LD5-RS and LE5-RS
Large Digit Displays
Operation and Instruction Manual

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1 Introduction

General description

This manual contains information for the installation and operation of the LD5-RS and LE5-RS display. The LD5-RS can be supplied with either RS485 or RS232 inputs. The LE5-RS version has the same input options but also adds Ethernet communications. The display has several modes of operation choices are:


Direct display of input. The display is sent an ASCII or Modbus RTU (function 6 or 16) string and displays the characters. To operate in this mode the **POLL ı ПРᴸ** function must be set to **OFF**. To operate in this mode the **CodE** function must be set to **RSCı** , **URL**, **dı SP** or **ñ.buS**.
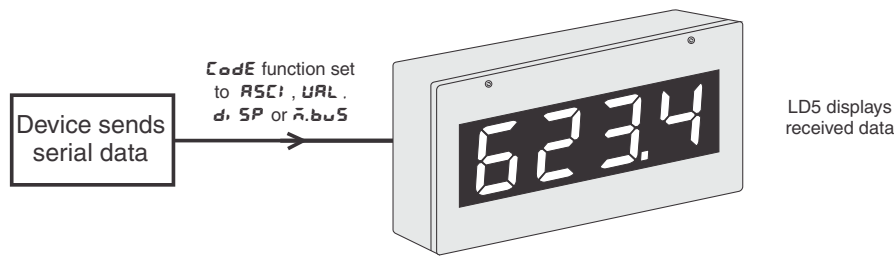

POLL mode. The display sends a poll command of up to 8 characters to request data. To operate in this mode the **POLL ı ПРᴸ** function must be set to **on** and the **CodE** function must be set to **RSCı** or **URL**.
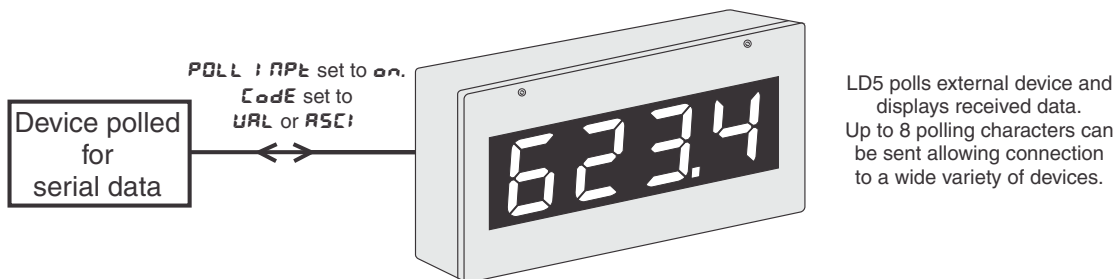

SCAП mode with arithmetic capability. The display sends a poll command of up to 8 separate instruments and displays the results. The address of each device or channel, the display value required etc. must be set, these setting can be found in the CH1 to CH8 section of software. When this mode is selected the channel number will ash followed by the value for that channel e.g. CH2 followed by the value returned for channel 2. The results can be simply displayed as the individual channels or an arithmetic operation can be set for the channels polled. To operate in this mode the **CodE** function must be set to **SCAП**. To perform an arithmetic operation on the scanned channels (e.g. adding all channels together to form a total) a calculated channel can be allocated. The calculation channel (**CC ı** to **CC8**) display can be selected to show one of various mathematical results e.g. display the highest of the inputs or the difference between inputs or the average of the inputs etc.

e.g. setting **CC ıFunc** function to **Rdd** will cause all of the polled channels to be added together and displayed as the **CC ı** calculated channel display value.
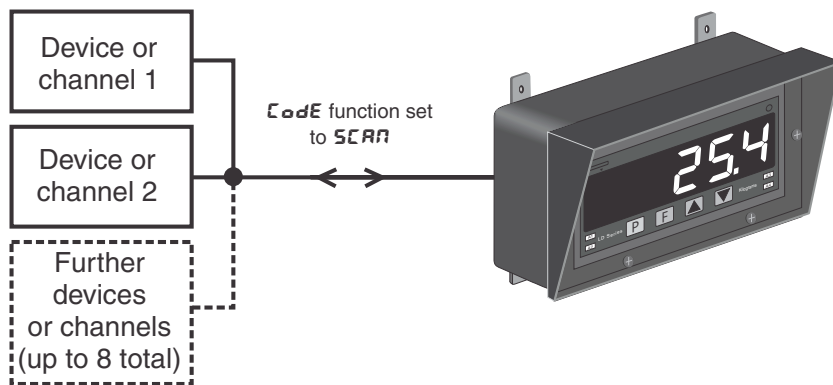
LD5 polls external devices ▲ & ▼ can be used to display each input or the display can scroll automatically. Polled devices must of the same manufacture as the LD5. Communications must be RS485 or RS232 if more than one device is polled.

Wind speed and direction (ΠΓΕΑ). This mode is used only with instruments using NMEA (National Marine Electronics Association) serial code wind speed and direction sensor. To operate in this mode the **COdE** function must be set to **ΠΓΕΑ**.
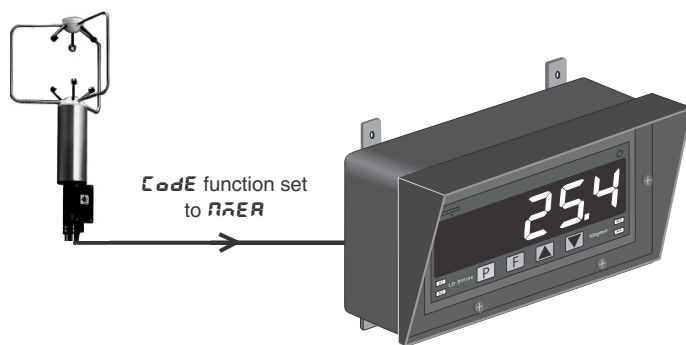
LD5 receives wind speed & direction information. Use ▲ or ▼ to toggle between speed & direction display. Operates with NMEA output sensors only.

Connection to Mettler Toledo IND131/331 module. (ɩ ɩ3 ɩ) - this special mode reads data sent from a Mettler Toledo IND131/331 weighing module.

1.1 Selecting and altering access levels

This subsection details the use "access levels". Access levels can be used to obtain easy access to functions which are regularly required and to limit access to functions which are not required or which restricted access is required. These access level settings can be ignored if no restrictions to access are required and no easy access to selected functions is required.

Each setup function has a default access level allocated to it, for example the ascending alarm 1 function **AL.A ɩ** is allocated a default level of 2. There is a facility for the user to change the access levels for a limited number of functions to make them either easier to access or harder to access as required, see the **Fn.ɩCOdE** function.

There are different ways of accessing setup functions, these are explained in the following section. Each mode allows a selection of access levels i.e. allows some choice of which functions are accessible.

The access levels available are:

None - no access to functions
1 - access to functions allocated to level 1
2 - access to functions allocated to level 2
3 - access to functions allocated to level 3
4 - access to functions allocated to level 4
5 - access to functions allocated to level 5
6 - access to functions allocated to level 6
CAL - access to all normal operation functions
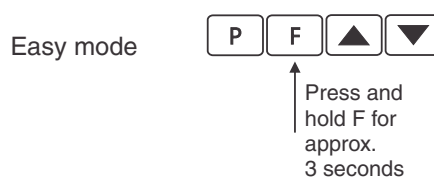
1.2 Accessing setup functions

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 **EASYLEUL** function in the **ACCS** menu. By default the Easy access is set to **NONE** level i.e. no access.
  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.

Easy mode | P | F | ▲ | ▼ |

Press and
hold F for
approx.
3 seconds

- **Remote input mode** - Allows access to the level set by the **r.i NPLEUL** function in the **ACCS** menu. By default the Remote input access is set to **CAL** level allowing access to all setup functions.

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.

Remote input mode

| P | F | ▲ | ▼ |

Press and hold F for approx. 3 seconds

Also requires that the selected remote input is set to **ACCSS** and is activated.
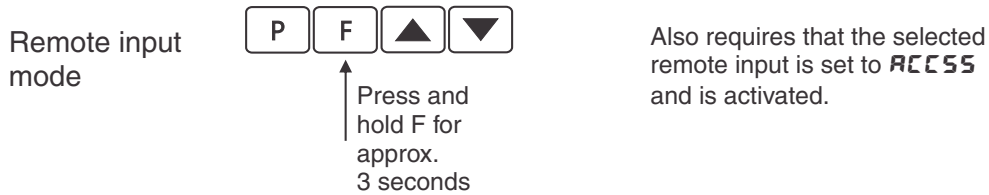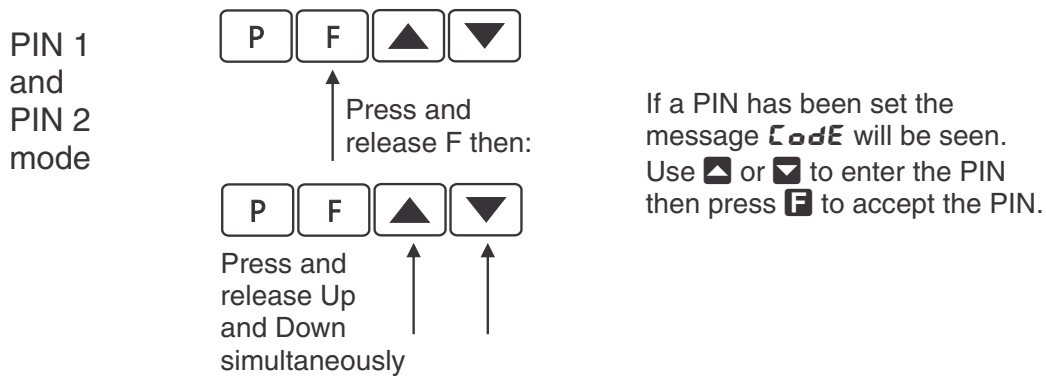
- **PIN 1 mode** - Allows access to the level set by the **USr. 1LEUL** function in the **ACCS** menu. The PIN 1 mode requires the **F** button is pressed and released then within 2 seconds press the **▲** and **▼** buttons at the same time. The PIN can be set via the **Pin. 1CodE** function in the **ACCS** menu. A **USr. 1LEUL** setting of **0** disables the PIN which means that there is no need to enter the PIN. If the **USr. 1LEUL** 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 **USr. 1LEUL** 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 **USr.2LEUL** function in the **ACCS** menu. This method uses the same access method as PIN 1 mode above. A **Pin.2CodE** setting of **NonE** disables the PIN. If the **USr. 1LEUL** or a **USr.2LEUL** 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 **USr. 1LEUL** function can be entered for access to the level set at the **Pin. 1ACCS** function or enter the **USr.2LEUL** PIN to gain access to the level set at the **Pin.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 **5.CAL**
message then
release F 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 channel 1 alarms are in the **AL 1** section. 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.

Typical sections for a basic instrument are illustrated below. In any particular instrument additional sections may appear depending on the part number and any optional outputs fitted.

