Default	Your record	Ref/Page
diSP brgt Auto	Automatic display brightness	OFF or ON	On		5.44 / 48
diSP brgt	Display brightness	1 to 63	63		5.45 / 48
diSP dull	Dimmed display brightness	0 to 63	7		5.46 / 48
diSP Auto HiGh	Auto display brightness high level	15 to 63	63		5.47 / 48
diSP Auto Lo	Auto display brightness low level	1 to 63	7		5.48 / 49

Display	Function	Range	Default	Your record	Ref/Page
di SP d.OFF	Timer for low brightness level	0 to Maximum display value mins	0		5.49 / 49

4.8 Analog output function table. See separate Addendum booklet

Display	Function	Range	Default	Your record	Ref/Page
rO 1 to rO2 OutPut	Analog retransmission outputs (*Optional)	4-20, 0-1.0, 0-10	4-20		Addendum
rO 1 to rO2 InPut	Analog retransmission input channel (*Optional)	Any available channel	CH 1		Addendum
rO 1 to rO2 P.Ctl	Analog output PI control (*Optional)	NO or YES	No		Addendum
rO 1 to rO2 SEtP	Analog output PI control setpoint (*Optional)	Any display value	0		Addendum
rO 1 to rO2 SPAn	Analog output PI control span (*Optional)	Any display value	1000		Addendum
rO 1 to rO2 P.9	Analog output PI control proportional gain (*Optional)	Any display value	1.000		Addendum
rO 1 to rO2 I.9	Analog output PI control integral gain (*Optional)	Any display value	0.000		Addendum
rO 1 to rO2 I.H	Analog output PI control integral high limit (*Optional)	0 to 100.0 %	100.0		Addendum
rO 1 to rO2 I.L	Analog output PI control integral low limit (*Optional)	0 to 100.0 %	100.0		Addendum
rO 1 to rO2 b.AS	Analog output PI control bias (*Optional)	0 to 100.0 %	50.0		Addendum
rO 1 to rO2 Lo	Analog retransmission low display value (*Optional)	Any display value	0		Addendum
rO 1 to rO2 H.9h	Analog retransmission high display value (*Optional)	Any display value	1000		Addendum

4.9 P button and remote inputs function table

Display	Function	Range	Default	Your record	Ref/Page
r.i nP *P.but*	Front P button operation mode	*nOnE*, *P.Hi* , *P.Lo*, *Hi .Lo*, *AL.Ac*, *S.Hol d*	*nOnE*		5.51 / 49
r.i nP *r.i n. 1*	Remote input 1 operation mode	*nOnE*, *P.Hol d*, *d.Hol d*, *P.Hi* , *P.Lo*, *Hi .Lo*, *AL.Ac*, *ACCSS*, *P.but*, *F.but*, *U.but*, *d.but*, *dui l* , *S.Hol d*, *r.SEi* , *b.i nc*, *b.dEc*	*nOnE*		5.52 / 50
r.i nP *r.i n.2*	Remote input 2 operation mode	*nOnE*, *P.Hol d*, *d.Hol d*, *P.Hi* , *P.Lo*, *Hi .Lo*, *AL.Ac*, *ACCSS*, *P.but*, *F.but*, *U.but*, *d.but*, *dui l* , *S.Hol d*, *r.SEi* , *b.i nc*, *b.dEc*	*nOnE*		5.53 / 51
r.i nP *r.i n.3*	Remote input 3 operation mode	*nOnE*, *P.Hol d*, *d.Hol d*, *P.Hi* , *P.Lo*, *Hi .Lo*, *AL.Ac*, *ACCSS*, *P.but*, *F.but*, *U.but*, *d.but*, *dui l* , *S.Hol d*, *r.SEi* , *b.i nc*, *b.dEc*	*nOnE*		5.54 / 51

Display	Function	Range	Default	Your record	Ref/Page
r.i ∩P *r.i ∩.4*	Remote input 4 operation mode	*∩O∩E*, *P.Hoi d*, *d.Hoi d*, *P.Hi*, *P.Lo*, *Hi .Lo*, *AL.Ac*, *ACCSS*, *P.but*, *F.but*, *U.but*, *d.but*, *dui l*, *S.Hoi d*, *r.SEt*, *b.i nc*, *b.dEc*	*∩O∩E*		5.55 / 52

4.10   Digital inputs function table

Display	Function	Range	Default	Your record	Ref/Page
di n *di n.1* *P.UP*	Remote input (digital inputs) 1 pull up/down operation	*OPEn*, *Hi gh*, *Lo*	*Hi gh*		5.56 / 52
di n *di n.1* *Lui*	Remote input (digital inputs) 1 input level	*Hi gh*, *Lo*	*Lo*		5.57 / 52
di n *di n.2* *P.UP*	Remote input (digital inputs) 2 pull up/down operation	*OPEn*, *Hi gh*, *Lo*	*Hi gh*		5.58 / 52
di n *di n.2* *Lui*	Remote input (digital inputs) 2 input level	*Hi gh*, *Lo*	*Lo*		5.59 / 53
di n *di n.3* *P.UP*	Remote input (digital inputs) 3 pull up/down operation	*OPEn*, *Hi gh*, *Lo*	*Hi gh*		5.60 / 53
di n *di n.3* *Lui*	Remote input (digital inputs) 3 input level	*Hi gh*, *Lo*	*Lo*		5.61 / 53
di n *di n.4* *P.UP*	Remote input (digital inputs) 4 pull up/down operation	*OPEn*, *Hi gh*, *Lo*	*Hi gh*		5.62 / 54
di n *di n.4* *Lui*	Remote input (digital inputs) 4 input level	*Hi gh*, *Lo*	*Lo*		5.63 / 54

4.11   Serial communications function table

Display	Function	Range	Default	Your record	Ref/Page

Display	Function	Range	Default	Your record	Ref/Page
SErI OPEr	Serial output operation mode	NonE, Cont, Poll, A.buS, diSP or M.buS	NonE		5.64 / 54
SErI bAud	Serial baud rate	1200, 2400, 4800, 9600, 19.2, 38.4, 57.6, 115.2	9600		5.65 / 55
SErI Prty	Serial parity	8NONE, 8 EUEN, 8Odd, 7EUEN, 7Odd	8NONE		5.66 / 55
SErI UnIt Addr	Serial address	1 to 127	1		5.67 / 55
SErI Error diSP	Send error display	OFF or On	On		5.68 / 56

4.12   User access function table

Display	Function	Range	Default	Your record	Ref/Page
ACCES EASY LEUEL	Easy access mode	NONE, 1, 2, 3, 4, 5, 6, CAL	NONE		5.69 / 56
ACCES r.INPut LEUEL	Remote input access mode	NONE, 1, 2, 3, 4, 5, 6, CAL	NONE		5.70 / 56
ACCES USr.1 PIn	PIN code 1	0 to 65535	0		5.71 / 56
ACCES USr.1 LEUEL	PIN code 1 access level	NONE, 1, 2, 3, 4, 5, 6, CAL	NONE		5.72 / 57
ACCES USr.2 PIn	PIN code 2	0 to 65535	0		5.73 / 57
ACCES USr.2 LEUEL	PIN code 2 access level	NONE, 1, 2, 3, 4, 5, 6, CAL	NONE		5.74 / 57
ACCES Fn.1 CodE	User assignable access function 1	0000 to FFFF hex.	0000		5.75 / 58
ACCES Fn.1 LEUEL	User assignable access 1 level value	dFlt, 1, 2, 3, 4, 5, 6, CAL, 5.CAL	dFlt		5.76 / 58
ACCES Fn.2 CodE	User assignable access function 2	0000 to FFFF hex.	0000		5.77 / 58

`ACCES`
`Fn.2`
`LEUEL`
	User assignable access 2 level value	`dFlt`, `1`, `2`, `3`,
		`4`, `5`, `6`, `CAL`,
		`S.CAL`
			`dFlt`		5.78 / 58

`ACCES`
`Fn.3`
`CodE`
	User assignable access function 3	`0000` to `FFFF`
		hex.
			`0000`		5.79 / 59

`ACCES`
`Fn.3`
`LEUEL`
	User assignable access 3 level value	`dFlt`, `1`, `2`, `3`,
		`4`, `5`, `6`, `CAL`,
		`S.CAL`
			`dFlt`		5.80 / 59

`ACCES`
`Fn.4`
`CodE`
	User assignable access function 4	`0000` to `FFFF`
		hex.
			`0000`		5.81 / 59

`ACCES`
`Fn.4`
`LEUEL`
	User assignable access 4 level value	`dFlt`, `1`, `2`, `3`,
		`4`, `5`, `6`, `CAL`,
		`S.CAL`
			`dFlt`		5.82 / 59

`ACCES`
`Fn.5`
`CodE`
	User assignable access function 5	`0000` to `FFFF`
		hex.
			`0000`		5.83 / 60

`ACCES`
`Fn.5`
`LEUEL`
	User assignable access 5 level value	`dFlt`, `1`, `2`, `3`,
		`4`, `5`, `6`, `CAL`,
		`S.CAL`
			`dFlt`		5.84 / 60

`ACCES`
`Fn.6`
`CodE`
	User assignable access function 6	`0000` to `FFFF`
		hex.
			`0000`		5.85 / 60

`ACCES`
`Fn.6`
`LEUEL`
	User assignable access 6 level value	`dFlt`, `1`, `2`, `3`,
		`4`, `5`, `6`, `CAL`,
		`S.CAL`
			`dFlt`		5.86 / 60

`ACCES`
`Fn.7`
`CodE`
	User assignable access function 7	`0000` to `FFFF`
		hex.
			`0000`		5.87 / 61

`ACCES`
`Fn.7`
`LEUEL`
	User assignable access 7 level value	`dFlt`, `1`, `2`, `3`,
		`4`, `5`, `6`, `CAL`,
		`S.CAL`
			`dFlt`		5.88 / 61

`ACCES`
`Fn.8`
`CodE`
	User assignable access function 8	`0000` to `FFFF`
		hex.
			`0000`		5.89 / 61

`ACCES`
`Fn.8`
`LEUEL`
	User assignable access 8 level value	`dFlt`, `1`, `2`, `3`,
		`4`, `5`, `6`, `CAL`,
		`S.CAL`
			`dFlt`		5.90 / 61

4.13   Relay tables

Note: 4 relays are provided as standard - 4 extra relays are optionally available

Record your relay settings in the table below

Display	Alarm 1	Alarm 2	Alarm 3	Alarm 4	Alarm 5	Alarm 6	Alarm 7	Alarm 8
Hi9h								
Lo								
HYSt								
triP								
rSt								
rLYS								
Ch								
LAtch								

Record which relays are allocated to which alarms and other relay settings in the table below

Display	Relay 1	Relay 2	Relay 3	Relay 4	Relay 5	Relay 6	Relay 7	Relay 8
Alarm 1								
Alarm 2								
Alarm 3								
Alarm 4								
Alarm 5								
Alarm 6								
Alarm 7								
Alarm 8								
rLY								
AcR								
bool								

5 Explanation of functions

The setup and calibration functions are configured through a push button sequence. The push buttons located at the front of the instrument or on the main circuit board are used to alter settings.

Display messages shown are those which would appear on a display with 4 digits for the process reading, these display messages may in some cases vary slightly for other display types.

Note: default access levels for each function are shown in this section but the access levels are not applicable to this software version.