Use ▲ or ▼ to move to the section required then press **F** to access the functions in that section. Press **P** to escape the section you are in or press **F** at the **End** function in the section.

```
┌──────────────────┐
│   Alarm setup    │
│    functions     │
│   e.g. AL 1      │
└──────────────────┘
         ↕
┌──────────────────┐
│   Relay setup    │
│    functions     │
│   e.g. rL 1      │
└──────────────────┘
         ↕
┌──────────────────┐
│ Alarm configure  │
│    functions     │
│     AL.CF        │
└──────────────────┘
         ↕
┌──────────────────┐
│ Input configure  │
│    functions     │
│      ini         │
└──────────────────┘
         ↕
┌──────────────────┐
│  Display setup   │
│    functions     │
│     di.SP        │
└──────────────────┘
         ↕
┌──────────────────┐
│  Remote input    │
│  functions e.g.  │
│     r.inP        │
└──────────────────┘
```
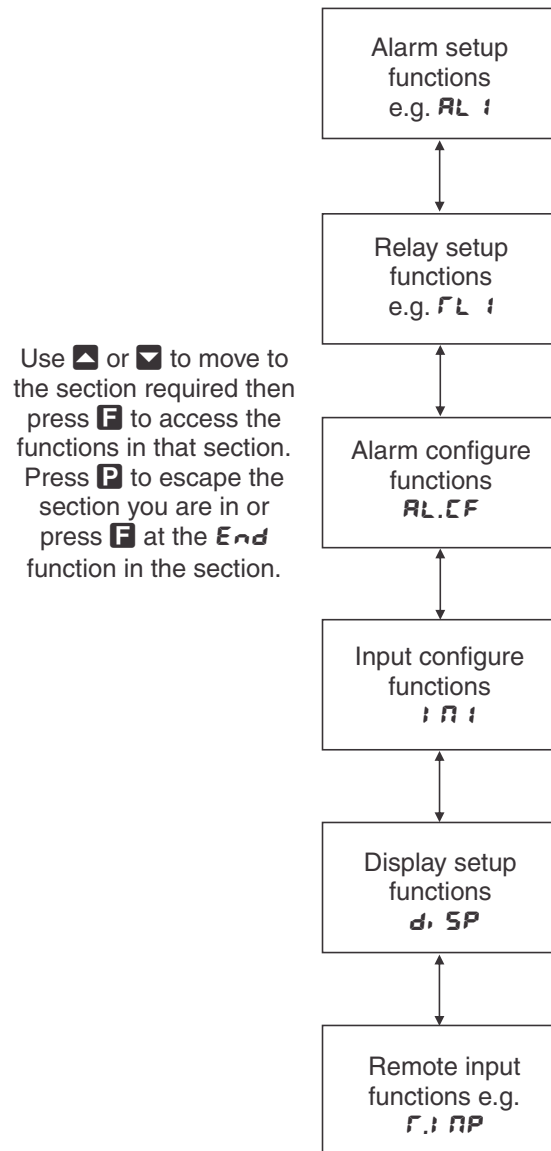
The example in the flowchart (for 4 digit display) below shows the method using alarm relay 1 setup function.

Alarm 2 setting section

```
AL 2
```

Press **F** to go to →

Settings for alarm 2

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

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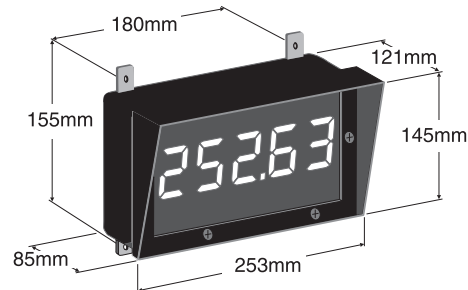Followed by the setting | Press **F** to go to setting → Use ▲ or ▼ to adjust to any setting or press ▲ and ▼ together to disable and set to **OFF**. Press **F** to accept the change.

```
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.

```
t.out
```
Followed by the setting | Press **F** to go to setting → Use ▲ or ▼ to choose **OFF** or **On** Press **F** to accept the change.

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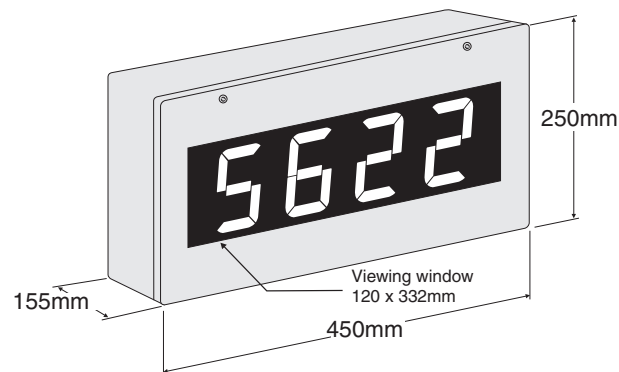
2 Mechanical installation

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

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.
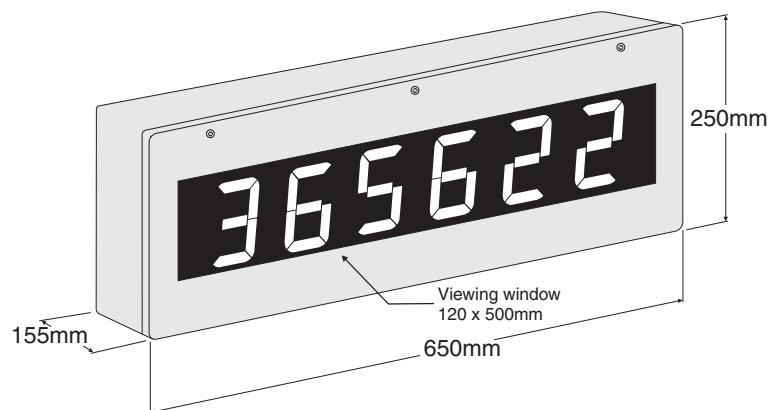
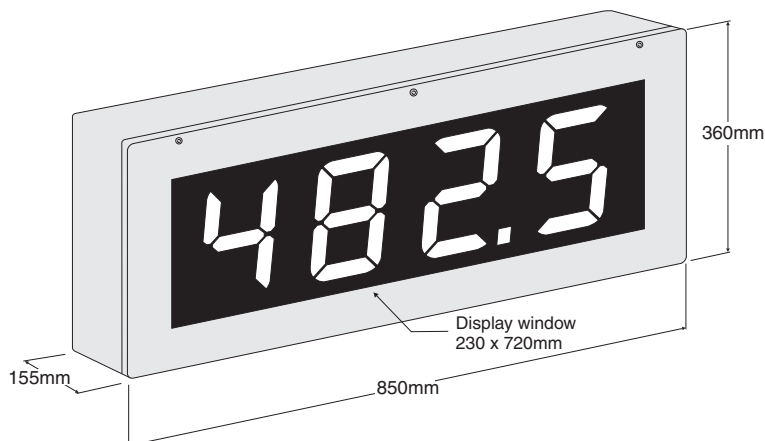## 2.2 100mm 4 digit LED

Weight 10kg (LED)

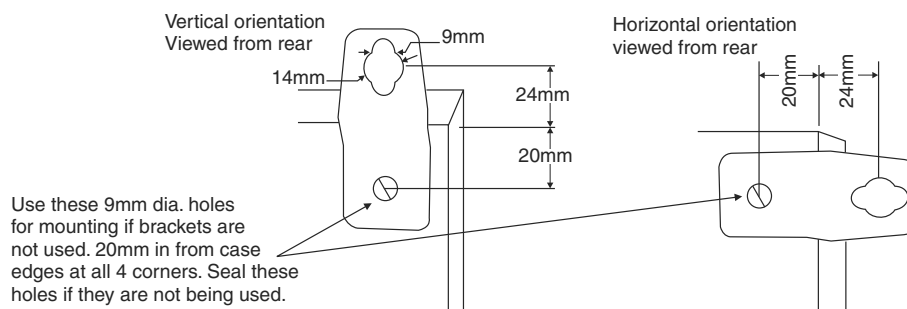## 2.3 100mm 6 digit LED

Weight 14kg (LED)

2.4   200mm 4 digit LED

Weight 14kg.

Display window
230 x 720mm

360mm

155mm

850mm

2.5   Cable entry and Mounting brackets

For 20 to 58mm displays 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 and four blind grommets are supplied for use with all 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 8 Channel Scanning Monitor Output Addendum" booklet for wiring details of any optional outputs not covered in this instruction manual.

Input board layout

LD5RSMAN-2.0-0
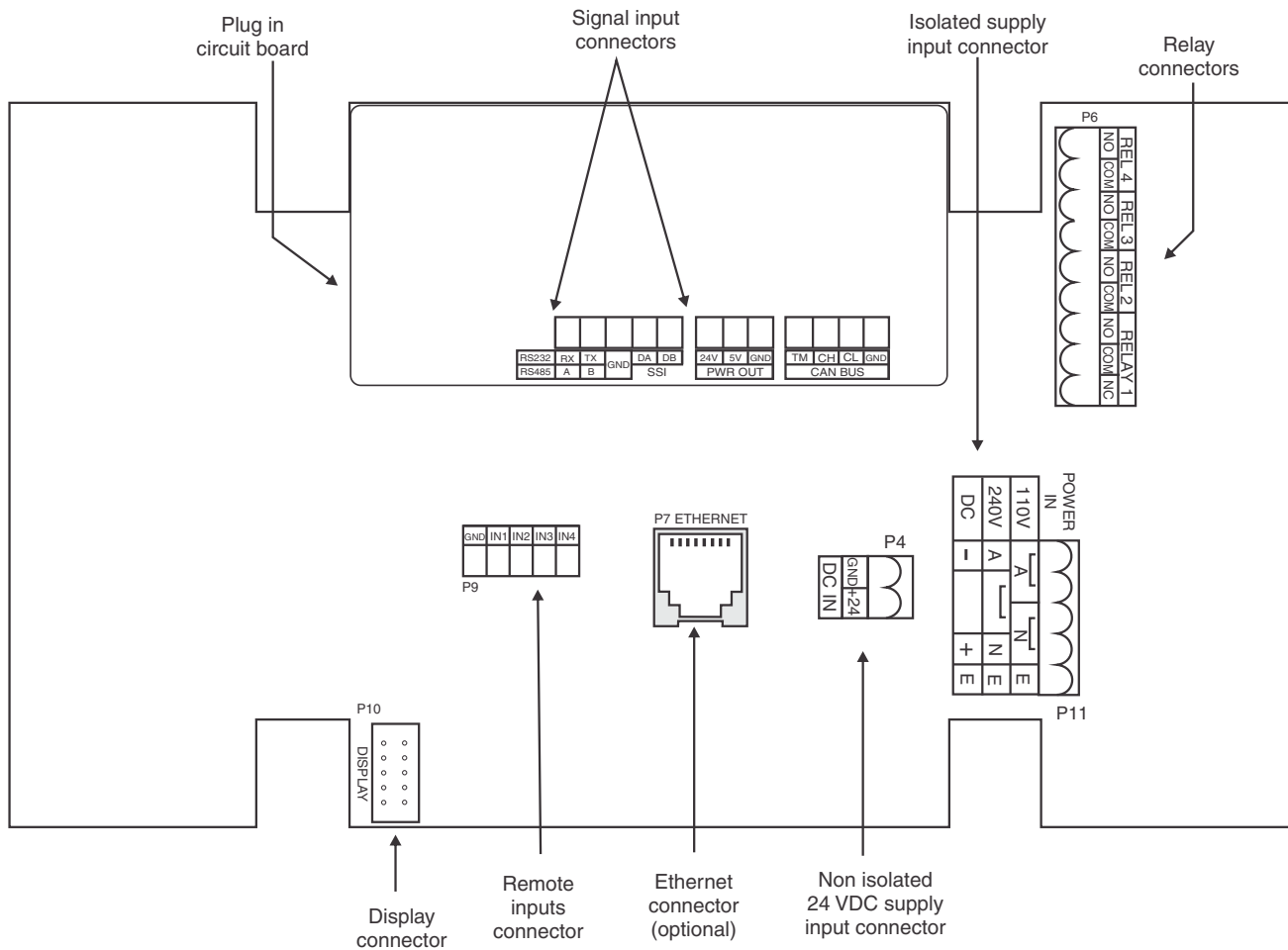
3.1   Power supply connections

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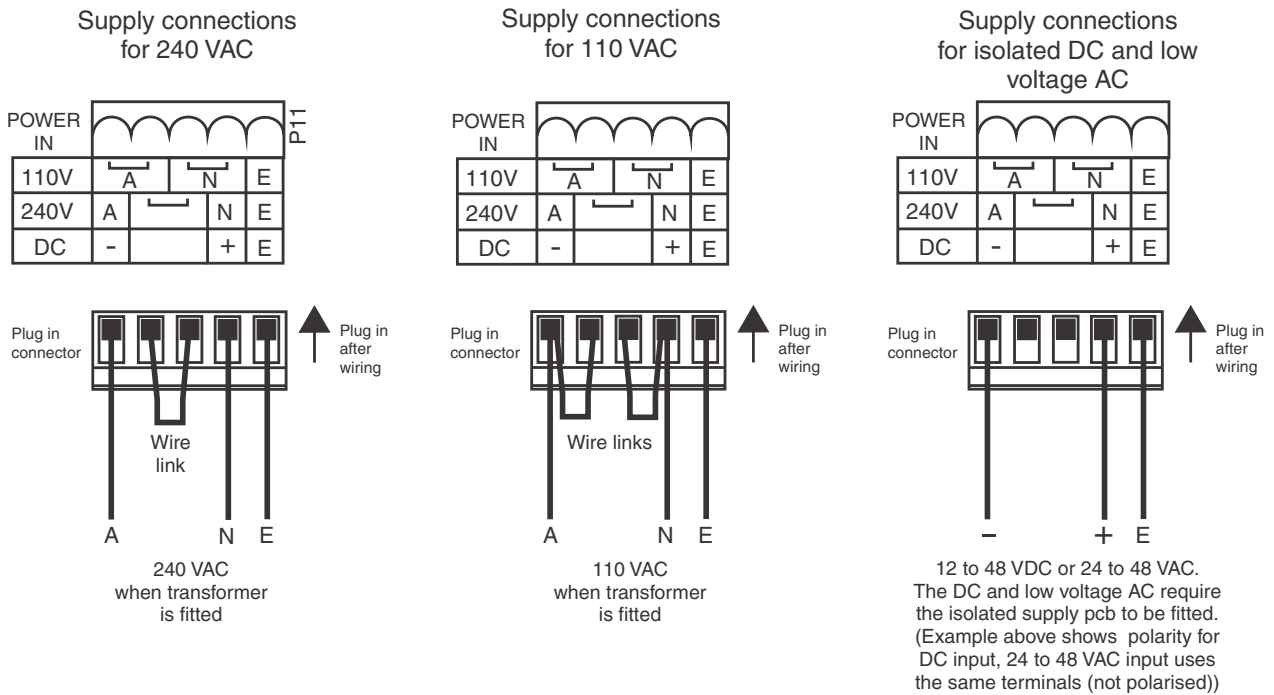
3.3   Non isolated DC supply - for displays digits less than 100mm

24VDC ±10% non isolated DC supply connections.
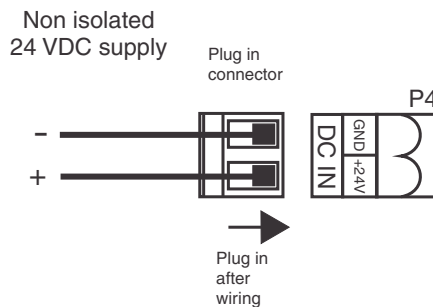
3.4 100mm and 200mm display power supplies

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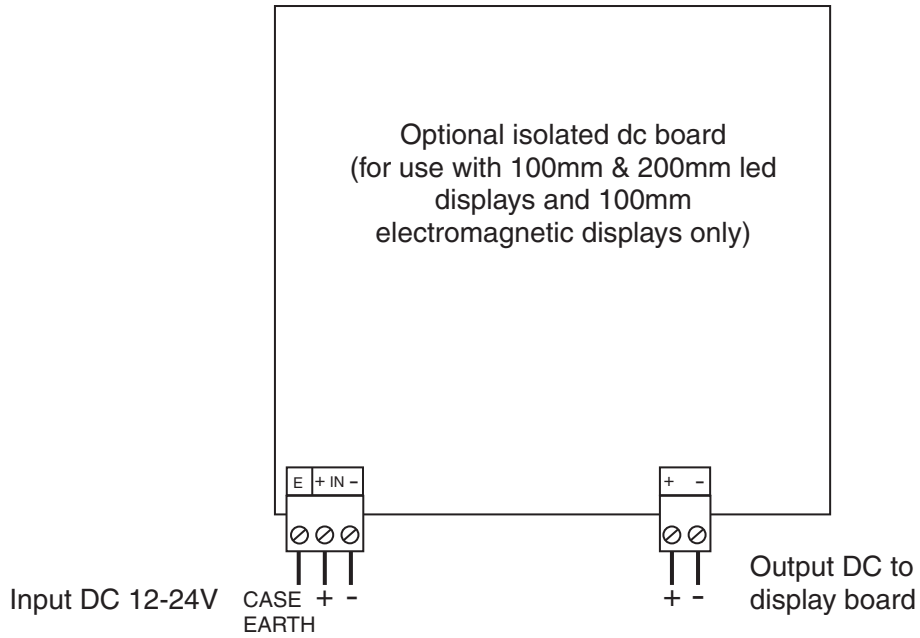
AC supplies - 100mm and 200mm displays. AC supplies connect to the transformer primary on the base board inside the case. Supply type is factory configured.

240 & 110VAC supplies.
For 100mm/200mm LED or 100mm electromagnetic display types only.
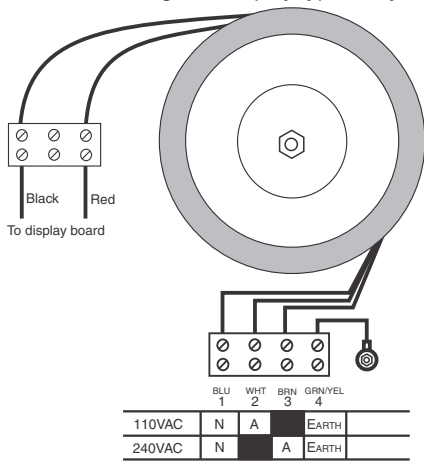
Low voltage AC supplies.
For 100mm/200mm LED or 100mm electromagnetic display types only.
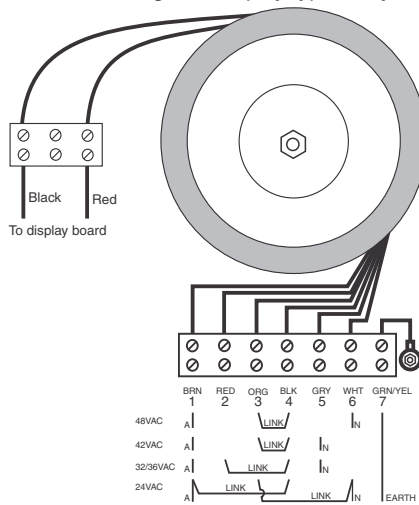
Wiring examples 240VAC & 110VAC

Wiring examples low voltage AC
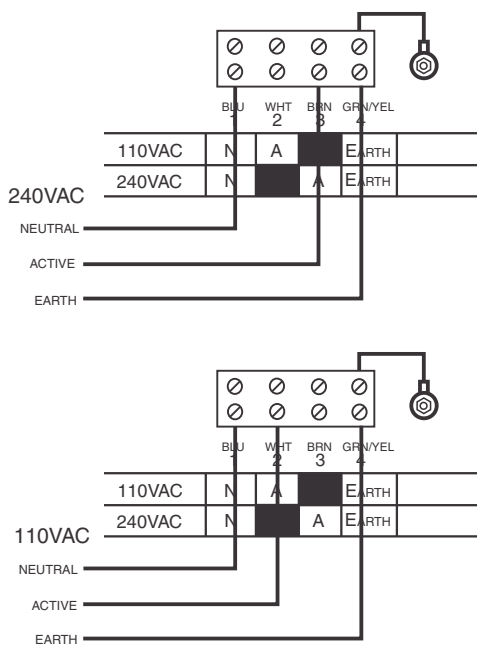
Important note: the 240V & 110V supplies use the same transformer, low voltage instruments use a different transformer. Do not use a low voltage transformer for 240V or 110V or vice versa.
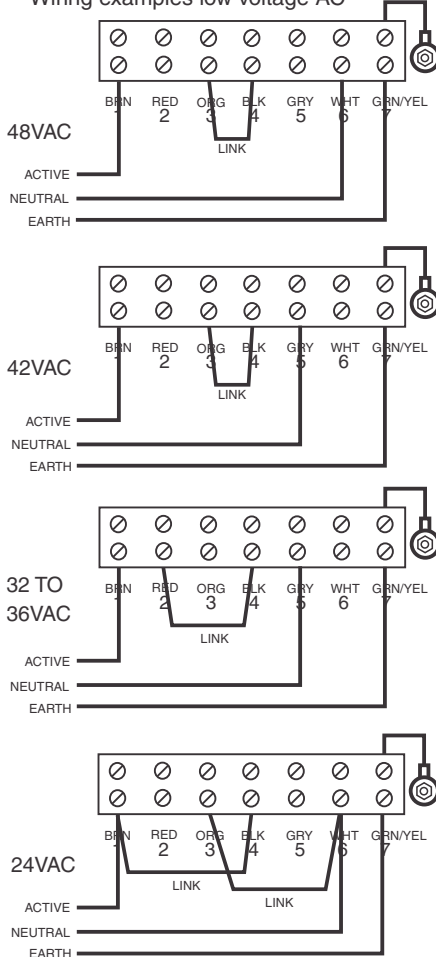
3.5 RS232

The RS232 connections are on a small pcb on top of the main pcb.

RS232	RX	TX	GND		DA	DB		24V	5V	GND		TM	CH	CL	GND
RS485	A	B													
				SSI				PWR OUT				CAN BUS			

Rx (in)
Tx (out)
GND

Not fitted
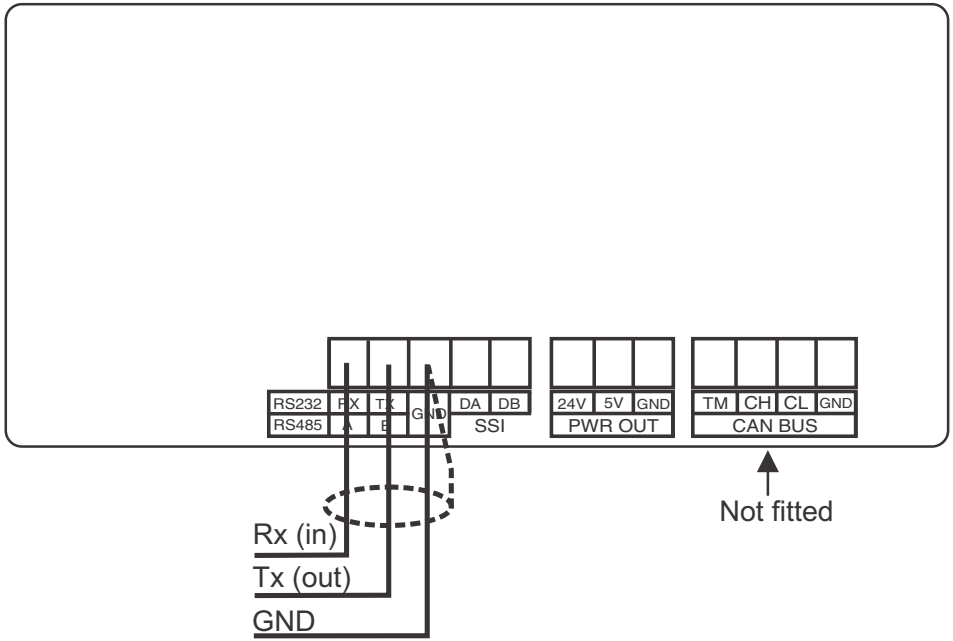
The optional ethernet connection is via the RJ45 connector P7 on the main board.

3.5.1 RS485 input

The RS485 connections are on a small pcb on top of the main pcb.

RS232	RX	TX	GND		DA	DB		24V	5V	GND		TM	CH	CL	GND
RS485	A	B													
				SSI				PWR OUT				CAN BUS			

A or +
B or -

Use twisted pair
shielded cable

Not fitted
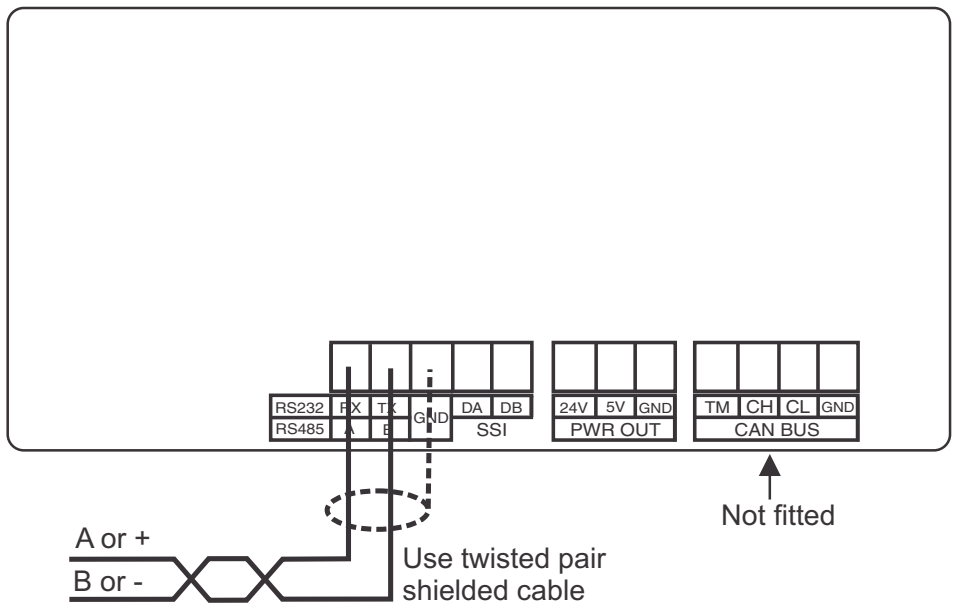
3.5.2 Remote/Digital inputs

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 $\mathbf{d.\iota\,n}$ section functions. The operation mode of the digital inputs are controlled by separate functions for each input, see the $\mathbf{r.\iota\,\Pi P}$ section functions. The electrical configuration for these inputs is configured by digital input functions, see the $\mathbf{d.\iota\,n}$ section functions. Wiring example showing voltage free contacts below.
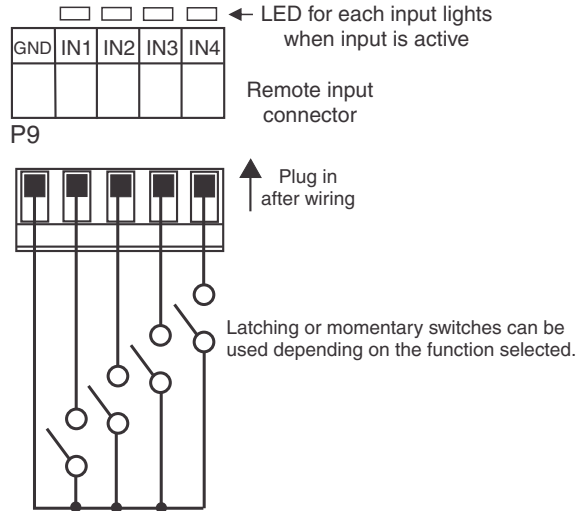
3.5.3 Relays 1 to 4

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 8 Channel Scanning Monitor Output Addendum" for wiring details of optional relays 5 to 8.
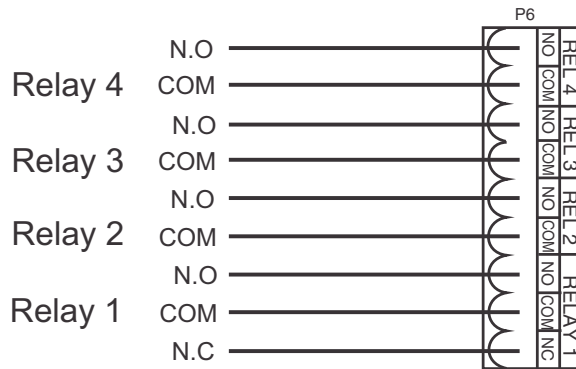
4 Function tables - summary of setup functions

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 4 digit display, these display messages may in some cases vary slightly for other display types.

4.1 Alarm relay function table

Display	Function	Range	Default	Your record	Ref/Page
AL 1 to **AL 8** **H, 9h**	High setpoint value for designated alarm relay	Any display value or **OFF**	**OFF**	See 4.14	5.1 / 30
AL 1 to **AL 8** **Lo**	Low setpoint value for designated alarm relay.	Any display value or **OFF**	**OFF**	See 4.14	5.2 / 31
AL 1 to **AL 8** **HYSt**	Alarm relay hysteresis (deadband)	**0** to **65535**	**10**	See 4.14	5.3 / 31
AL 1 to **AL 8** **tr, P**	Trip time delay for the designated alarm relay	**0** to **6553.5** secs	**0.0**	See 4.14	5.4 / 32
AL 1 to **AL 8** **rSt**	Reset time delay for the designated alarm relay	**0** to **6553.5** secs	**0.0**	See 4.14	5.5 / 32
AL 1 to **AL 8** **rLYS**	Relay selection **On** or **OFF**	**On** or **OFF**	**OFF**	See 4.14	5.15 / 35
AL 1 to **AL 8** **trL**	Alarm trailing or setpoint mode	**SEt.P, tL 1, tL 2, tL 3, tL 4, tL 5, tL 6, tL 7**	**SEt.P**	See 4.14	5.16 / 35
AL 1 to **AL 8** **OPEr**	Alarm relay operating mode	**H, .Lo, Ctrl , FrE9**	**H, .Lo**	See 4.14	5.17 / 36
AL 1 to **AL 8** **Ch**	Alarm relay operation input selection	Varies with settings	**CH 1**	See 4.14	5.18 / 36
AL 1 to **AL 8** **Ltch**	Alarm relay latching operation	**Auto, Ltch, A.b, L.b**	**Auto**	See 4.14	5.19 / 36
AL 1 to **AL 8** **tout**	Serial input timeout alarm	**OFF** or **On**	**OFF**	See 4.14	5.20 / 37

4.2 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	1000	See 4.14	Addendum
AL 1 to AL 8 SEtP	Relay PI control setpoint	Any display value	1000	See 4.14	Addendum
AL 1 to AL 8 P.9	Relay PI control proportional gain value	Any display value	0.010	See 4.14	Addendum
AL 1 to AL 8 i.9	Relay PI control integral gain value	Any display value	0.000	See 4.14	Addendum
AL 1 to AL 8 i.H	Relay PI control integral high limit value	0 to 100.0 %	0.000	See 4.14	Addendum
AL 1 to AL 8 i.L	Relay PI control integral low limit value	0 to 100.0 %	100.0	See 4.14	Addendum
AL 1 to AL 8 bi.AS	Relay PI control bias	0 to 100.0 %	50.0	See 4.14	Addendum
AL 1 to AL 8 dutY SECS	Relay PI control duty cycle	0 to 6553.5 secs	10.0	See 4.14	Addendum
AL 1 to AL 8 on SECS	Relay PI frequency control "on" time	0 to 6553.5 secs	1.0	See 4.14	Addendum

4.3 Relay function table.

Display	Function	Range	Default	Your record	Ref/Page
rL 1 to rL 8 rLY	Alarm relay *x* action to normally open (de-energised) or normally closed (energised)	n.o, n.c	n.o	See 4.14	5.31 / 39
rL 1 to rL 8 AcK	Relay acknowledge	OFF or On	OFF	See 4.14	5.32 / 39
rL 1 to rL 8 bool	Alarm relay Boolean logic operation	Or, And	Or	See 4.14	5.33 / 40

4.4 Configuration setup table.

Display	Function	Range	Default	Your record	Ref/Page
CONF CodE	Serial input operation mode	d, SP, ASCi, UAL, m.buS, SCAn, mmEA, , i3 i	ASCi		5.34 / 40
CONF E.nEt	Ethernet input	OFF or On	OFF		5.35 / 42
CONF bAud	Baud rate	300, 600, 1200, 2400, 4800, 9600, 19.2, 38.4	9600		5.36 / 42
CONF dAtA	Serial input data bits and parity	8.non, 8.odd, 8.Eun, 7.odd, 7.Eun, 7.non	8.non		5.37 / 42
CONF CHAn Cnt	Select number of channels to scan	1, 2, 3, 4, 5, 6, 7, 8	1		5.38 / 42
CONF CALC Cnt	Select number of calculation channels	0, 1, 2, 3, 4, 5, 6, 7, 8	0		5.39 / 43
CONF AL Cnt	Select number of alarms	0, 1, 2, 3, 4, 5, 6, 7, 8	2		5.40 / 43
CONF SCAn dLY	Select scan delay time	0 to 200 secs	10		5.41 / 43
CC 1 to CC 8 Arth SCLE	Calculation channel multiplication scale	Any display value	n/a		5.89 / 59
CC 1 to CC 8 Arth OFSt	Calculation channel offset value	Any display value	n/a		5.90 / 59
CC 1 to CC 8 Arth di u	Calculation channel division	Any display value	n/a		5.91 / 59

4.5 Analog output function table. See separate Addendum booklet

Display	Function	Range	Default	Your record	Ref/Page
rO 1 to rO 2 OutP	Analog retransmission outputs (*Optional)	4-20, 0-1.0, 0-10	4-20		Addendum

rO 1 to *rO2* *InPt*	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

4.6   Input setup function table

Display	Function	Range	Default	Your record	Ref/Page
In 1 *C.Sum*	Checksum error detection	*OFF* or *On*	*On*		5.43 / 43
In 1 *SCH 1*	Serial input address character 1	*-2* to *255*	*-1*		5.44 / 44
In 1 *SCH2*	Serial input address character 2	*-2* to *255*	*-1*		5.45 / 44
In 1 *SCH3*	Serial input address character 3	*-2* to *255*	*-1*		5.46 / 45
In 1 *SCH4*	Serial input address character 4	*-2* to *255*	*-1*		5.47 / 45