Explanation of Functions

5.1 Number of input channels to be used

Section:	`CONFIG`
Display:	`CHAN Count`
Range:	`1, 2, 3, 4, 5, 6, 7, 8`
Default Value:	`8`
Default Access Level	`4`
Function number	`438D`

Allows selection of the number of input channels required. Up to 8 channels can be selected. For example if 6 channels are selected then inputs 1 to 6 will be used and these 6 input channels (plus any calculation channels) will be displayed.

5.2 Number of calculation channels to be used

Section:	`CONFIG`
Display:	`CALC Count`
Range:	`0, 1, 2, 3, 4, 5, 6, 7, 8`
Default Value:	`0`
Default Access Level	`4`
Function number	`438d`

Allows selection of the number of calculation channels required. Calculation channels are not physical inputs but are the results of the chosen arithmetic operation between selected input or other calculated channels. Up to 8 calculated channels can be selected. If required calculated channels can be made show up on the display following the physical channel readings. See the `CALC 1` to `CALC 8` functions for details of calculation channel setup.

5.3 Set number of alarms

Section:	`CONFIG`
Display:	`AL Count`
Range:	`0, 1, 2, 3, 4, 5, 6, 7, 8`
Default Value:	`2`
Default Access Level	`4`
Function number	`437d`

Allows setting of the number of alarms from 0 to 8 alarms. Each alarm can be allocated to respond from one or more input channels or calculated channels. If relays are fitted then one or more relays can be allocated to each alarm.

5.4   Set display rotation time per channel

Section:	CONFIG
Display:	SCAN dELAY
Range:	0 to 200 secs
Default Value:	6
Default Access Level	4
Function number	4385

Allows setting of the number of seconds between each channel display rotation. For example if set to 2 seconds each channel will be displayed for 2 seconds before the display automatically changes to the next higher channel. A setting of 0 will disable the automatic scanning meaning that the ▲ or ▼ pushbuttons will have to be used to view each channel. If a scan time is set but a channels are selected by the ▲ or ▼ pushbuttons the display will stay on the selected channel for approximately 20 seconds and will then automatically begin scanning again. If a channel is selected manually and the pushbutton held for 3 seconds then that display will remain on the selected channel for 1 hour before resuming scanning. Inputs are scanned internally and acted upon even if the automatic display scanning is stopped.

5.5   Channel display on/off - 6 digit displays only

Section:	CONFIG
Display:	CH diSP
Range:	OFF or ON
Default Value:	On
Default Access Level	2
Function number	4377

Only seen in 6 digit displays. This function allows the user to select whether or not the channel number for each input and/or calculation channel is shown on the display. If set to ON the channel number will be displayed alongside the measurement e.g. a reading for channel 3 may appear as 1234 3. If set to OFF the channel number will not be shown.

5.6   Alarm relay high setpoint

Section:	AL 1 to AL 8
Display:	Hi Gh
Range:	Any display value or OFF
Default Value:	OFF
Default Access Level	2
Function number	4000 to 4007

Displays and sets the high setpoint value for the designated alarm relay. Use this high setpoint function if a relay operation is required when the display value becomes equal to or more than the low setpoint value.

To set the high alarm value go to the Hi Gh function, press 🄵 and when you see a digit of the value flash use the ▲ or ▼ push buttons to set the required value then press 🄵 to accept this selection. The high alarm setpoint may be disabled by pressing the ▲ and ▼ push buttons simultaneously. When the alarm is disabled the display will indicate OFF. If the relay is allocated both a low and high setpoint then the relay will activate when the value displayed moves outside the band set by the low and high setpoints. The value at which the relay will reset is controlled by the HYSt function.

Overlapping alarms - if the Hi Gh value is set lower than the Lo value then the alarm will activate in the band between the two values.

If the display has annunciator leds for the relay then the annunciator will initially flash in alarm condition,

if the alarm is acknowledged by pressing the **F** button (where fitted) or has been acknowledged by a **P** button or remote input operation the annunciator will be solidly lit until the display moves out of alarm condition.

Example:
If **Hᵢ9h** under **AL 1** is set to **100** then relay 1 will activate when the display value is **100** or higher.
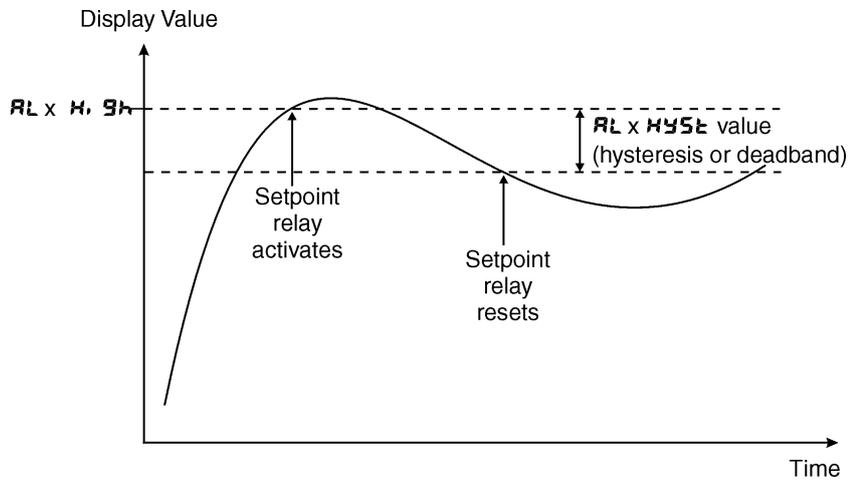
Note if the high alarm value is set lower than the low alarm value the relay will activate between the two i.e. activate in the band between the two values.

5.7 Alarm relay low setpoint

Section:	**AL 1** to **AL 8**
Display:	**Lo**
Range:	Any display value or **OFF**
Default Value:	**OFF**
Default Access Level	**2**
Function number	**40 10** to **40 17**

Displays and sets the low setpoint value for the designated alarm relay. Use this low setpoint function if a relay operation is required when the display value becomes equal to or less than the low setpoint value.

To set the low alarm value press **F** and when you see a digit of the value flash use the **▲** or **▼** push buttons to set the required value then press **F** to accept this selection.

The low alarm setpoint may be disabled by pressing the **▲** and **▼** push buttons simultaneously. When the alarm is disabled the display will indicate **OFF**. If the relay is allocated both a low and high setpoint then the relay will activate when the value displayed moves outside the band set by the low and high setpoints. The value at which the relay will reset is controlled by the Hysteresis function.

If the display has annunciator leds for the relay then the annunciator will initially flash in alarm condition, if the alarm is acknowledged by pressing the **F** button (where fitted) or has been acknowledged by a **P** button or remote input operation the annunciator will be solidly lit until the display moves out of alarm condition.

Example:
If **Lo** under **AL 1** is set to **10** then relay 1 will activate when the display value is 10 or less.
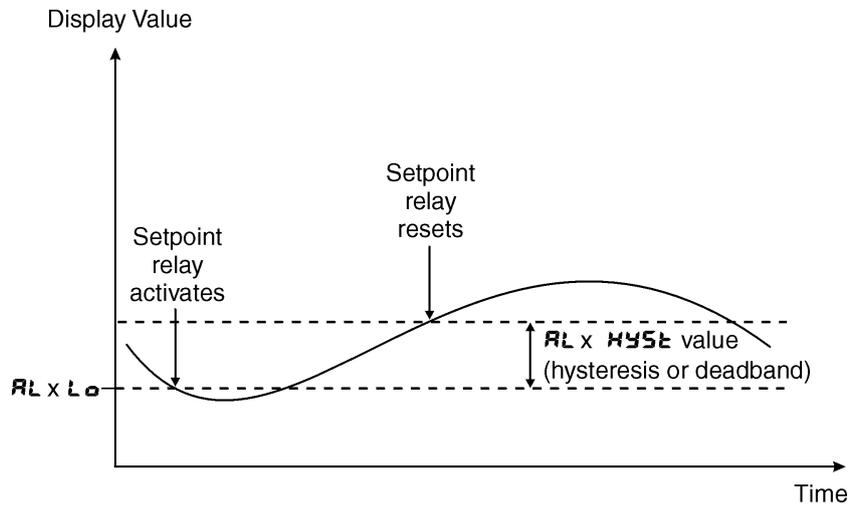
5.8 Alarm relay hysteresis (deadband)

Section:	**AL 1** to **AL 8**
Display:	**HYSt**
Range:	**0** to **6553.5**
Default Value:	**1.0**
Default Access Level	**3**
Function number	**4020** to **4027**

Displays and sets the alarm relay hysteresis limit for the selected channel. To set a relay hysteresis value go to the **HYSt** function and use the ▲ or ▼ push buttons to set the value required then press **F** to accept this value. The hysteresis value is common to Fault, Low and High setpoint values. The hysteresis value may be used to prevent too frequent operation of the relay when the measured value is rising and falling around setpoint value.

The hysteresis setting operates as follows: For the ascending alarms, once the alarm is activated the input must fall below the setpoint value minus the hysteresis value to reset the alarm. e.g. if **AL 3 HI 9h** is to **50.0** and **AL 3 HYSt** is set to **3.0** then the channel 4 alarm will activate once the display value goes to **50.0** or above and will reset when the display value goes below **47.0** i.e. at **46.9** or below.

For the descending alarms, once the alarm is activated the input must rise above the setpoint value plus the hysteresis value to reset the alarm. e.g. if **AL 2 HI 9h** is to **0.0** and **AL 2 HYSt** is set to **10.0** then the channel 5 alarm will activate when the display value falls below **0.0** and will reset when the display value goes above **10.0** i.e at **10.1** or above. The hysteresis units are expressed in displayed engineering units.

5.9 Alarm relay trip time

Section:	**AL 1** to **AL 8**
Display:	**trIP**
Range:	**0** to **6553.5** secs
Default Value:	**0.0**
Default Access Level	**3**
Function number	**4040** to **4047**

Displays and sets the alarm trip time in seconds. The trip time is common for both alarm high and low setpoint values. The trip time provides a time delay before the alarm relay will activate when an alarm condition is present. The alarm condition must be present continuously for the whole trip time period before the alarm will activate. If the input moves out of alarm condition during this period the timer will reset and the full time delay will be restored. This trip time delay is useful for preventing an alarm

trip due to short non critical deviations from setpoint. The trip time is selectable over **0.0** to **6553.5** seconds.

To set the trip time value go to the **tri P** function, press **F** and when you see a digit of the value flash use the **▲** or **▼** push buttons to set the required value then press **F** to accept this selection.

Example: If **tri P** is set to **5.0** seconds then the display must indicate an alarm value for a full 5 seconds before the relay will activate.

5.10   Alarm relay reset time

Section:	**AL 1** to **AL 8**
Display:	**rSt**
Range:	**0** to **6553.5** secs
Default Value:	**0.0**
Default Access Level	**3**
Function number	**4050** to **4057**

Displays and sets the alarm reset delay time in seconds. The reset time is common for both alarm high and low setpoint values. With the alarm condition is removed the alarm relay will stay in its alarm condition for the time selected as the reset time. If the input moves back into alarm condition during this period the timer will reset and the full time delay will be restored. The reset time is selectable over **0.0** to **6553.5** seconds.

To set the reset time value go to the **rSt** function, press **F** and when you see a digit of the value flash use the **▲** or **▼** push buttons to set the required value then press **F** to accept this selection.

Example: If **rSt** is set to **10.0** seconds then the resetting of alarm relay will be delayed by 10 seconds.