Display	Function	Range	Default	Your record	Ref/Page
INI **t.chr**	Serial input terminating character	*-1* to **255**	**13**		5.48 / 45
INI **dLAY**	Number of serial input characters to skip	**0** to **255**	**0**		5.49 / 45
INI **bAct**	Number of serial input characters to skip back	**0** to **120**	**0**		5.50 / 46
INI **N.Chr**	Number of serial input characters to skip from **SCH**	*-120* to **120**	**0**		5.51 / 46
INI **I.dPt**	Serial input string decimal point insertion	*-1* to **8**	*-1*		5.52 / 47
INI **ALPH**	Alpha character display off or on	**OFF, On, All**	**All**		5.53 / 47
INI **d.Pnt**	Decimal point	**0, 0.1, 0.02, 0.003**	**0**		5.54 / 48
INI **d.rnd**	Display rounding	**1** to **5000**	**1**		5.55 / 48
INI **FLtr**	Digital filter	**0, 1, 2, 3, 4, 5, 6, 7, 8**	**0**		5.56 / 48
INI **Ch.PL**	Display polarity	**both, PoS, NEG, AbS**	**both**		5.57 / 49
INI **Addr**	Modbus address	**0** to **255**	**1**		5.58 / 49
INI **dS.to**	Display timeout	**0** to **1000** secs	**10**		5.59 / 49
INI **t.out**	Data string timeout	**0.1** to **10.0** secs	**1.0**		5.60 / 49
INI **Unit**	Display units	**NS, KPh, NPh, Knot**	**NS**		5.61 / 50
INI **dFlt diSP**	Default display	**SCAN, SPEd, dir**	**SCAN**		5.62 / 50
INI **diSP SEcS**	Display scan time	**0** to **200** secs	**10**		5.63 / 50

4.7 Poll input function table

Display	Function	Range	Default	Your record	Ref/Page
POLL INPt	Polling function	**on** or **OFF**	**OFF**		5.64 / 50
POLL dLAY	Polling delay time	**0.0** to **10.0**	**1.0**		5.65 / 51
POLL P.Ch.1	First polling character	*-1* to **255**	*-1*		5.66 / 51
POLL P.Ch.2	Second polling character	*-1* to **255**	*-1*		5.67 / 51

POLL **P.Ch.3**	Third polling character	**-1** to **255**	**-1**		5.68 / 52
POLL **P.Ch.4**	Fourth polling character	**-1** to **255**	**-1**		5.69 / 52
POLL **P.Ch.5**	Fifth polling character	**-1** to **255**	**-1**		5.70 / 52
POLL **P.Ch.6**	Sixth polling character	**-1** to **255**	**-1**		5.71 / 52
POLL **P.Ch.7**	Seventh polling character	**-1** to **255**	**-1**		5.72 / 53
POLL **P.Ch.8**	Eighth polling character	**-1** to **255**	**-1**		5.73 / 53

4.8 Scanned channels function table

Display	Function	Range	Default	Your record	Ref/Page
CH1 to **CH8** **Poll** **Addr**	Scan channel poll address	**1** to **255**	**1**		5.74 / 53
CH1 to **CH8** **Cmd**	Scan channel command	**Pri**, **SEc**, **tEr**, **quAd**, **CH0**, **CH1**, **CH2**, **CH3**, **CH4**, **CH5**, **CH6**, **CH7**, **CH8**, **AbUS**	**Pri**		5.75 / 53
CH1 to **CH8** **AbuS** **CodE**	ABUS command value	**0000** to **FFFF**			5.76 / 54
CH1 to **CH8** **d.Pnt**	Channel decimal point	**0**, **0.1**, **0.02**, **0.003**	**0**		5.77 / 54
CH1 to **CH8** **d.rnd**	Channel display rounding	**1** to **5000**	**1**		5.78 / 54
CH1 to **CH8** **FLtr**	Channel display filter	**0**, **1**, **2**, **3**, **4**, **5**, **6**, **7**, **8**	**0**		5.79 / 55
CH1 to **CH8** **Ch.PL**	Channel display polarity	**both**, **PoS**, **NEg**, **AbS**	**both**		5.80 / 55
CH1 to **CH8** **diSP**	Seen when the **CONF CodE** function is set to **SCAN**. Channel display on or off	**OFF** or **ON**	**On**		5.81 / 55

4.9　Calculated channel function table

Display	Function	Range	Default	Your record	Ref/Page
CC 1 to *CC 8* *Func*	Calculation channel function	*Hi* , *Lo*, *diFF*, *AUG*, *d.AUG*, *P.AUG*, *N.AUG*, *S.diF*, *Add*, *PC 1*, *PC 2*, *Sub*, *Prod*, *div*, *SinE*, *CoS*, *r.AUG*, *F.AUG*	*Hi*		5.82 / 55
CC 1 to *CC 8* *d.LoG*	Calculation channel data log	*OFF* or *On*	*OFF*		5.83 / 57
CC 1 to *CC 8* *diSP*	Calculation channel display	*OFF* or *On*	*OFF*		5.84 / 57
CC 1 to *CC 8* *d.Pnt*	Calculation channel decimal point	*0*, *0. 1*, *0.02*	*0*		5.85 / 58
CC 1 to *CC 8* *d.rnd*	Calculation channel display rounding	*1* to *5000*	*1*		5.86 / 58
CC 1 to *CC 8* *ChAn SEL*	Calculation channel selection. Set each channel *On* or *OFF*	*CH 1*, *CH2*, *CH 3*, *CH4*, *CH5*, *CH6*, *CH 7*, *CH 8*, *CC 1*, *CC2*, *CC 3*, *CC 4*, *CC 5*, *CC6*, *CC 7*, *CC 8*	n/a		5.87 / 58
CC 1 to *CC 8* *A.cnt*	Calculation channel fixed average count	*1* to *128*	*4*		5.88 / 59
CC 1 to *CC 8* *Arth SCLE*	Calculation channel multiplication scale	Any display value	n/a		5.89 / 59
CC 1 to *CC 8* *Arth OFSt*	Calculation channel offset value	Any display value	n/a		5.90 / 59
CC 1 to *CC 8* *Arth div*	Calculation channel division	Any display value	n/a		5.91 / 59

4.10 Display function table

Display	Function	Range	Default	Your record	Ref/Page
di SP br 9t Auto	Automatic display brightness	OFF or On	On		5.92 / 60
di SP br 9t	Display brightness	1 to 64	63		5.93 / 60
di SP dul 1	Dimmed display brightness	0 to 63	7		5.94 / 60
di SP Auto Hi 9h	Auto display brightness high level	16 to 64	63		5.95 / 60
di SP Auto Lo	Auto display brightness low level	1 to 64	7		5.96 / 61

4.11 Serial output function table

Display	Function	Range	Default	Your record	Ref/Page
SEri OPEr	Serial comms. operation mode (*Optional)	NONE, Cont, Pol 1, A.buS, di SP, m.buS	NONE		5.97 / 61
SEri bAud	Serial baud rate (*Optional)	1200, 2400, 4800, 9600, 19.2, 38.4, 57.6, 115.2	9600		5.98 / 61
SEri PrtY	Serial parity (*Optional)	8n, 8E, 8o, 7 E, 7o	8n		5.99 / 62
SEri Uni t Addr	Serial address (*Optional)	1 to 127	1		5.100 / 62

(*Optional)—this function will only be accessible if the relevant option is fitted

4.12 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	NONE		5.101 / 62

Display	Function	Range	Default	Your record	Ref/Page
r.I nP r.I n. 1	Remote input 1 operation mode	nOnE, P.HI d, d.HI d, P.HI , P.Lo, HI .Lo, AL.Ac, ACCS, P.buk, F.buk, U.buk, d.buk, dwI I , b.I nc, b.dEc	nOnE		5.102 / 62
r.I nP r.I n.2	Remote input 2 operation mode	nOnE, P.HI d, d.HI d, P.HI , P.Lo, HI .Lo, AL.Ac, ACCS, P.buk, F.buk, U.buk, d.buk, dwI I , b.I nc, b.dEc	nOnE		5.103 / 64
r.I nP r.I n.3	Remote input 3 operation mode	nOnE, P.HI d, d.HI d, P.HI , P.Lo, HI .Lo, AL.Ac, ACCS, P.buk, F.buk, U.buk, d.buk, dwI I , b.I nc, b.dEc	nOnE		5.104 / 64
r.I nP r.I n.4	Remote input 4 operation mode	nOnE, P.HI d, d.HI d, P.HI , P.Lo, HI .Lo, AL.Ac, ACCS, P.buk, F.buk, U.buk, d.buk, dwI I , b.I nc, b.dEc	nOnE		5.105 / 64

4.13   Access control function table

Display	Function	Range	Default	Your record	Ref/Page
ACCES EASY LEUL	Easy access mode	nOnE, 1, 2, 3, 4, 5, 6, CAL	nOnE		5.106 / 64
ACCES r.I nP LEUL	Remote input access mode	nOnE, 1, 2, 3, 4, 5, 6, CAL	nOnE		5.107 / 65
ACCES USr.1 PI n	PIN code 1	0 to 65535	0		5.108 / 65
ACCES USr.1 LEUL	PIN code 1 access level	nOnE, 1, 2, 3, 4, 5, 6, CAL	nOnE		5.109 / 65

`ACCES`
`USr.2`
`Pin`
	PIN code 2	`0` to `65535`	`0`		5.110 / 66

`ACCES`
`USr.2`
`LEUL`
	PIN code 2 access level	`NONE`, `1`, `2`, `3`,
		`4`, `5`, `6`, `CAL`
			`NONE`		5.111 / 66

`ACCES`
`Fn.1`
`CodE`
	User assignable access function 1	`0000` to `FFFF`
		hex.
			`0000`		5.112 / 66

`ACCES`
`Fn.1`
`LEUL`
	User assignable access 1 level value	`dFlt`, `1`, `2`, `3`,
		`4`, `5`, `6`, `CAL`,
		`S.CAL`
			`dFlt`		5.113 / 67

`ACCES`
`Fn.2`
`CodE`
	User assignable access function 2	`0000` to `FFFF`
		hex.
			`0000`		5.114 / 67

`ACCES`
`Fn.2`
`LEUL`
	User assignable access 2 level value	`dFlt`, `1`, `2`, `3`,
		`4`, `5`, `6`, `CAL`,
		`S.CAL`
			`dFlt`		5.115 / 67

`ACCES`
`Fn.3`
`CodE`
	User assignable access function 3	`0000` to `FFFF`
		hex.
			`0000`		5.116 / 67

`ACCES`
`Fn.3`
`LEUL`
	User assignable access 3 level value	`dFlt`, `1`, `2`, `3`,
		`4`, `5`, `6`, `CAL`,
		`S.CAL`
			`dFlt`		5.117 / 68

`ACCES`
`Fn.4`
`CodE`
	User assignable access function 4	`0000` to `FFFF`
		hex.
			`0000`		5.118 / 68

`ACCES`
`Fn.4`
`LEUL`
	User assignable access 4 level value	`dFlt`, `1`, `2`, `3`,
		`4`, `5`, `6`, `CAL`,
		`S.CAL`
			`dFlt`		5.119 / 68

`ACCES`
`Fn.5`
`CodE`
	User assignable access function 5	`0000` to `FFFF`
		hex.
			`0000`		5.120 / 68

`ACCES`
`Fn.5`
`LEUL`
	User assignable access 5 level value	`dFlt`, `1`, `2`, `3`,
		`4`, `5`, `6`, `CAL`,
		`S.CAL`
			`dFlt`		5.121 / 69

`ACCES`
`Fn.6`
`CodE`
	User assignable access function 6	`0000` to `FFFF`
		hex.
			`0000`		5.122 / 69

`ACCES`
`Fn.6`
`LEUL`
	User assignable access 6 level value	`dFlt`, `1`, `2`, `3`,