5.11   Relay selection

Section:	**AL 1** to **AL 8**
Display:	**rLYS**
Range:	**On** or **OFF**
Default Value:	**OFF**
Default Access Level	**4**
Function number	**4330** to **4337**

Allows a relay to be allocated to an alarm. For example if a high alarm value has been selected at the **AL 1 Hi 9h** function this alarm could be allocated to relay 3 by selecting **rLY3 On** at this function. Press the **F** button to enter this function then use the **▲** or **▼** pushbuttons to choose the required relay then press the **F** button to toggle to **On** or **OFF** as required. When relay PI control is used alarm 1 is dedicated to relay 1 and alarm 2 is dedicated to relay 2 so no selection choice will appear when set for PI control.

5.12   Alarm trailing or setpoint mode

Section:	**AL2** to **AL8**
Display:	**trAiL**
Range:	**SEt.P**, **tL 1**, **tL 2**, **tL 3**, **tL 4**, **tL 5**, **tL 6**, **tL 7**
Default Value:	**SEt.P**
Default Access Level	**4**
Function number	**4060** to **4067**

This function will not be seen unless relays are fitted to the instrument. Each alarm, except alarm 1, may be programmed to operate with an independent setpoint value (**SEt.P** selected) or may be linked to

operate at a fixed difference to one or more other alarms, known as trailing operation. The operation is as follows:

- Alarm 1 (**AL 1**) is always independent.

- Alarm 2 (**AL2**) may be independent or may be linked to alarm 1 (**tL 1**).

- Alarm 3 (**AL3**) may be independent or may be linked to alarm 1 (**tL 1**) or alarm 2 (**tL 2**).

- Alarm 4 (**AL4**) may be independent or may be linked to alarm 1 (**tL 1**), alarm 2 (**tL 2**) or alarm 3 (**tL 3**).

- Alarm 5 (**AL5**) may be independent or may be linked to alarm 1 (**tL 1**), alarm 2 (**tL 2**), alarm 3 (**tL 3**) or alarm 4 (**tL 4**).

- Alarm 6 (**AL6**) may be independent or may be linked to alarm 1 (**tL 1**), alarm 2 (**tL 2**), alarm 3 (**tL 3**), alarm 4 (**tL 4**) or alarm 5 (**tL 5**).

- Alarm 7 (**AL 7**) may be independent or may be linked to alarm 1 (**tL 1**), alarm 2 (**tL 2**), alarm 3 (**tL 3**), alarm 4 (**tL 4**), alarm 5 (**tL 5**) or alarm 6 (**tL 6**)

- Alarm 8 (**AL8**) may be independent or may be linked to alarm 1 (**tL 1**), alarm 2 (**tL 2**), alarm 3 (**tL 3**), alarm 4 (**tL 4**), alarm 5 (**tL 5**), alarm 6 (**tL 6**) or alarm 6 (**tL 7**)

The operation of each alarm is selectable by selecting, for example, (Alarm 4) **AL4 SEt.P** = alarm 4 normal setpoint or **AL4 tL 1** = alarm 4 trailing alarm 1 or **AL4 tL2** = alarm 4 trailing alarm 2 or **AL4 tL3** = alarm 4 trailing relay 3. For trailing set points the setpoint value is entered as the difference from the setpoint being trailed.

If the trailing setpoint is to operate ahead of the prime setpoint then the value is entered as a positive number and if operating behind the prime setpoint then the value is entered as a negative number.

Notes: If a high (**AL** x **Hi.9h**) trailing alarm is set then this will only follow the high alarm setting of the alarm it is set to trail. Similarly a low alarm will only trail a low alarm of the alarm it is set to trail. It is possible to use trailing alarms with both high and low alarm settings used for each relay.

Example 1 - High alarm: With alarm 2 set to trail alarm 1, if **AL 1 Hi.9h** is set to **1000** and **AL2 Hi.9h** is set to **50** then alarm 1 will activate at **1000** and alarm 2 will activate at **1050** (i.e. 1000 + 50). If alarm 2 had been set at **-50** then alarm 2 would activate at **950** (i.e. 1000 − 50) or above.

Example 2 - Low alarm: With alarm 2 set to trail alarm 1, if **AL 1 Lo** is set to **600** and **AL2 Lo** is set to **200** then alarm 1 will activate at **600** and alarm 2 will activate at **800** (i.e. 600 + 200). If alarm 2 had been set at **-200** then alarm 2 would activate at **400** (i.e. 600 − 200) or below.

5.13 Relay operation mode

Section:	**AL 1** to **AL2**
Display:	**OPEr**
Range:	**Hi.Lo**, **Ctrl** or **FrEq**
Default Value:	**Hi.Lo**
Default Access Level	**4**
Function number	**4160** to **4167**

The relay operation can be set for simple on/off operation from a high and or low setpoint value **Hi.Lo** of can be set for PI control operation (**Ctrl** or **FrEq**). The alarm operation mode is only available for alarms 1 and 2 using relays 1 and 2.

5.14　Alarm input channel selection

Section:	**AL 1** to **AL 8**
Display:	**Ch**
Range:	**CH 1**, **CH2**, **CH3**, **CH4**, **CH5**, **CH6**, **CH 7**, **CH8**, **CC 1**, **CC 2**, **CC 3**, **CC 4**, **CC 5**, **CC 6**, **CC 7**, **CC 8**
Default Value:	**CH 1**
Default Access Level	**4**
Function number	**4070** to **4077**

Allows selection of which channel the alarm will operate from. A physical input channel **CH 1** to **CH8** or a calculation channel **CALC 1** to **CALC8** can be chosen as the channel whose value will be used for the alarm. To select the channel go to the required alarm and press the **F** button to enter the alarm setup then use the ⏶ or ⏷ pushbutton until the display shows the required channel and then press the **F** button to accept this selection and store it in memory.

For example to select alarm 1 to operated from calculated channel 2 go to the **AL 1 Ch** function and press the **F** button, use the ⏶ or ⏷ until the **CALC 2** channel is on the display then press the **F** button to accept this selection and store it in memory.

5.15　Alarm relay latching operation

Section:	**AL 1** to **AL 8**
Display:	**LAtch**
Range:	**Auto**, **LAtch**, **A.bEEP**, **L.bEEP**
Default Value:	**Auto**
Default Access Level	**4**
Function number	**4170** to **4177**

Allows selection of alarm latching operation. If set to **Auto** the alarm relays will not latch i.e. they will automatically reset when the display moves out of alarm condition. If set to **LAtch** the relay will latch and will not reset until the display value is out of alarm condition and either the **F** button is pressed to clear the latch condition or if power is removed. The relay hysteresis, trip time and reset time settings still apply to latching relays.

In latching mode the alarm annunciator (if annunciators are fitted) will flash when the display goes into alarm condition. If the display goes out of alarm condition without being acknowledged the flashing period will change to give a longer "off" time. If the alarm is acknowledged by pressing the **F** button then the annunciator will change from flashing to solidly lit. Once the alarm has been acknowledged the relay will be free to reset once the display value moves out of alarm condition.

5.16　Relay PI control functions

See the "LD5 Series Large Digit Display Output Addendum" booklet for details of PI control functions available for relays 1 and 2.

5.17 Alarm relay normally open/closed

Section:	`rLY 1` to `rLY 17`
Display:	`rLY`
Range:	`n.o`, `n.c`
Default Value:	`n.o`
Default Access Level	`4`
Function number	`4030` to `4040`

Displays and sets the setpoint alarm relay *x* action to normally open (de-energised) or normally closed (energised), when no alarm condition is present. Since the relay will always open when power is removed a normally closed alarm is often used to provide a power failure alarm indication. To set the alarm relay for normally open or closed go to the `rLY 1` to `rLY 17` `rLY` function and use the ▲ or ▼ push buttons to set the required operation then press **F** to accept this selection. **Example:**
If set to `A 1n.o` alarm relay 1 will be open circuit when the display is outside alarm condition and will be closed (short circuit across COM and N/O terminals) when the display is in alarm condition.

5.18 Relay acknowledge

Section:	`rLY 1` to `rLY 17`
Display:	`Ack`
Range:	`OFF` or `On`
Default Value:	`OFF`
Default Access Level	`4`
Function number	`4320` to `4330`

If an alarm has been set to latching operation it will not reset until the reading is outside its alarm condition and the operator has acknowledged the alarm by pressing the **F** button (where fitted) or when programmed for this purpose using a **P** button or remote input to acknowledge the alarm. If the `Ack` is set to `On` the operator can acknowledge the alarm whilst still in alarm condition allowing the alarm to reset automatically when the reading moves outside the alarm condition.

5.19 Alarm relay Boolean logic operation

Section:	`rLY 1` to `rLY 17`
Display:	`bool`
Range:	`Or`, `And`
Default Value:	`Or`
Default Access Level	`4`
Function number	`4310` to `4320`

This function allows a Boolean logic AND (`And`) or OR (`Or`) function to be applied to alarms. If two or more alarms use the same relay and that relay is set to operate as an OR operation then this effectively puts the alarms in parallel. If two or more alarms use the same relay that relay is set to operate on an AND operation then this effectively puts the alarms in series.

Examples: 1. If alarms 1, 2 and 3 all use relay 1 and relay 1 is set for `Or` operation then relay 1 will activate if the display value for the selected channels for these alarms causes either alarm 1 or alarm 2 or alarm 3 to go into alarm condition. i.e. relay 1 will activate if any of the alarms is in alarm condition.

2. If alarms 1, 2 and 3 all use relay 1 and relay 1 is set for `And` operation then relay 1 will activate if the display value for the selected channels for these alarms causes alarm 1 and alarm 2 and alarm 3 to go into alarm condition. i.e. all 3 alarms must be in alarm condition for relay 1 to activate.

5.20   Input channel decimal point selection

Section:	*INP1* to *INP8*
Display:	*d.Pnt*
Range:	*0*, *0.1*, *0.02*, *0.003*
Default Value:	*0.1*
Default Access Level	*4*
Function number	*4100* to *4107*

This function allows the user to select the decimal point for the input channel displays. In temperature displays the choice will be *0* (no decimal point) or *0.1* (one decimal point).

5.21   Input channel display rounding selection

Section:	*INP1* to *INP8*
Display:	*d.rnd*
Range:	*0.1* to *500.0*
Default Value:	*0.1*
Default Access Level	*4*
Function number	*4360* to *4367*

This function allows the user to select the display rounding for the input channel display. Display rounding allow the resolution of the display to be reduced to an acceptable level whilst minimising any distracting changing of display value at each sample. For example with this function set to *5* the value displayed will be rounded up or down and will change in multiples of 5 only e.g. 0, 5, 10, 15 etc. and values in between will not be shown.

5.22   Input filter

Section:	*INP1* to *INP8*
Display:	*Filtr*
Range:	*0*, *1*, *2*, *3*, *4*, *5*, *6*, *7*, *8*
Default Value:	*2*
Default Access Level	*4*
Function number	*43C0* to *43C7*

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 *Filtr* 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 *Filtr* function and use the ▲ or ▼ push buttons to set the required value then press **F** to accept this selection.