		`4`, `5`, `6`, `CAL`,
		`S.CAL`
			`dFlt`		5.123 / 69

`ACCES`
`Fn.7`
`CodE`
	User assignable access function 7	`0000` to `FFFF`
		hex.
			`0000`		5.124 / 69

`ACCES`
`Fn.7`
`LEUL`
	User assignable access 7 level value	`dFlt`, `1`, `2`, `3`,
		`4`, `5`, `6`, `CAL`,
		`S.CAL`
			`dFlt`		5.125 / 70

ACCES Fn.8 CodE	User assignable access function 8	0000 to FFFF hex.	0000		5.126 / 70
ACCES Fn.8 LEUL	User assignable access 8 level value	dFlt, 1, 2, 3, 4, 5, 6, CAL, 5.CAL	dFlt		5.127 / 70

4.14   Relay table

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
H, 9h								
Lo								
HYSt								
tr, P								
rSt								
tFL								
OPEr			n/a	n/a	n/a	n/a	n/a	n/a
SPAn			n/a	n/a	n/a	n/a	n/a	n/a
SEtP			n/a	n/a	n/a	n/a	n/a	n/a
P.9			n/a	n/a	n/a	n/a	n/a	n/a
i.9			n/a	n/a	n/a	n/a	n/a	n/a
i.H			n/a	n/a	n/a	n/a	n/a	n/a
i.L			n/a	n/a	n/a	n/a	n/a	n/a
b, AS			n/a	n/a	n/a	n/a	n/a	n/a
duty SECS			n/a	n/a	n/a	n/a	n/a	n/a
on SECS			n/a	n/a	n/a	n/a	n/a	n/a
rLYS								
Ch								
Ltch								
tout								

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								
Ack								
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 Alarm relay high setpoint

Section:	**RL 1** to **RL 8**
Display:	**Hi 9h**
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 9h** 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. 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 9h** 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 **Hi 9h** under **RL 1** is set to **100** then relay 1 will activate when the display value is **100** or higher.
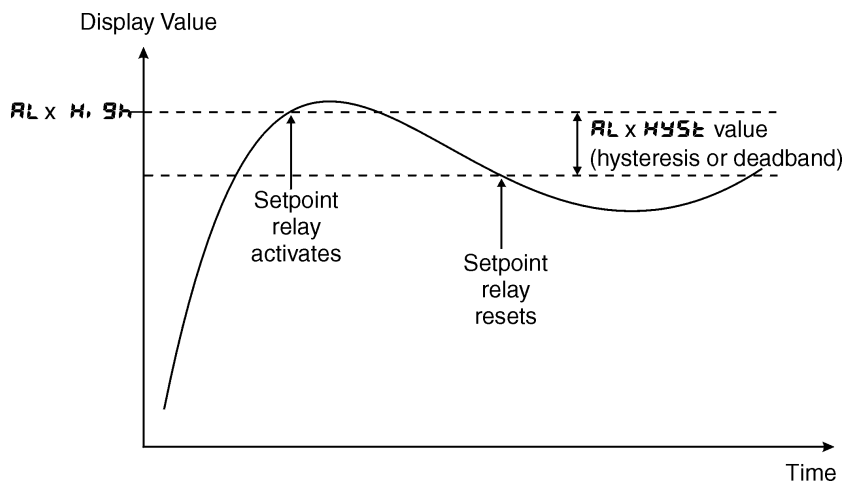
Note if the high alarm value is set lower than the low alarm value the relay will activate between the two i.e. activate in the band between the two values.

5.2   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	**4010** to **4017**

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.
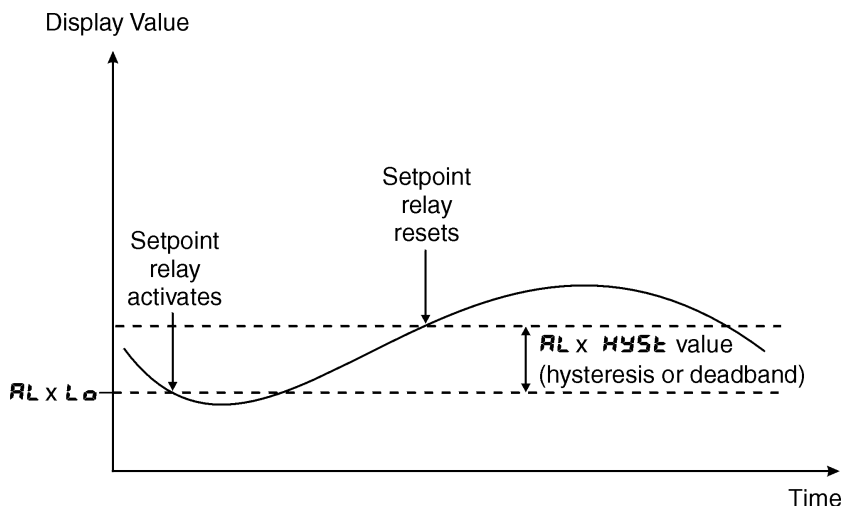
5.3   Alarm relay hysteresis (deadband)

Section:	**AL 1** to **AL 8**
Display:	**HYSt**
Range:	**0** to **65535**
Default Value:	**10**
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 **AL3 Hi gh** is to **50.0** and **AL3 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 **AL2 Hi gh** is to **0.0** and **AL2 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.

5.4 Alarm relay trip time

Section:	**AL 1** to **AL 8**
Display:	**tri P**
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 ▣ 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.

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.

5.5 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 ▣ 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.

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

5.6   Relay PI control span

Section:	*RL 1* to *RL 8*
Display:	*SPAN*
Range:	Any display value
Default Value:	*1000*
Default Access Level	*4*
Function number	*4290* to *4297*

Allows setting of the control span, refer to "Setting up the relay PI control" chapter in the Addendum booklet.

5.7   Relay PI control setpoint

Section:	*RL 1* to *RL 8*
Display:	*SEtP*
Range:	Any display value
Default Value:	*1000*
Default Access Level	*4*
Function number	*4200* to *4207*

Allows setting of the control setpoint, refer to "Setting up the relay PI control" chapter in the Addendum booklet.

5.8   Relay PI control proportional gain value

Section:	*RL 1* to *RL 8*
Display:	*P.9*
Range:	Any display value
Default Value:	*0.010*
Default Access Level	*4*
Function number	*4210* to *4217*

Allow the relay PI control proportional gain to be set, refer to "Setting up the relay PI control" chapter in the Addendum booklet.

5.9   Relay PI control integral gain value

Section:	*RL 1* to *RL 8*
Display:	*I.9*
Range:	Any display value
Default Value:	*0.000*
Default Access Level	*4*
Function number	*4220* to *4227*

Allow the relay PI control integral gain to be set, refer to "Setting up the relay PI control" chapter in the Addendum booklet.

5.10 Relay PI control integral high limit value

Section: RL 1 to RL 8
Display: I .H
Range: 0 to 100.0 %
Default Value: 0.000
Default Access Level 4
Function number   4240 to 4247

Allow the relay PI control integral high limit to be set, refer to "Setting up the relay PI control" chapter in the Addendum booklet.

5.11 Relay PI control integral low limit value

Section: RL 1 to RL 8
Display: I .L
Range: 0 to 100.0 %
Default Value: 100.0
Default Access Level 4
Function number   4250 to 4257

Allow the relay PI control integral low limit to be set, refer to "Setting up the relay PI control" chapter in the Addendum booklet.

5.12 Relay PI control bias

Section: RL 1 to RL 8
Display: b, AS
Range: 0 to 100.0 %
Default Value: 50.0
Default Access Level 4
Function number   4260 to 4267

Allow the relay PI control bias to be set, refer to "Setting up the relay PI control" chapter in the Addendum booklet.

5.13 Relay PI control duty cycle

Section: RL 1 to RL 8
Display: duty SECS
Range: 0 to 6553.5 secs
Default Value: 10.0
Default Access Level 4
Function number   4270 to 4277

Allows the relay PI control duty cycle to be set, refer to "Setting up the relay PI control" chapter in the Addendum booklet.

5.14 Relay PI frequency control "on" time

Section:	**AL 1** to **AL 8**
Display:	**on SECS**
Range:	**0** to **6553.5** secs
Default Value:	**1.0**
Default Access Level	**4**
Function number	**4280** to **4287**

Allows the relay PI frequency control "on" time to be set, refer to "Setting up the relay PI control" chapter in the Addendum booklet.

5.15 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.

5.16 Alarm trailing or setpoint mode

Section:	**AL 1** to **AL 8**
Display:	**trL**
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**

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: 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.

5.17   Alarm relay operating mode

Section:	**RL 1** to **RL 8**
Display:	**OPEr**
Range:	**Hi.Lo**, **Ctrl**, **FrEq**
Default Value:	**Hi.Lo**
Default Access Level	**4**
Function number	**4 160** to **4 167**

Sets the operating mode for the selected relay, refer to "Setting up the relay PI control" chapter in the Addendum booklet.

5.18   Alarm relay operation input selection

Section:	**RL 1** to **RL 8**
Display:	**Ch**
Range:	Varies with settings
Default Value:	**CH 1**
Default Access Level	**4**
Function number	**4070** to **4077**

Sets the input from which the selected alarm relay will operate. Note the alarms do not operate when the **CodE** function is set to **RSCi** . The settings seen will depend on other settings, for example the **CC 1** to **CC8** choices will not be seen if the **CALC Cnt** function is set to zero. Selections available are:

CH 1 to **CH8** relay operates from value of selected channel

CC 1 to **CC 8** relay operates from value of selected calculation channel

dir relay operates from wind direction value (only available in **NMER** mode)

SPEEd relay operates from wind speed value (only available in **NMER** mode)

To set the alarm relay input selection go to the function, press ▣ and when you see the decimal points flash use the ▲ or ▼ push buttons to set the required selection then press ▣ to accept this selection.

5.19   Alarm relay latching operation

Section:	**RL 1** to **RL 8**
Display:	**Ltch**
Range:	**Auto**, **Ltch**, **A.b**, **L.b**
Default Value:	**Auto**
Default Access Level	**4**
Function number	**4 170** to **4 177**

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 ▣ 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 ▣ 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.

5.20 Serial input timeout alarm

Section:	RL 1 to RL 8
Display:	tout
Range:	OFF or ON
Default Value:	OFF
Default Access Level	4
Function number	41d0 to 41d7

Allows the selected relay to be used to give an alarm indication if the serial input string is not received. Note that this can be used in addition to the high and low setpoints.

5.21 Relay PI control functions

See the "LD5 Series 8 Channel Scanning Monitor Output Addendum" booklet for details of the PI control functions available