5.23   4mA display scale value

Section:	`INP1` to `INP8`
Display:	`En4`
Range:	Any display value
Default Value:	`0`
Default Access Level	`CAL`
Function number	`4700` to `4707`

Set the display value for 4mA input. This calibration method can be used with 4-20mA inputs only. The instrument can be scaled for a 4-20mA input without a live input i.e. this is an alternative method to the `CAL1` and `CAL2` method of scaling. The `En4` function sets the value to be displayed for a 4mA input. To set the 4mA display value go to the `En4` function and press the 🄵 button. The previous setting will flash. Us the 🔼 or 🔽 pushbutton to set the required display value for a 4mA input then press 🄵 to accept this new value. The message `CAL End` should be seen.

5.24   20mA display scale value

Section:	`INP1` to `INP8`
Display:	`En20`
Range:	Any display value
Default Value:	`1000`
Default Access Level	`CAL`
Function number	`4710` to `4717`

Set the display value for 20mA input. This calibration method can be used with 4-20mA inputs only. The instrument can be scaled for a 4-20mA input without a live input i.e. this is an alternative method to the `CAL1` and `CAL2` method of scaling. The `En20` function sets the value to be displayed for a 20mA input. To set the 20mA display value go to the `En20` function and press the 🄵 button. The previous setting will flash. Us the 🔼 or 🔽 pushbutton to set the required display value for a 20mA input then press 🄵 to accept this new value. The message `CAL End` should be seen.

5.25   Input Voltage Range

Section:	`INP1` to `INP8`
Display:	`rAnge`
Range:	`1`, `2`, `4`, `8`, `16`, `32`, `64`
Default Value:	`16`
Default Access Level	`4`
Function number	`4110` to `4117`

The Input Range function is only available for input channels that have been factory set as Voltage inputs. The Input Range function sets the minimum/maximum input voltage range for a given channel. If the voltage on the physical input exceeds ± the Input Range voltage, the channel will display an over/under range error message, e.g. `-Or-` / `-Ur-`

The Input Voltage Range should be set as close to the maximum physical input voltage that the sensor will output in its normal operating mode. For example, `8` volts is a more appropriate range than `64` for a 0-5V transducer.

5.26   Uncalibrate the input channel

Section:	**` INP I`** to **`INP8`**
Display:	**`U.CAL`**
Range:	n/a
Default Value:	n/a
Default Access Level	**`CAL`**
Function number	**`0620`** to **`0627`**

This function allows the user to clear the calibration memory for the selected channel. If calibration problems have been encountered on a particular channel it is recommended that the channel be uncalibrated and then the reading checked before any new calibration attempt is made. If the display reading after uncalibration is not close to the expected reading then this indicates that there is a problem (e.g. a problem with the input sensor) which should be investigated before a new calibration is attempted. To uncalibrate go to the **`U.CAL`** function for the input channel required and press **`F`** then toggle the display to show **`YES`** using the **▲** or **▼** pushbuttons and then press **`F`** again to accept the uncalibration. The display will show an uncal end message such as **`U.CAL End`**.

5.27   Input Scale Point 1

Section:	**` INP I`** to **`INP8`**
Display:	**`SCALE I`**
Range:	n/a
Default Value:	n/a
Default Access Level	**`CAL`**
Function number	**`4770`** to **`4777`**

The Input Scale calibration method is only available for input channels that have been factory set as Voltage inputs. This method allows an input channel to be scaled without a live input i.e. this is an alternative method to the **`CAL I`** and **`CAL2`** method of scaling. The **`SCALE I`** combined with the **`SCALE2`** function allows two calibration points to be entered manually. Each point has an input voltage and a scale value (value to be displayed) for the given voltage. The instrument interpolates between these to points to calculate a display value for any input voltage.

To set a Scale point, press the **`F`** button followed by the **▲** key to select **`YES`** and **`F`** to accept. You will be prompted to enter an **` INPUT`** value. Use the **▲▼** keys to enter the desired input voltage and press **`F`** to accept. You will then be prompted to enter the **`SCALE`** value, in the same way, enter the value that should be displayed for the previously entered input voltage. Note: both **`SCALE I`** and **`SCALE2`** points need to be set for correct calibration via this method.

5.28   Input Scale Point 2

Section:	**` INP I`** to **`INP8`**
Display:	**`SCALE2`**
Range:	n/a
Default Value:	n/a
Default Access Level	**`CAL`**
Function number	**`4790`** to **`4797`**

See **`SCALE I`** function above (5.27)

5.29   First calibration point for selected input

Section:	**INP 1** to **INP8**
Display:	**CAL 1**
Range:	n/a
Default Value:	n/a
Default Access Level	**CAL**
Function number	**0b00** to **0b07**

This function as the first calibration point of a two point calibration. See also the **U.CAL** and **OFSt** functions. If calibration problems are encountered use the **U.CAL** to uncalibrate i.e. clear the previous calibration memory.

The calibration procedure for the first calibration point is:

- With the input at known low value (typically an input for a zero display value) go to the **CAL 1** function for the required input channel e.g. **INPt6 CAL 1** when calibrating input 6.

- The display should show **NO**. Press the **F** pushbutton, the **NO** should flash. Press the ▲ or ▼ pushbutton until the display changes to a flashing **YES** then press the **F** button.

- The display should show **CAL 1** followed by the channel number followed by a live input reading. Press the **F** pushbutton.

- The display should show **SCLE** followed by a value which is flashing. Use the ▲ or ▼ pushbutton to make the display show the reading required for that input then press the **F** button.

- The display should show the message **CAL End** and return to the input menu.

5.30   Second calibration point for selected input

Section:	**INP 1** to **INP8**
Display:	**CAL2**
Range:	n/a
Default Value:	n/a
Default Access Level	**CAL**
Function number	**0b10** to **0b17**

This function as the second calibration point of a two point calibration. See also the **CAL 1** first point calibration function.

The calibration procedure for the second calibration point is:

- With the input at a different than the first calibration point (difference must be at least 10% of the input full range) go to the **CAL2** function for the required input channel e.g. **INPt 6 CAL2** when calibrating input 6.

- The display should show **NO**. Press the **F** pushbutton, the **NO** should flash. Press the ▲ or ▼ pushbutton until the display changes to a flashing **YES** then press the **F** button.

- The display should show **CAL2** followed by the channel number followed by a live input reading. Press the **F** pushbutton.

- The display should show **SCLE** followed by a value which is flashing. Use the ▲ or ▼ pushbutton to make the display show the reading required for that input then press the **F** button.

- The display should show the message **CAL End** and return to the input menu.
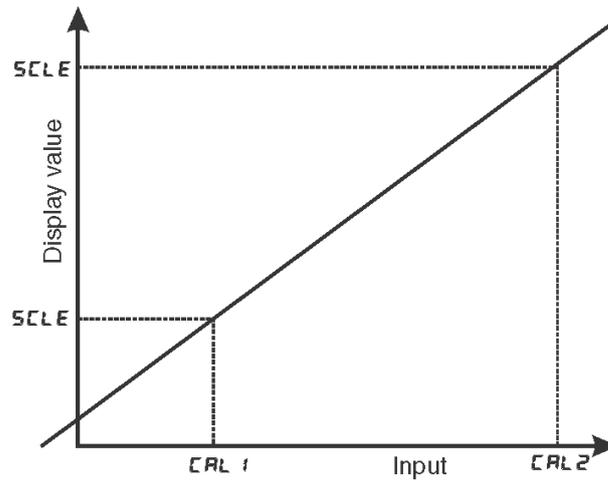
5.31 Calibration offset

Section:	**iNP i** to **iNP8**
Display:	**OFSt**
Range:	n/a
Default Value:	n/a
Default Access Level	**CAL**
Function number	**0b60** to **0b67**

The offset can be used to adjust for a consistent error in the display reading. The offset allows a value to be added or subtracted from the displays previously values. The offset procedure is:

- Go to the **OFSt** function for the required channel and press **F** the display will flash **NO** use the ▲ pushbutton to toggle to **YES** and press **F** again.

- The display will show the live display reading. Press **F** the display will now eventually show a value with the last digit flashing. Use the ▲ or ▼ button to adjust the value to the reading required for the input present at this time.

- When the new value is displayed press **F** the message **OFSt End** should be displayed and the display will then return to the input menu.
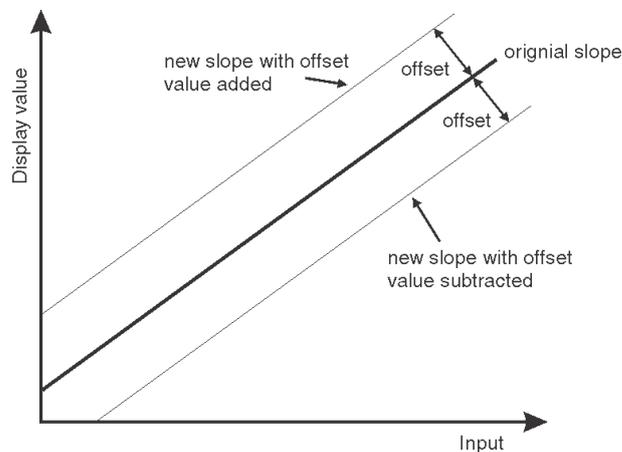
5.32   Channel display on/off

Section:	*ınp ı* to *ınp 8*
Display:	*dıSP*
Range:	*OFF* or *On*
Default Value:	*On*
Default Access Level	*4*
Function number	*44F0* to *44F7*

If this function is set to *On* the selected channel will be seen as part of the normal automatic scanning display. If set to *OFF* the selected channel will not be seen as part of the automatic scanning display but will still be seen if the display is manually scrolled between channels using the ▲ and ▼ buttons.

5.33   Copy channel settings to another channel

Section:	*ınp ı* to *ınp 8*
Display:	*COPY to*
Range:	*nOnE*, *2*, *3*, *4*, *5*, *6*, *7*, *8*
Default Value:	*nOnE*
Default Access Level	*4*
Function number	*20E0* to *20E7*

This function allows selected channel settings of decimal point, display rounding, digital filter and input type to be to be copied to another channel e.g. if *ınp5 COPY to* function is selected as 7 is chosen in this function then channel 5 settings will be copied to channel 7. Once completed another channel may be chosen i.e. if all channels are to have the same input settings it is possible to set one channel then copy these settings to all other channels one at a time. Once the copy to channel is chosen press the **F** button, the display will then return to *nOnE* but the settings will have been copied. The calibration will not be copied.

5.34   Calculation channel function

Section:	*CALC ı* to *CALC 8*
Display:	*Func*
Range:	*Hı*, *Lo*, *dıFF*, *AUg*, *d.AUg*, *P.AUg*, *n.AUg*, *S.dıFF*, *Add*, *PC ı*, *PC 2*, *Sub*, *Prod*, *dıu*, *SınE*, *CoS*, *r.AUg*, *F.AUg*
Default Value:	*Hı*
Default Access Level	*4*
Function number	*4E10* to *4E17*

Allows selection of the function to be used for each calculated channel. Options are:

Hı - calculated channel shows the highest positive value from all of the selected input channels.

Lo - calculated channel shows the lowest value from all of the selected input channels.

dıFF - calculated channel shows the difference in value between the highest and lowest selected input channel readings.

AUg - calculated channel shows the average of all selected input channel readings.

d.AUg - calculated channel shows a value equal to the biggest difference from the average of all selected channels

P.AUg - calculated channel shows a value equal to the highest positive value and the average of the selected channels.

n.AUg - calculated channel shows a value equal to the average minus the lowest value of the selected channels.

S.dıFF - calculated channel shows the difference (positive or negative) between the first two selected active channels.

Add - calculated channel shows the sum of all active channels

PE 1 - calculated channel shows the percentage of the first selected channel to the sum of all selected channels including itself.

PE 2 - calculated channel shows the percentage of the second selected channel to the sum of all selected channels including itself.

Sub - subtraction, channel 2 will be subtracted from channel 1 and if there are more than 2 channels selected the next channel will be subtracted from the result of channel 1 minus channel 2 etc.

Prod - multiplication, channel 1 and 2 will be multiplied and if there are more than 2 channels selected the result of channel 1 times channel 2 will be multiplied by the next channel etc.

div - division. channel 1 divided by channel 2 and if there are more than 2 channels selected this result will be divided by the next channel etc.

SinE - sine, channel 1 is multiplied by the sine of the value on channel 2 and if there are more than 2 channels selected this result will be multiplied by the sine of the value of the next channel etc.

CoS - cosine, channel 1 is multiplied by the cosine of the value on channel 2 and if there are more than 2 channels selected this result will be multiplied by the cosine of the value of the next channel etc.

r.AUG - rolling average. The rolling average will take the current input and average this with the previously calculated average figure. The rolling and fixed averages both use the count set by the **A.cnt** function to set the number of input values to be averaged but the rolling average updates with every new input value received. The rolling average can only be calculated for a single input channel.

F.AUG - fixed average. The fixed average causes the display to show the average of the number of data strings selected at the **A.cnt** function. The fixed average will only be displayed at the end of the number of data string selected. For example if **A.cnt** is set to **20** then the display will update when 20 data strings have been input and averaged (assuming timeouts have not been exceeded). The fixed average can only be calculated for a single input channel.

Example 1: To program calculated channel 1 to activate relay 1 and 2 to operate on an highest value if the value of any of the 8 inputs exceeds 120 the basic settings are:

- At the **CONFIG CHAN Count** function ensure that at least one calculation channel is set

- Set **AL 1 Hi.gh** to **120**

- Set **AL 1 rLYS** to **rLY1 On** and **rLY2 On**

- Set **AL 1 OPEr** to **Hi.Lo**

- Set **AL 1 Ch** to **CC 1**

- Set **CC 1 Func** to **Hi**

- Set **CC 1 CHAn SEL** to **Ch 1 On**, **Ch2 On**, **Ch3 On**, **Ch4 On**, **Ch5 On**, **Ch6 On**, **Ch7 On** and **Ch8 On**

Relays 1 and 2 will now activate if any of the 8 inputs exceeds a value of 120 and if annunciators are fitted annunciator 1 will flash. In the example above if **AL 1 Lo** had been set to **120** with the high alarm set to **OFF** then the relays would activate if any of the inputs falls below 120.

Example 2: To program calculated channel 1 to activate relay 1 to operate on a difference value if the difference between inputs 1 and 2 exceeds a value of 20 the basic settings are:

- At the **CONFIG CHAN Count** function ensure that at least one calculation channel is set

- Set **AL 1 Hi.gh** to **20**

- Set **AL 1 rLYS** to **rLY1 On**

- Set **AL 1 OPEr** to **Hi.Lo**

- Set **AL 1 Ch** and to **CC 1**

- Set **CC 1 Func** to **diFF**

- Set **CC1 ChAn SEL** to **Ch1 On** and **Ch2 On**

Relay 1 will now activate if the difference between input channels 1 and 2 exceeds a value of 20 and if annunciators are fitted annunciator 1 will flash. In the example above if **AL1 Lo** had been set to **20** with the high alarm set to **OFF** then the relay would activate if the difference between the two inputs was less than 20.

Example 3: To program calculated channel 3 to show the sine of the value on input 1 divided by the cosine of the value on input 2 the basic settings are:

- At the **CONFI9 CHAN Count** function ensure that three calculation channel are set

- Set **CC1 Func** to **SinE**

- Set **CC1 ChAn SEL** to **Ch1 On** and **Ch2 OFF**

- Set **CC2 Func** to **CoS**

- Set **CC2 ChAn SEL** to **Ch1 OFF**, **Ch2 On**, **CALC1 OFF**.

- Set **CC3 Func** to **div**

- Set **CC3 ChAn SEL** to **Ch1 OFF**, **Ch2 OFF**, **CALC1 On** and **CALC2 On**

Calculated channel 3 (**c3** display) will now show the sine of input 1 divided by the cosine of input 2 i.e. the value on the **c1** display divided by the value on the **c2** display.

5.35   Calculation channel data log

Section:	**CALC1** to **CALC8**
Display:	**d.Lo9**
Range:	**OFF** or **On**
Default Value:	**OFF**
Default Access Level	**4**
Function number	**4E50** to **4E57**

Applicable only when the internal data logger option is fitted. This function allows the calculated channel values to be added to the values logged by the data logger when set to **On** or stops the values being added to the logged values when set to **OFF**.

5.36   Calculation channel display on/off

Section:	**CALC1** to **CALC8**
Display:	**diSP**
Range:	**OFF** or **On**
Default Value:	**OFF**
Default Access Level	**4**
Function number	**4E60** to **4E67**

This function allows the user to select whether or not the calculated channel is shown on the display along with the input channels during an automatic display scan. Each calculated channel can be independently set to **On** or **OFF** i.e. it is possible to select only those channels you wish to see during the automatic display scan. If set to **OFF** the calculated channel selected will not be displayed. If set to **On** the calculated channel selected will be displayed and will show a **c** on the display e.g. a display of **123c4** would indicate the calculated channel 4 value is 123. The calculated channel can still be seen if the channels are manually scanned via the ▲ or ▼ pusbuttons even if this function is set to **OFF**.

5.37 Calculation channel decimal point

Section:	`CALC 1` to `CALC 8`
Display:	`d.Pnt`
Range:	`0`, `0.1`, `0.02`, `0.003`
Default Value:	`0`
Default Access Level	`4`
Function number	`4E70` to `4E77`

This function allows the user to select the decimal point for the calculated channel display. In temperature displays the choice will be `0` (no decimal point) or `0.1` (one decimal point). In other displays this may go up to `0.003` (3 decimal points). The decimal points for the calculated channel do not need to match those of the physical input channels but allowances need to be made for the number of display digits available.

5.38 Calculation channel display rounding

Section:	`CALC 1` to `CALC 8`
Display:	`d.rnd`
Range:	`1` to `5000`
Default Value:	`1`
Default Access Level	`4`
Function number	`4E80` to `4E87`

This function allows the user to select the display rounding for the calculated channel display. Display rounding allow the resolution of the display to be reduced to an acceptable level whilst minimising any distracting changing of display value at each sample. For example with this function set to `5` the value displayed will be rounded up or down and will change in multiples of 5 only e.g. 0, 5, 10, 15 etc. and values in between will not be shown.

5.39 Calculation channel selection

Section:	`CALC 1` to `CALC 8`
Display:	`ChAn SEL`
Range:	`CH1`, `CH2`, `CH3`, `CH4`, `CH5`, `CH6`, `CH7`, `CH8`, `CALC 1`, `CALC 2`, `CALC 3`, `CALC 4`, `CALC 5`, `CALC 6`, `CALC 7`, `CALC 8`
Default Value:	n/a
Default Access Level	`4`
Function number	`4E20` to `4E27`

This function allows the user to select which the available channels the calculated channel will use by turning each channel on (`On`) or off (`OFF`). For example if you wish to display the highest input from physical inputs 2, 4 and 6 on calculated channel 1 then at the `CC1 ChAn SEL` function set `CH2`, `CH4` and `CH6` to `On` and set all other channels to `OFF`.

Note this function allows both physical input channels and other calculated channels to be used as inputs for the calculated result. e.g. in the example above it would also be possible to choose to display the highest value from `CH2`, `CH4`, `CH6` or `CC2` (calculated channel 2).

See the `Func` function for a list of the mathematical calculations available.

5.40 Calculation channel fixed average count

Section:	`CALC 1` to `CALC 8`
Display:	`A.cnt`
Range:	`1` to `128`
Default Value:	`4`
Default Access Level	`4`
Function number	`4EF0` to `4EF7`

This function set the number of channels to average when the calculation channel is set for rolling or fixed average operation (`r.AVg` or `F.AVg`).

5.41 Calculation channel multiplication scale

Section:	`CALC 1` to `CALC 8`
Display:	`Arith SCALE`
Range:	Any display value
Default Value:	n/a
Default Access Level	`4`
Function number	`4E90` to `4E97`

Arithmetic offset, scale and division functions allow the value sent to the display to be altered prior to display. The offset operation will be performed first followed by the scale and then the division. The `Arith SCALE` function allows the user to select a scaling value for the display. For example if this function is set to `2` then the value sent to the display will (after any addition required) be doubled.

5.42 Calculation channel offset value

Section:	`CALC 1` to `CALC 8`
Display:	`Arith OFFSEt`
Range:	Any display value
Default Value:	n/a
Default Access Level	`4`
Function number	`4EA0` to `4EA7`

Arithmetic offset, scale and division functions allow the value sent to the display to be altered prior to display. The offset operation will be performed first followed by the scale and then the division. The `Arith OFFSEt` function allows the user to select an offset value to be added to the incoming value prior to display. For example if this function is set to `100` then the value sent to the display will be have the value of 100 added to it.

5.43 Calculation channel division

Section:	`CALC 1` to `CALC 8`
Display:	`Arith div`
Range:	Any display value
Default Value:	n/a
Default Access Level	`4`
Function number	`4Eb0` to `4Eb7`

Arithmetic offset, scale and division functions allow the value sent to the display to be altered prior to display. The offset operation will be performed first followed by the scale and then the division. The `Arith div` function allows the user to select a division value to be used on the incoming value prior to display. For example if this function is set to `5` then the value sent to the display will (after any addition and scale has been applied) be divided by 5.

5.44 Automatic display brightness

Section:	di SP
Display:	br9t Auto
Range:	OFF or ON
Default Value:	On
Default Access Level	2
Function number	22FC

Automatic display brightness adjustment. Applies only to instruments with light sensor fitted. The automatic brightness adjustment uses the optional light sensor to gauge the required brightness level for the environment. The high and low brightness limits are set at the **Auto Hi9h** and **Auto Lo** functions described below.

5.45 Display brightness

Section:	di SP
Display:	br9t
Range:	1 to 63
Default Value:	63
Default Access Level	2
Function number	22Fb

Allows manual adjustment of the display brightness from 1 (lowest brightness) to 63 (highest brightness).

5.46 Dimmed display brightness

Section:	di SP
Display:	dull
Range:	0 to 63
Default Value:	7
Default Access Level	2
Function number	22EC

Displays and sets the manually set level for remote input brightness switching. When a remote input is set to **dull** the remote input can be used to switch between the display brightness level set by the **br9t** function and the dimmed display brightness set by the **dull** function. The display dull level is selectable from **0** to **63**, where **0** = lowest intensity and **63** = highest intensity. This function is useful in reducing glare when the display needs to be viewed in both light and dark ambient light levels.

5.47 Auto display brightness high level

Section:	di SP
Display:	Auto Hi9h
Range:	15 to 63
Default Value:	63
Default Access Level	2
Function number	22EA

Automatic brightness high level - seen only when **br9t Auto** is set to **ON**. The high brightness level sets the maximum brightness which the automatic brightness control can achieve with 64 being the highest intensity.

5.48 Auto display brightness low level

Section:	di5P
Display:	Auto Lo
Range:	1 to 63
Default Value:	7
Default Access Level	2
Function number	22Eb

Automatic brightness low level - seen only when br9t Auto is set to ON. The low brightness level sets the minimum brightness which the automatic brightness control can achieve with 64 being the highest intensity and 0 being the lowest intensity.