5.22 Relay PI control span

Section:	RL 1 to RL 8
Display:	SPAN
Range:	Any display value
Default Value:	1000
Default Access Level	4
Function number	4290 to 4297

Allows setting of the control span, refer to "Setting up the relay PI control" chapter in the Addendum booklet.

5.23 Relay PI control setpoint

Section:	RL 1 to RL 8
Display:	SEtP
Range:	Any display value
Default Value:	1000
Default Access Level	4
Function number	4200 to 4207

Allows setting of the control setpoint, refer to "Setting up the relay PI control" chapter in the Addendum booklet.

5.24 Relay PI control proportional gain value

Section:	RL 1 to RL 8
Display:	P.9
Range:	Any display value
Default Value:	0.010
Default Access Level	4
Function number	4210 to 4217

Allow the relay PI control proportional gain to be set, refer to "Setting up the relay PI control" chapter in the Addendum booklet.

5.25 Relay PI control integral gain value

Section:	RL 1 to RL 8
Display:	I .9
Range:	Any display value
Default Value:	0.000
Default Access Level	4
Function number	4220 to 4227

Allow the relay PI control integral gain to be set, refer to "Setting up the relay PI control" chapter in the Addendum booklet.

5.26 Relay PI control integral high limit value

Section:	RL 1 to RL 8
Display:	I .H
Range:	0 to 100.0 %
Default Value:	0.000
Default Access Level	4
Function number	4240 to 4247

Allow the relay PI control integral high limit to be set, refer to "Setting up the relay PI control" chapter in the Addendum booklet.

5.27 Relay PI control integral low limit value

Section:	RL 1 to RL 8
Display:	I .L
Range:	0 to 100.0 %
Default Value:	100.0
Default Access Level	4
Function number	4250 to 4257

Allow the relay PI control integral low limit to be set, refer to "Setting up the relay PI control" chapter in the Addendum booklet.

5.28 Relay PI control bias

Section:	RL 1 to RL 8
Display:	b, AS
Range:	0 to 100.0 %
Default Value:	50.0
Default Access Level	4
Function number	4260 to 4267

Allow the relay PI control bias to be set, refer to "Setting up the relay PI control" chapter in the Addendum booklet.

5.29 Relay PI control duty cycle

Section:	**AL 1** to **AL 8**
Display:	**duty SECS**
Range:	**0** to **6553.5** secs
Default Value:	**10.0**
Default Access Level	**4**
Function number	**4270** to **4277**

Allows the relay PI control duty cycle to be set, refer to "Setting up the relay PI control" chapter in the Addendum booklet.

5.30 Relay PI frequency control "on" time

Section:	**AL 1** to **AL 8**
Display:	**on SECS**
Range:	**0** to **6553.5** secs
Default Value:	**1.0**
Default Access Level	**4**
Function number	**4280** to **4287**

Allows the relay PI frequency control "on" time to be set, refer to "Setting up the relay PI control" chapter in the Addendum booklet.

5.31 Alarm relay normally open/closed

Section:	**rL 1** to **rL 8**
Display:	**rLY**
Range:	**n.o**, **n.c**
Default Value:	**n.o**
Default Access Level	**4**
Function number	**4030** to **4037**

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 **rL 1** to **rL 8 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.

5.32 Relay acknowledge

Section:	**rL 1** to **rL 8**
Display:	**Ack**
Range:	**OFF** or **On**
Default Value:	**OFF**
Default Access Level	**4**
Function number	**4320** to **4327**

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.

5.33   Alarm relay Boolean logic operation

Section:	⌐L 1 to ⌐L 8
Display:	bool
Range:	Or, And
Default Value:	Or
Default Access Level	4
Function number	43 10 to 43 17

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.

5.34   Serial input operation mode

Section:	CONF
Display:	CodE
Range:	di SP, ASCi , UAL, m.buS, SCAN, mmEA, i 13 1
Default Value:	ASCi
Default Access Level	CAL
Function number	4d00

Allows selection of the operating mode to be used for serial communications.

di SP mode

With **di SP** selected (image mode) the display expects to see an input in raw display data format from another instrument. This mode is generally only used when the display is connected to an instrument from the same manufacturer. This mode is not used with any other source.
The data format expected is: <ESC>Incccc
Where: <ESC> is 27 Dec or 1B Hex
I is the ASCII character "I"
n is the number of image characters to follow
cccc are the image characters in Hex. format

ASCi mode

ASCi selects ASCII type input data, the input data will then be displayed without modification (see also **ALPH** function as this can also affect what is displayed). Displays of characters in **ALPH** mode are left justified. Any leading zeroes received will be visible in this mode e.g. data received such as 00873 will be displayed as 00873.

UAL mode

With **UAL** selected (numeric or value mode) the incoming characters will not be displayed unless they are numeric

characters or a negative sign "-", the characters will be read until a terminating character (see **t.chr**) is found. In circumstances, e.g. when terminating characters are not sent by the transmitting device, the instrument can be programmed to look for a constant transmitted character which occurs before to the required display values rather than at the end of the string. In this instance the **SCH 1** character can be used and the display told to display a number of characters after this character (see **n.Chr** function). Once the **t.chr** or **SCH 1** character is found the numeric value will be updated and displayed. If a non numeric character is found then the conversion will cease at that point. Note that ASCII control characters 00 Decimal (Null) to 31 Decimal (Unit Separator) will be ignored if they are seen as part of the string and will not cause the conversion to cease when encountered, they will however not be ignored if used as a start character (**SCH 1**, **2** or **3**) or the terminating character set at the **t.chr** function. The numeric value is filtered after conversion the **FLtr** setting determines the level of filtering. Note: In **URL** mode any leading zeroes transmitted will be ignored e.g. data received such as -00345 will be displayed as -345.

ñ.buS mode

With **ñ.buS** selected the display will accept a Modbus RTU input (RS232 or RS485) or Modbus TCP (port 502) with LE5 models. An address (1 to 255, do not use address 0) must be selected at the function to correspond to the address selected at the host device. The instrument accepts Modbus command 6 "preset single register" and command 16 "preset multiple registers" to send values to the display. The command 6 or 16 information sent can be used to preset four registers, these are:

Register 0 Decimal point position (note **1 ñ 1 dPnt** function must be set to **Auto** if this register is to be used to set the decimal point)

Register 1 Input taken as an unsigned 16 bit number (0 to 65535)

Register 2 Input taken as a signed 16 bit number (-32767 to 32767)

Register 3 Signed 32 bit number high order 16 bits

Register 4 Signed 32 bit number low order 16 bits

Registers 3 and 4 are used together to form a 32 bit number. The display will be updated when the low order register is set.

For example to send the number 1234 to a display with address 1 using Modbus RTU function 6 the following could be sent:

01 06 00 01 04 d2 5a 97

Where:

01 is the address set at the **1 ñ 1 Addr** function

06 is the function number 6

00 01 is the register number (register 1 unsigned 16 bit number)

04 d2 is 1234 in Hex

5a 97 is the system generated checksum

To poll for the display value via Modbus use address 0x1000 and 0x1001 hex, registers 44097 and 44098, Modbus function 3. Modbus function 1 can be used to poll for relay coil status addresses 0x0000 to 0x0007, registers 1 to 8, for relays 1 to 8 (4 relays fitted as standard, up to 8 relays are optionally available).

SCAn mode

When **SCAn** is selected the display can scan up to 8 other compatible devices or channels. The address of each device or channel, the display value required etc. must be set, these setting can be found in the **CH 1** to **CH 8** section of software. When this mode is selected the channel number will flash followed by the value for that channel e.g. **CH 2** followed by the value returned for channel 2.