5.49 Timer for low brightness level

Section:	di5P
Display:	d.OFF
Range:	0 to Maximum display value mins
Default Value:	0
Default Access Level	2
Function number	22EE

This function can be used to select the number of minutes for the automatic display dulling (brightness falls to the level set at the dul1 function). If set to 0 the auto display blanking is disabled and the display will remain on. If set to a number other than 0 then the display will switch off in the number of minutes set. When the display blanks the alarm annunciators, the input reading and the channel number will all be blanked. Timing for the auto blanking starts from the last keypad operation i.e. from the last time the 🅿, 🅵, 🔼 or 🔽 button was pressed. To turn the display back on or to restart the timing process simply press any of these buttons. The instrument will continue to measure input, operate alarms etc. even if the display is blank. The display blanking is provided primarily to reduce power consumption in battery powered applications .

5.50 Optional analog output functions

See the '"LD5 Series Large Digit Display Output Addendum" booklet for details of the optional analog retransmission and PI control functions available

5.51 Front P button operation mode

Section:	r.i NP
Display:	P.but
Range:	NONE, P.Hi , P.Lo, Hi.Lo, AL.Ac, 5.Hol d
Default Value:	NONE
Default Access Level	4
Function number	4720

Sets the operation mode for front P button. Functions available are identical to the same functions used in the r.i N.1 to r.i N.4 functions. For the 5.Hol d function using the 🅿 button press 🅿 to hold the display and then when ready to resume scanning press 🅿 again. Whilst the scan is held the message Hol d will flash momentarily every 8 seconds.

5.52   Remote input 1 operation mode

Section:	$r.I$ nP
Display:	$r.I$ $n.I$
Range:	$nOnE$, $P.HoId$, $d.HoId$, $P.HI$, $P.Lo$, $HI.Lo$, $AL.Ac$, $ACCSS$, $P.but$,
	$F.but$, $U.but$, $d.but$, duI, $S.HoId$, $r.SEI$, $b.Inc$, $b.dEc$
Default Value:	$nOnE$
Default Access Level	$r.I$ $n.I$
Function number	$472I$

Sets the operation mode for remote input 1 terminal. Choices are as follows:

- $nOnE$ - If this option is selected then remote input 1 will have no function.

- $P.HoId$ - 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 $P.HI$ d will appear briefly every 8 seconds whilst the input terminals are short circuited to indicate that the peak hold function is active. All active channels will be peak held when this mode is chosen and activated.

- $d.HoId$ - 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. All active channels will be display held when this mode is chosen and activated.

- $P.HI$ - 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 return to normal measurement after 20 seconds. If the short circuit is held for 2 to 3 seconds or the power is removed from the instrument then the memory will be reset, a rSt message will be seen if the memory is reset by holding a short circuit for 2 to 3 seconds. The peak high mode will operate on all active channels.

- $P.Lo$ - valley memory. The minimum value stored in memory will be displayed. Otherwise operates in the same manner as the $P.HI$ function described above. The peak low mode will operate on all active channels.

- $HI.Lo$ - toggle between HI and Lo displays. This function allows the remote input to be used to toggle between peak and valley memory displays. The first operation of the remote input will cause the peak memory value to be displayed, the next operation will give a valley memory display. $P.HI$ or $P.Lo$ will flash before each display to give an indication of display type. The peak high/low mode will operate on all active channels.

- $AI.AC$ - alarm acknowledge. Allows the remote input to be used to acknowledge an alarm. If the alarm is set for latching operation the acknowledgment will allow the alarm and any relays allocated to that alarm to reset when the alarm condition is removed. If the alarm is set for automatic reset the acknowledgment will allow the alarm and any relays allocated to that alarm to reset even if the alarm condition still exists this could typically be used to silence a siren controlled by a relay even though the alarm condition is still present. The acknowledge will operate on all alarms programmed to require acknowledgement.

- $ACCS$ - remote input access. Allows the remote input to be used for setup function access control purposes. Refer to the " Accessing setup functions" in the Introduction chapter.

- $P.but$ - allows the selected remote input to act as the **P** pushbutton.

- $F.but$ - allows the selected remote input to act as the **F** pushbutton.

- $U.but$ - allows the selected remote input to act as the ▲ pushbutton.

- $d.but$ - allows the selected remote input to act as the ▼ pushbutton.

- **dul ı** - remote dulling of the display. When activated the display brightness will fall to the level set by the **dı SP dul ı** level. This is generally used to reduce current consumption in battery powered applications or for switching between day and night brightness levels.

- **S.Hol d** - scan hold. When activated the automatic display scanning will be held. Whilst the scan is held the message **Hol d** will flash momentarily every 8 seconds.

- **r.SEl** - optional analog output channel select. When this mode is chosen one or more remote inputs can be used to select which channel (input channels 1 to 8 and calculation channels 1 to 8) is retransmitted on the optional analog output. This method dedicates the remote inputs to be used as binary on/off inputs for channel select. For example remote inputs 1, 2 and 3 could be set to allow binary inputs 000 to 111 to select from channel 1 to channel 8. If all 4 remote input channels are selected for this use the calculation channels can also be selected for analog retransmission. See the remote input section of the electrical installation chapter for details.

- **b.ı nc** - display brightness increment. Allows the selected remote input to be used to increment the display brightness. If no other remote input is set to **b.dEc** then once maximum brightness is reached the brightness will start again from lowest brightness and increment. If auto brightness is turned on then when powered up the display will go to its auto brightness level and can be adjusted from there. . If auto brightness is turned off then the display will remember its last brightness setting on power up.

- **b.dEc** - display brightness decrement. Allows the selected remote input to be used to decrement the display brightness. If no other remote input is set to **b.ı nc** then once minimum brightness is reached the brightness will start again from lowest highest brightness and decrement. If auto brightness is turned on then when powered up the display will go to its auto brightness level and can be adjusted from there. If auto brightness is turned off then the display will remember its last brightness setting on power up.

5.53 Remote input 2 operation mode

Section:	**r.ı nP**
Display:	**r.ı n.2**
Range:	**nOnE**, **P.Hol d**, **d.Hol d**, **P.Hı** , **P.Lo**, **Hı .Lo**, **AL.Ac**, **ACCSS**, **P.but**, **F.but**, **U.but**, **d.but**, **dul ı** , **S.Hol d**, **r.SEl** , **b.ı nc**, **b.dEc**
Default Value:	**nOnE**
Default Access Level	**4**
Function number	**4722**

Remote input 2 functions. Same choices as **r.ı nP r.ı n. ı** apply.

5.54 Remote input 3 operation mode

Section:	**r.ı nP**
Display:	**r.ı n.3**
Range:	**nOnE**, **P.Hol d**, **d.Hol d**, **P.Hı** , **P.Lo**, **Hı .Lo**, **AL.Ac**, **ACCSS**, **P.but**, **F.but**, **U.but**, **d.but**, **dul ı** , **S.Hol d**, **r.SEl** , **b.ı nc**, **b.dEc**
Default Value:	**nOnE**
Default Access Level	**4**
Function number	**4723**

Remote input 3 functions. Same choices as **r.ı nP r.ı n. ı** apply.

5.55 Remote input 4 operation mode

Section:	*r.i nP*
Display:	*r.i n.4*
Range:	*nOnE*, *P.Hol d*, *d.Hol d*, *P.Hi*, *P.Lo*, *Hi .Lo*, *AL.Ac*, *ACCSS*, *P.but*,
	F.but, *U.but*, *d.but*, *dul i*, *S.Hol d*, *r.SEt*, *b.i nc*, *b.dEc*
Default Value:	*nOnE*
Default Access Level	*4*
Function number	*4724*

Remote input 4 functions. Same choices as *r.i nP r.i n. i* apply.

5.56 Remote input (digital inputs) 1 pull up/down operation

Section:	*d.i n*
Display:	*d.i n.1 P.UP*
Range:	*OPEn*, *Hi 9h*, *Lo*
Default Value:	*Hi 9h*
Default Access Level	*4*
Function number	*4A50*

This function sets the voltage level present on the digital input terminal. If set to *Hi 9h* a 5VDC voltage will be placed on the input terminal via a pull up resistor and a short circuit to ground or voltage below 2V will be required to activate the remote input. If set to *Lo* then the input terminal will be connected to ground via a pull down resistor and a voltage between 5 and 24VDC will be required at the input to activate the remote input. If set to *OPEn* then both the pull up and pull down resistors will be taken out of circuit and the terminal voltage will be "floating", this choice can be used when input devices are used which may supply their own voltage to the digital input terminal, maximum acceptable voltage is 24VDC.

5.57 Remote input (digital inputs) 1 input level

Section:	*d.i n*
Display:	*d.i n.1 Lul*
Range:	*Hi 9h*, *Lo*
Default Value:	*Lo*
Default Access Level	*4*
Function number	*4A58*

This function sets the input level required to activate the remote input. A setting of *Lo* means that a low voltage usually 0V or a short circuit to ground will activate the remote input. A setting of *Hi 9h* means that a voltage of 5 to 24V is required to activate the remote input.

5.58 Remote input (digital inputs) 2 pull up/down operation

Section:	*d.i n*
Display:	*d.i n.2 P.UP*
Range:	*OPEn*, *Hi 9h*, *Lo*
Default Value:	*Hi 9h*
Default Access Level	*4*
Function number	*4A5 i*

This function sets the voltage level present on the digital input terminal. If set to *Hi 9h* a 5VDC voltage will be placed on the input terminal via a pull up resistor and a short circuit to ground or voltage below

2V will be required to activate the remote input. If set to `Lo` then the input terminal will be connected to ground via a pull down resistor and a voltage between 5 and 24VDC will be required at the input to activate the remote input. If set to `OPEn` then both the pull up and pull down resistors will be taken out of circuit and the terminal voltage will be "floating", this choice can be used when input devices are used which may supply their own voltage to the digital input terminal, maximum acceptable voltage is 24VDC.

5.59   Remote input (digital inputs) 2 input level

Section:	`d.in`
Display:	`d.in.2 Lvl`
Range:	`Hi9h`, `Lo`
Default Value:	`Lo`
Default Access Level	`4`
Function number	`4A59`

This function sets the input level required to activate the remote input. A setting of `Lo` means that a low voltage usually 0V or a short circuit to ground will activate the remote input. A setting of `Hi9h` means that a voltage of 5 to 24V is required to activate the remote input.

5.60   Remote input (digital inputs) 3 pull up/down operation

Section:	`d.in`
Display:	`d.in.3 P.UP`
Range:	`OPEn`, `Hi9h`, `Lo`
Default Value:	`Hi9h`
Default Access Level	`4`
Function number	`4A52`

This function sets the voltage level present on the digital input terminal. If set to `Hi9h` a 5VDC voltage will be placed on the input terminal via a pull up resistor and a short circuit to ground or voltage below 2V will be required to activate the remote input. If set to `Lo` then the input terminal will be connected to ground via a pull down resistor and a voltage between 5 and 24VDC will be required at the input to activate the remote input. If set to `OPEn` then both the pull up and pull down resistors will be taken out of circuit and the terminal voltage will be "floating", this choice can be used when input devices are used which may supply their own voltage to the digital input terminal, maximum acceptable voltage is 24VDC.