nñEA mode

With **nñEA** selected the instrument must be connected to a sensor with standard NMEA output. In this mode the decimal point **d.Pnt** function operates only on the speed display.

in 131 mode

This is a special mode use when connected to a Mettler Toledo IND131/331 module. This mode examines special status words sent by the device to determine the placement of decimal points and whether the value is positive or negative. The standard decimal point functions in the PM5 display do not need to be used when connected in this

mode. Default settings for this mode are 9600 baud, 7 bit, even parity though this can be altered if the sending unit is not programmed for these settings. When this mode is selected some of the other input setup functions will not be seen. An overrange message on the Mettler Toledo display will be displayed as $-$ *OF* $-$ on the PM5 display.

5.35 Ethernet input

Section:	*COnF*
Display:	*E.nEt*
Range:	*OFF* or *On*
Default Value:	*OFF*
Default Access Level	*CAL*
Function number	*4d0C*

Seen only in LE5 version displays. Sets the Ethernet input to on (*On* or *OFF*). Note if the Ethernet is being used to input display data then the RS485 or RS232 inputs cannot be used. Port 10002 must be specified following the TCP/IP address. When specifying the IP address put a colon ":" after the IP address followed by the port number of 10002 e.g. 172.16.243.1:10002. Note this example is not a real IP address.
Modbus TCP can also be used with Ethernet (Function 6 or 16).

5.36 Baud rate

Section:	*COnF*
Display:	*bAud*
Range:	*300*, *600*, *1200*, *2400*, *4800*, *9600*, *19.2*, *38.4*
Default Value:	*9600*
Default Access Level	*CAL*
Function number	*4d01*

Sets the baud rate for the incoming data string. This must be set to match the baud rate from the sending device. This function will not be seen if Ethernet input is being used.

5.37 Serial input data bits and parity

Section:	*COnF*
Display:	*dAtA*
Range:	*8.nОn*, *8.odd*, *8.Eun*, *7.odd*, *7.Eun*, *7.nОn*
Default Value:	*8.nОn*
Default Access Level	*CAL*
Function number	*4d02*

Sets the number of data and parity bits for the incoming serial string. For example for an incoming serial string using 7 bit, even parity select *7.EUEn*. This function will not be seen if Ethernet input is being used.

5.38 Select number of channels to scan

Section:	*COnF*
Display:	*CHAn Cnt*
Range:	*1*, *2*, *3*, *4*, *5*, *6*, *7*, *8*
Default Value:	*1*
Default Access Level	*CAL*
Function number	*4d42*

Sets the number of channels to be scanned when set for scanning operation at the *CodE* function.

5.39 Select number of calculation channels

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

Sets the number of calculation channels required. Calculation channels are not actual inputs but are channels which allow various operations to be conducted on one or more inputs. See the calculation channel `Func` function for a full description.

5.40 Select number of alarms

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

Sets the number of alarms required. Alarms can be set for high, low etc. operation and can be assigned to one or more relays. See the `AL 1` to `AL 8` functions for full description.

5.41 Select scan delay time

Section:	`CONF`
Display:	`SCAN dLY`
Range:	`0` to `200` secs
Default Value:	`10`
Default Access Level	`2`
Function number	`4d1E`

Sets delay time between scans for each channel in seconds. This function is only required when scanning operation is selected at the `CodE` function.

5.42 Optional analog output functions

See the "LD5 Series 8 Channel Scanning Monitor Output Addendum" booklet for details of the optional analog retransmission and PI control functions available

5.43 Checksum error detection

Section:	`IN 1`
Display:	`C.SUM`
Range:	`OFF` or `ON`
Default Value:	`On`
Default Access Level	`CAL`
Function number	`4d08`

Seen only when `IN 1 C.SUM` is set to `in131`. Allows checksum error detection. If set to `oFF` then no checksum detection is used. If set to `on` then an error message (`C.SUM Error` or for a 4 digit display `C.SUM Err`) will

flash when a checksum error is detected.

5.44   Serial input address character 1

Section:	*i.n.i*
Display:	*SCH1*
Range:	*-2* to *255*
Default Value:	*- 1*
Default Access Level	*CAL*
Function number	*4d20*

Used only when *SCH1* function = *UAL* or *ASCi* . When a string is sent the instrument will look for four address characters, *SCH1*, *SCH2*, *SCH3* and *SCH4*. If these characters do not appear, one after the other, then the string of data will not be accepted and will not be displayed. Selecting *-2* means "don't care" i.e. a character will be expected in the SCH character selected but any character will be acceptable as a match. Selecting *- 1* disables the function and no matching will be required for that character. Valid characters are -2 to 255 Decimal. *SCH1* is the first start of text character. The use of one or more start of text characters allows addressing of the display in multidrop applications using RS485 or RS422. If data is required to be displayed by only selected displays on a multidrop line then the data can be preceded by an address which matches the *SCH* settings in the instruments required.

For example if the string for. a particular display is to be proceeded by the letters AB then set *SCH1* to *65* (decimal form or the ASCII character A), *SCH2* to *66* (decimal form of the ASCII character B), *SCH3* to *- 1* and *SCH4* to *- 1*. Any display set with these SCH characters will accept an input only if it is preceded by the letters AB i.e the letters AB have been used to address displays with these settings. If no address is required then leave the *SCH1* to *SCH4* characters set at *- 1*.

The *SCH1* character can also be used in conjunction with the *n.Chr* function to force the display to show only a certain number of characters following the *SCH1* character. This method cannot be used with either *SCH2*, *SCH3* or *SCH4*. For example if the data string is always preceded by the letter M e.g. M345678 then setting *SCH1* to *77* (decimal form of the ASCII character M) and *n.Chr* to *3* will mean that the display will show *345* i.e. the three characters following the M character.

5.45   Serial input address character 2

Section:	*i.n.i*
Display:	*SCH2*
Range:	*-2* to *255*
Default Value:	*- 1*
Default Access Level	*CAL*
Function number	*4d21*

Second address character. Used only when *CodE* function = *UAL* or *ASCi* . Refer to the *SCH1* function for further details.

5.46 Serial input address character 3

Section: `I.N.I`
Display: `SCH3`
Range: `-2` to `255`
Default Value: `- 1`
Default Access Level   `CAL`
Function number   `4d22`

Third address character. Used only when `CodE` function = `URL` or `ASCI`. Refer to the `SCH1` function for further details.

5.47 Serial input address character 4

Section: `I.N.I`
Display: `SCH4`
Range: `-2` to `255`
Default Value: `- 1`
Default Access Level   `CAL`
Function number   `4d23`

Fourth address character. Used only when `CodE` function = `URL` or `ASCI`. Refer to the `SCH1` function for further details.

5.48 Serial input terminating character

Section: `I.N.I`
Display: `t.chr`
Range: `- 1` to `255`
Default Value: `13`
Default Access Level   `CAL`
Function number   `4d10`

Used only when function = `URL` or `ASCI`. The display will look for this terminating character to determine when the incoming serial data string has ended. A setting of `- 1` means that no terminating character is used so the display will not look for one. If no regular terminating character is available then an alternative method may have to be considered such as using the `SCH1` etc. functions to detect a regular value prior to the required display value.

For example a string of 1234<CR> would use the <CR> (carriage return character) as the terminating character, in this case the `t.chr` function would be set to `13` as 13 is the ASCII value (decimal) for carriage return.