5.61   Remote input (digital inputs) 3 input level

Section:	`d.in`
Display:	`d.in.3 Lvl`
Range:	`Hi9h`, `Lo`
Default Value:	`Lo`
Default Access Level	`4`
Function number	`4A5A`

This function sets the input level required to activate the remote input. A setting of `Lo` means that a low voltage usually 0V or a short circuit to ground will activate the remote input. A setting of `Hi9h` means that a voltage of 5 to 24V is required to activate the remote input.

5.62 Remote input (digital inputs) 4 pull up/down operation

Section:	d.ın
Display:	d.ın.4 P.UP
Range:	OPEn, Hı9h, Lo
Default Value:	Hı9h
Default Access Level	4
Function number	4A53

This function sets the voltage level present on the digital input terminal. If set to **Hı9h** a 5VDC voltage will be placed on the input terminal via a pull up resistor and a short circuit to ground or voltage below 2V will be required to activate the remote input. If set to **Lo** then the input terminal will be connected to ground via a pull down resistor and a voltage between 5 and 24VDC will be required at the input to activate the remote input. If set to **OPEn** then both the pull up and pull down resistors will be taken out of circuit and the terminal voltage will be "floating", this choice can be used when input devices are used which may supply their own voltage to the digital input terminal, maximum acceptable voltage is 24VDC.

5.63 Remote input (digital inputs) 4 input level

Section:	d.ın
Display:	d.ın.4 Lvl
Range:	Hı9h, Lo
Default Value:	Lo
Default Access Level	4
Function number	4A5b

This function sets the input level required to activate the remote input. A setting of **Lo** means that a low voltage usually 0V or a short circuit to ground will activate the remote input. A setting of **Hı9h** means that a voltage of 5 to 24V is required to activate the remote input.

Serial communications functions.
Optional RS232, RS485 and Ethernet communications are available. Refer to the 05 Series Large Digit Display Output Addendum" booklet for further details and examples of serial communications commands.

5.64 Serial output operation mode

Section:	SErı
Display:	OPEr
Range:	NonE, Cont, Poll, A.buS, dıSP or m.buS
Default Value:	NonE
Default Access Level	4
Function number	4480

Allows selection of the operating mode to be used for serial output communications. See the "LD5 Series 8 Channel Scanning Monitor Output Addendum" for more information and wiring details of optional isolated serial communications.

If using USB communications then **A.buS** must be chosen as the operating mode.

Choices are:

- **NonE** - no serial comms. required.

- **Cont** - sends ASCII form of display data at a rate typically 90% of the sample rate.

- **Poll** - controlled by computer or PLC etc. as host. The host sends command via RS232/485 and instrument responds as requested.

- **A.buS** - this is a special communications mode used with Windows compatible PC download software. This mode must be used if communications via USB is used. Refer to the user manual supplied with this optional software.

- **di SP** - sends image data from the display without conversion to ASCII. This mode should only be used when the serial output is connected to another display from the same manufacturer.

- **m.buS** output - Modbus RTU (RS232/RS485) or Modbus TCP if Ethernet is used. To poll for the display value via Modbus use address 0x1000 and 0x1001 hex (registers 44095 and 44096 decimal), Modbus function 3.

5.65   Serial baud rate

Section:	**SEri**
Display:	**bAud**
Range:	**1200**, **2400**, **4800**, **9600**, **19.2**, **38.4**, **57.6**, **115.2**
Default Value:	**9600**
Default Access Level	**4**
Function number	**4484**

Allows the baud rate to be set for serial communications. Choices are:

1200, **2400**, **4800**, **9600**, **19.2**, **38.4**, **57.6**, **115.2**

Baud rates above 9600 are in k Baud.

5.66   Serial parity

Section:	**SEri**
Display:	**PrtY**
Range:	**8 nOnE**, **8 EUEn**, **8 Odd**, **7 EUEn**, **7 Odd**
Default Value:	**8 nOnE**
Default Access Level	**4**
Function number	**4482**

Allows selection of the parity check. The parity check selected should match that of the device it is being communicated with. The choices are 8 bit with no parity, even parity or odd parity or 7 bit with even or odd parity.

5.67   Serial address

Section:	**SEri**
Display:	**Unit Addr**
Range:	**1** to **127**
Default Value:	**1**
Default Access Level	**4**
Function number	**0430**

Allows selection of the unit address when the operation is set for **POLL** mode. The unit address is offset by 32(DECIMAL) to avoid clashing with ACSII special characters, therefore 42 (DECIMAL) or 2A (HEX) would be unit address 10.

5.68 Send error display

Section:	SErI
Display:	Error d. SP
Range:	OFF or On
Default Value:	On
Default Access Level	4
Function number	4483

When set to On the selected any error display will be sent via the serial comms. to any connected receiving device or slave display. When sent to OFF the error display will not be sent.

5.69 Easy access mode

Section:	ACCES
Display:	EASY LEUEL
Range:	nonE, 1, 2, 3, 4, 5, 6, CAL
Default Value:	nonE
Default Access Level	5.CAL
Function number	0C00

Allows choice of the access level available when using the easy access method. For example if this function is set to 3 then functions with levels 1, 2 and 3 can be viewed and changed when access to setup functions is made using this method. To access setup functions using the easy access method press and hold the F button until the message FUnC is seen followed by the first function message, this should take approximately 3 seconds. If the message FUnC End or no response is seen at this point it means that the access level has been set to nonE and that access to setup functions has been refused.

5.70 Remote input access mode

Section:	ACCES
Display:	r.I nPut LEUEL
Range:	nonE, 1, 2, 3, 4, 5, 6, CAL
Default Value:	nonE
Default Access Level	5.CAL
Function number	0C01

This function allows choice of the access level available when using the remote input access method. To access setup functions using the remote input access method one of the remote inputs must be set to ACCSS and the chosen remote input must be shorted to ground. Press and hold the F button until the message FUnC is seen followed by the first function message, this should take approximately 3 seconds. If the message FUnC End is seen at this point it means that the access level has been set to nonE.

5.71 PIN code 1

Section:	ACCES
Display:	USr.1 P.n
Range:	0 to 65535
Default Value:	0
Default Access Level	5.CAL
Function number	0C09

This function allows choice of the PIN code to be used for PIN code input access method. Associated with the PIN is an access level (see P.n.1AccS). If a PIN is not required leave the setting at 0. If a PIN other than 0 is chosen then this PIN must be entered to gain access to the the selected level.

To access setup functions using the PIN code input access method press then release the **F** button then within 2 seconds press the ▲ and ▼ buttons at the same time. The message **FUNC** is seen followed by the message **CodE**. If the message **FUNC End** is seen at this point it means that the access level has been set to **NonE**. Use the ▲ and ▼ buttons to enter the PIN then press **F** to accept the PIN and proceed to the setup functions.

5.72   PIN code 1 access level

Section:	**ACCES**
Display:	**USr.1 LEVEL**
Range:	**NONE**, **1**, **2**, **3**, **4**, **5**, **6**, **CAL**
Default Value:	**NONE**
Default Access Level	**5.CAL**
Function number	**0C02**

This function allows choice of the access level available when using the PIN code 1 input access method. To access setup functions using the PIN code 1 input access method press and hold the **F** button until the message **FUNC** is seen followed by the first function message, this should take approximately 3 seconds. If the message **FUNC End** is seen at this point it means that the access level has been set to **NonE**.

5.73   PIN code 2

Section:	**ACCES**
Display:	**USr.2 Pin**
Range:	**0** to **65535**
Default Value:	**0**
Default Access Level	**5.CAL**
Function number	**0C0A**

This function allows choice of a second PIN code to be used for PIN code input access method. Associated with the PIN is an access level (see **Pin.2AccS**). The second PIN would normally be used to allow a second person to have a higher access to setup functions via a different PIN. If a second PIN is not required leave the setting at **0**. If a PIN other than 0 is chosen then this PIN must be entered to gain access to the the selected level.

To access setup functions using the PIN code input access method press then release the **F** button then within 2 seconds press the ▲ and ▼ buttons at the same time. The message **FUNC** is seen followed by the message **CodE**. If the message **FUNC End** is seen at this point it means that the access level has been set to **NonE**. Use the ▲ and ▼ buttons to enter the PIN then press **F** to accept the PIN and proceed to the setup functions. Ony one **CodE** message will appear even though there can be a second PIN. If the number entered into the **CodE** at this point is the PIN code 1 number then access will be granted to the functions allocated to the first PIN. If the PIN code 2 value is entered then access will be granted to the functions allocated to the second PIN.

5.74   PIN code 2 access level

Section:	**ACCES**
Display:	**USr.2 LEVEL**
Range:	**NONE**, **1**, **2**, **3**, **4**, **5**, **6**, **CAL**
Default Value:	**NONE**
Default Access Level	**5.CAL**
Function number	**0C03**

This function allows choice of the access level available when using the PIN code 2 input access method. To access setup functions using the PIN code 2 input access method press and hold the **F** button until the

message **FUNC** is seen followed by the first function message, this should take approximately 3 seconds. If the message **FUNC End** is seen at this point it means that the access level has been set to **NonE**.

5.75   User assignable access 1 function number

Section:	**ACCES**
Display:	**Fn.1 CodE**
Range:	**0000** to **FFFF** hex.
Default Value:	**0000**
Default Access Level	**S.CAL**
Function number	**0C10**

In addition to being assigned an access level each setup function is assigned an individual function number. This functions and the ones which follow (**Fn.2 CodE** etc.) can be used to alter the access level for particular functions. For example if the user wishes to change the access level of the channel 1 display units (function number 43A0) from level 5 to level 1 then the value **43A0** would be entered at this function and the value **3** would be entered at the function which follows. This would then enable the channel 1 display unit functions to be accessed at the lowest access level.

5.76   User assignable access 1 level value

Section:	**ACCES**
Display:	**Fn.1 LEVEL**
Range:	**dFlt**, **1**, **2**, **3**, **4**, **5**, **6**, **CAL**, **S.CAL**
Default Value:	**dFlt**
Default Access Level	**S.CAL**
Function number	**0C40**

Allows a new access level for the function with the number set in the function to be chosen. If **dFlt** is chosen then the level reverts back to the original default level.

5.77   User assignable access 2 function number

Section:	**ACCES**
Display:	**Fn.2 CodE**
Range:	**0000** to **FFFF** hex.
Default Value:	**0000**
Default Access Level	**S.CAL**
Function number	**0C11**

This function allows as second function access change and operates in the same manner as . Enter the function number required and then enter the new access level at the function which follows.

5.78   User assignable access 2 level value

Section:	**ACCES**
Display:	**Fn.2 LEVEL**
Range:	**dFlt**, **1**, **2**, **3**, **4**, **5**, **6**, **CAL**, **S.CAL**
Default Value:	**dFlt**
Default Access Level	**S.CAL**
Function number	**0C41**

Allows a new access level for the function with the number set in the function to be chosen. If **dFlt** is

chosen then the level reverts back to the original default level.

5.79 User assignable access 3 function number

Section:	**ACCES**
Display:	**Fn.3 CodE**
Range:	**0000** to **FFFF** hex.
Default Value:	**0000**
Default Access Level	**S.CAL**
Function number	**OC 12**

This function allows as third function access change and operates in the same manner as . Enter the function number required and then enter the new access level at the function which follows.

5.80 User assignable access 3 level value

Section:	**ACCES**
Display:	**Fn.3 LEVEL**
Range:	**dFlt**, **1**, **2**, **3**, **4**, **5**, **6**, **CAL**, **S.CAL**
Default Value:	**dFlt**
Default Access Level	**S.CAL**
Function number	**OC42**

Allows a new access level for the function with the number set in the function to be chosen. If **dFlt** is chosen then the level reverts back to the original default level.

5.81 User assignable access 4 function number

Section:	**ACCES**
Display:	**Fn.4 CodE**
Range:	**0000** to **FFFF** hex.
Default Value:	**0000**
Default Access Level	**S.CAL**
Function number	**OC 13**

This function allows as fourth function access change and operates in the same manner as . Enter the function number required and then enter the new access level at the function which follows.

5.82 User assignable access 4 level value

Section:	**ACCES**
Display:	**Fn.4 LEVEL**
Range:	**dFlt**, **1**, **2**, **3**, **4**, **5**, **6**, **CAL**, **S.CAL**
Default Value:	**dFlt**
Default Access Level	**S.CAL**
Function number	**OC43**

Allows a new access level for the function with the number set in the function to be chosen. If **dFlt** is chosen then the level reverts back to the original default level.

5.83 User assignable access 5 function number

Section:	ACCES
Display:	Fn.5 CodE
Range:	0000 to FFFF hex.
Default Value:	0000
Default Access Level	S.CAL
Function number	OC14

This function allows as third function access change and operates in the same manner as . Enter the function number required and then enter the new access level at the function which follows.

5.84 User assignable access 5 level value

Section:	ACCES
Display:	Fn.5 LEVEL
Range:	dFlt, 1, 2, 3, 4, 5, 6, CAL, S.CAL
Default Value:	dFlt
Default Access Level	S.CAL
Function number	OC44

Allows a new access level for the function with the number set in the function to be chosen. If dFlt is chosen then the level reverts back to the original default level.

5.85 User assignable access 6 function number

Section:	ACCES
Display:	Fn.6 CodE
Range:	0000 to FFFF hex.
Default Value:	0000
Default Access Level	S.CAL
Function number	OC15

This function allows as third function access change and operates in the same manner as . Enter the function number required and then enter the new access level at the function which follows.

5.86 User assignable access 6 level value

Section:	ACCES
Display:	Fn.6 LEVEL
Range:	dFlt, 1, 2, 3, 4, 5, 6, CAL, S.CAL
Default Value:	dFlt
Default Access Level	S.CAL
Function number	OC45

Allows a new access level for the function with the number set in the function to be chosen. If dFlt is chosen then the level reverts back to the original default level.

5.87   User assignable access 7 function number

Section:	ACCES
Display:	Fn.7 CodE
Range:	0000 to FFFF hex.
Default Value:	0000
Default Access Level	S.CAL
Function number	OC 16

This function allows as third function access change and operates in the same manner as . Enter the function number required and then enter the new access level at the function which follows.

## 5.88   User assignable access 7 level value

Section:	ACCES
Display:	Fn.7 LEVEL
Range:	dFlt, 1, 2, 3, 4, 5, 6, CAL, S.CAL
Default Value:	dFlt
Default Access Level	S.CAL
Function number	OC46

Allows a new access level for the function with the number set in the function to be chosen. If **dFlt** is chosen then the level reverts back to the original default level.

5.89   User assignable access 8 function number

Section:	ACCES
Display:	Fn.8 CodE
Range:	0000 to FFFF hex.
Default Value:	0000
Default Access Level	S.CAL
Function number	OC 17

This function allows as fourth function access change and operates in the same manner as . Enter the function number required and then enter the new access level at the function which follows.

5.90   User assignable access 8 level value

Section:	ACCES
Display:	Fn.8 LEVEL
Range:	dFlt, 1, 2, 3, 4, 5, 6, CAL, S.CAL
Default Value:	dFlt
Default Access Level	S.CAL
Function number	OC47

Allows a new access level for the function with the number set in the function to be chosen. If **dFlt** is chosen then the level reverts back to the original default level.

6   PC/Laptop software

A free software is available which will allow some operations including calibration and some configuration to be undertaken via PC or laptop when the instrument is fitted with optional RS232 or RS485 communications or has Ethernet fitted. Contact the supplier of this instrument for software downloading instructions. The software is designed to be used intuitively but this chapter gives a basic guide.

Once the software has been downloaded and run a main menu page as illustrated below will appear. With your LD5/LE5 connected via one of its optional communication ports or Ethernet connector click on **Settings** then **Comms** to bring up the communications options menu and set as required. Alteration of configuration and calibration require the entry of a password, go to **Tools** then **Enter Password** to enter the password. The default password is **Password** but this can be changed at the window accessed via **View** then **Password Configuration**. A separate user guide will be provided if the optional full version of this software has been obtained and is provided as standard with Ethernet/Datlogging models.
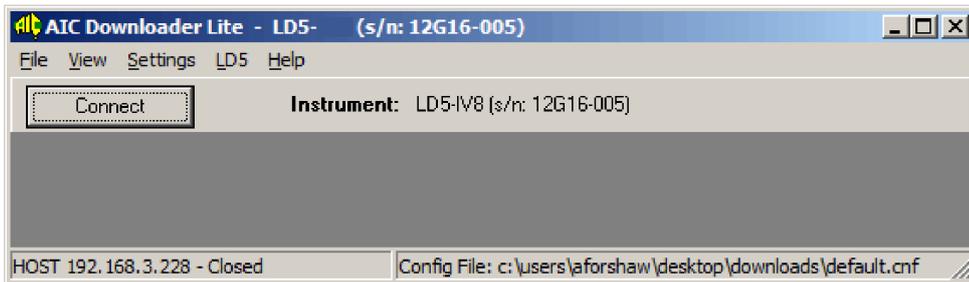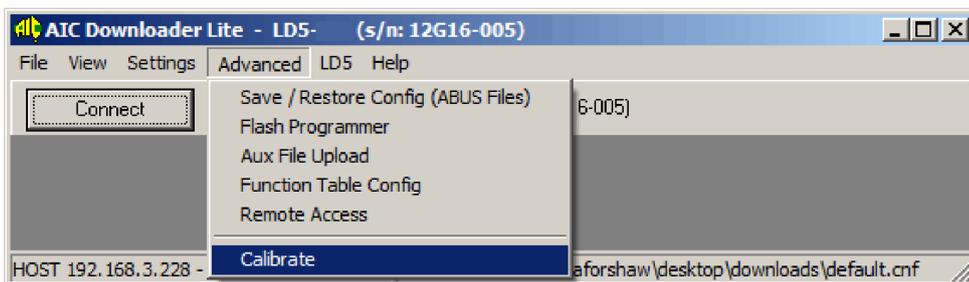

Software main menu
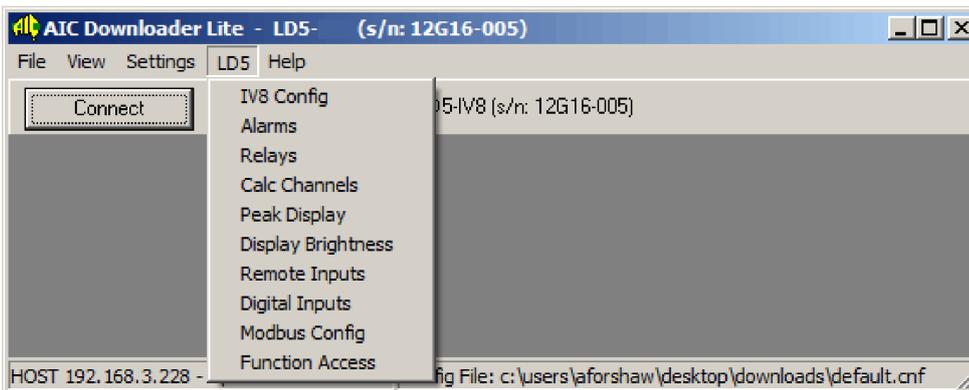
Some LD5 configuration options
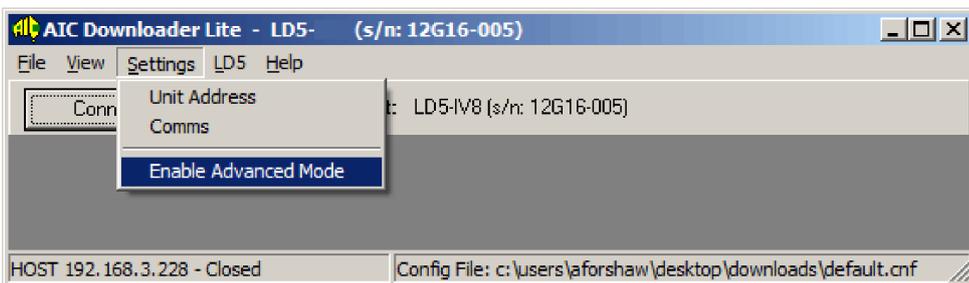
To enable advanced operations such as Calibration hold "Ctrl" then click on **Settings** then click on **Enable Advanced Mode**

Some of the advanced operation options

7 Specifications

7.1 Technical specifications

Input types:	Model LD5/LE5–I8: up to Eight 4-20mA inputs
	Model LD5/LE5–V8: up to Eight DC Voltage inputs
	Model LD5/LE5–IV4: up to Four 4-20mA plus up to Four DC Voltage inputs
	Voltage input ranges are user configurable per channel
	Voltage Ranges: ±1, ±2, ±4, ±8, ±16, ±32, ±64VDC
Accuracy:	Better than 0.1% of full scale when calibrated
Sample rate:	3 samples per second (8 channels scanned in approx. 2.4 secs)
ADC Resolution:	Effective resolution 18.5 bits
Thermal stability:	25ppm per ^{o}C
Ambient temperature:	LED -10 to 60° C
Humidity:	5 to 95% non condensing
Power supply:	100 and 200mm LED:
	AC 240 or 110V selectable, 50/60Hz or
	AC 48/42/32/24 selectable, 50/60Hz or
	DC isolated wide range 12 to 24V.
	20mm, 38mm, 45mm, 57 or 58mm LED:
	AC 240/110V 50/60Hz or
	AC 24 to 48V 50/60Hz or
	DC 12 to 48V isolated or
	DC 24V non isolated
	Supply type is factory configured
Output (standard):	4 x relays, 1 x Form C, 3 x Form A rated 5A resistive.
	Programmable N.O. or N.C. Relays 1 and 2 can alternatively be
	set for PI control (frequency or pulse width)

Optional outputs - some options below are available in combination

Extra relays:	4 extra relays, form A
Analog retransmission:	Single 4 to 20mA 12 bit or 16 bit versions
	Single 4-20mA, 0-1VDC or 0-10VDC (user selectable), 16 bit
	(4-20mA will drive into resistive loads of up to 800Ω)
	Analog outputs can be configured for retransmission or PI control
Serial communications:	RS485 isolated 8 bit (ASCII or Modbus RTU functions 1 and 3)
	RS232 serial comms. 8 bit (ASCII or Modbus RTU functions 1 and 3)
	Ethernet (supplied as models LE5-I8, LE5-V8 or LE5-IV4),
	includes 16MB data logger memory,
	can be used with Modbus TCP
	Web page optional with Ethernet option
	USB port, type B

7.2 Physical characteristics

Refer to "Mechanical installation", chapter 2 page 11 for size and weight specifications.

8 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 document is the property of the instrument manufacturer and may not be reproduced in whole or part without the written consent of the manufacturer.

This product is designed and manufactured in Australia.