5.49 Number of serial input characters to skip

Section: `I.N.I`
Display: `dLAY`
Range: `0` to `255`
Default Value: `0`
Default Access Level   `CAL`
Function number   `4d11`

Used only when function = `URL` or `ASCI`. Select the numbers of characters in front of the input string to skip before displaying (may be set from `0` to `255`, default is `0` (off)). This allows the display to skip a certain number of characters in the input string before starting the display. This is useful for skipping unwanted data such as control characters etc., which may be sent by the instruments along with the display information. For example if `dLAY` is

set to **5** then **678** will be displayed from the following example string: <STX>12345678<CR> i.e. the first 5 characters of the string will be ignored. Note that in **URL** mode the values displayed will be right justified and in **RSCI** mode the display is left justified e.g. for this example using a 4 digit display <BLANK>**678** will be seen in **URL** mode whereas in **RSCI** mode the value will displayed as **678**<BLANK> for a 4 digit display.

The **RLPH** function can also affect the character skipping used by the **dLRY** function. See the the **N.Chr** function, section 5.51 for further description and example.

5.50   Number of serial input characters to skip back

Section:	**INI**
Display:	**bRct**
Range:	**0** to **120**
Default Value:	**0**
Default Access Level	**CRL**
Function number	**4d12**

Used only when   function = **URL** or **RSCI** . Number of characters back from the terminating character to skip, default is **0** (off). The display will wait for the terminating character and will then skip back over the last X characters in front to the terminating character with the X value being the value set in this function. For example if the terminating character **t.chr** is set to **13** (i.e. carriage return <CR>) and **bRct** is set to **2** then **1234** will be displayed from the example string <STX>123456<CR>. For the same input string the display would show **123456** if the **bRct** function was set to **0** and the display had enough digits to show this value. If the number of display digits is too few the overrange message **-or-** will be seen in **URL** mode or the most significant values which will fit on the display will be displayed in **RSCI** mode. Both **RSCI** an **URL** mode values will be right justified when the **bRct** function is used and the display value is less than the number of digits on the display.

5.51   Number of serial input characters to skip from **SCH** or **t.chr**

Section:	**INI**
Display:	**N.Chr**
Range:	**-120** to **120**
Default Value:	**0**
Default Access Level	**CRL**
Function number	**4d13**

Used only when   function = **URL** or **RSCI** . This function is used to select the required display value from a string using either the start character or end character as a reference. The **N.Chr** function can be used with the **dLRY** or **bRct** function to further aid in selecting the required value, see example below.

The **RLPH** function setting can also affect what is displayed, if this function is set to **OFF** then alpha characters (A, B, C etc.) will not be counted i.e. they can be ignored as part of the count forward or back. If this function is set to **ON** then both numeric and alpha characters will be counted. If this function is set to **RII** then all characters including control characters (e.g. <STX>, <CR> etc.) will be counted.

If the **N.Chr** value is positive then this function sets the number of characters to be extracted from the data string immediately following the **SCH1** (or **SCH2**, **SCH3** or **SCH4** if used) character. If no **SCH** character is selected then the display will count forward from the first character in the string.

If the **N.Chr** value is negative then this function sets the number of characters to be extracted from the data string immediately following the **t.chr** character.

If this function is not required it should be left at the default setting of **0** which will disable the function.

Example 1:

For string <STX>12345678<CR> the value 1234 will be displayed if the **N.Chr** function is set to 4 and the

value 5678 will be displayed if the 𝘕.𝘊𝘩𝘳 function is set to -4.

For the example above the value 3456 if the 𝘕.𝘊𝘩𝘳 function is set to 4 and the 𝘥𝘓𝘈𝘠 function is set to 2. For the example above the value 4567 would be displayed if the 𝘕.𝘊𝘩𝘳 function is set to -4 and the 𝘣𝘈𝘤𝘵 function is set to 1.

Example 2: For string <STX>A12345678B<ETX><CR> the value 5678 will be displayed if the 𝘕.𝘊𝘩𝘳 function is set to -4 and the 𝘈𝘓𝘗𝘏 function is set to 𝘖𝘍𝘍 or the value 678 will be displayed if the 𝘈𝘓𝘗𝘏 function is set to 𝘖𝘯 i.e. the B character has been counted but the control character <ETX> has not. If the 𝘈𝘓𝘗𝘏 function is set to 𝘈𝘭𝘭 the the B and <ETX> characters would both be counted and the display value for this string would be 78.

5.52 Serial input string decimal point insertion

Section:	𝘪𝘯𝘪
Display:	𝘪.𝘥𝘗𝘵
Range:	- 𝘪 to 𝟠
Default Value:	- 𝘪
Default Access Level	𝘊𝘈𝘓
Function number	𝟜𝘥𝟙𝟜

In some systems the transmitting unit may display a decimal point position but not transmit the decimal point as part of the serial data. The 𝘪.𝘥𝘗𝘵 function can be used to inform the instrument of the required position of the decimal point on the display. The decimal point position of the result shown on the display is set via the 𝘥𝘊𝘗𝘵 function. If the 𝘪.𝘥𝘗𝘵 function is not needed then it should be left at the default setting of - 𝘪 which will disable the function.

Example: Transmitted string is 234 with no decimal point sent. With 𝘥𝘊𝘗𝘵 set to 𝟢.𝘪 and 𝘪.𝘥𝘗𝘵 set to - 𝘪 the displayed value will be 𝟤𝟥𝟦.𝟢 i.e. the display has been told to show one decimal place but no decimal point has been sent. If we now change the 𝘪.𝘥𝘗𝘵 to 𝘪 the displayed value will be 𝟤𝟥.𝟦

5.53 Alpha character display off or on

Section:	𝘪𝘯𝘪
Display:	𝘈𝘓𝘗𝘏
Range:	𝘖𝘍𝘍, 𝘖𝘯, 𝘈𝘭𝘭
Default Value:	𝘈𝘭𝘭
Default Access Level	𝘊𝘈𝘓
Function number	𝟜𝘥𝟙𝟝

Used only when 𝘊𝘰𝘥𝘌 function = 𝘜𝘈𝘓 or 𝘈𝘚𝘊𝘪 but applicable only to 𝘈𝘚𝘊𝘪 . Set this function to 𝘖𝘍𝘍 to filter alpha characters from the input stream i.e. only numeric characters, spaces, decimal points and negative signs will be displayed and alpha characters ignored.

When set to 𝘰𝘯 the instrument will display both alpha and numeric characters. Note: only a limited number of alpha characters may be displayed due to the nature of 7 segment displays, non displayable characters (e.g. W and X) will be ignored.

When set to 𝘈𝘭𝘭 alpha, numeric and control characters e.g. carriage returns will be included for counting purposes in the string, see paragraph below.

This function can also affect the character skipping used by the 𝘣𝘈𝘤𝘵 𝘥𝘓𝘈𝘠 and 𝘕.𝘊𝘩𝘳 functions. For example if 𝘈𝘓𝘗𝘏 is set to 𝘖𝘍𝘍 then only numeric characters, spaces, decimal points and negative signs will be counted and all other characters ignored. If 𝘈𝘓𝘗𝘏 is set to 𝘰𝘯 then all characters except control characters will be counted. If 𝘈𝘓𝘗𝘏 is set to 𝘈𝘭𝘭 then all characters including control characters will be counted.

See the the 𝘕.𝘊𝘩𝘳 function, section 5.51 for further description and example.

5.54 Decimal point

Section: *ın ı*
Display: *d.Pnt*
Range: *0*, *0.1*, *0.02*, *0.003*
Default Value: *0*
Default Access Level *CAL*
Function number *4100*

Displays and sets the decimal point. By pressing the ▲ or ▼ pushbutton at the *dCPt* function the decimal point position may be set. The display will indicate as follows: *0* (no decimal point), *0.1* (1 decimal place), *0.02* (2 decimal places) or *0.003* (3 decimal places). Note if the decimal point is altered the display alarm settings etc. will need to be re-adjusted checked. The *Auto* selection is used when *CodE* function is set to *ınd131* only. In this mode the panel meter expect to receive a separate data word which contains the decimal point position, the panel meter then automatically adjusts the decimal points displayed to match.

5.55 Display rounding

Section: *ın ı*
Display: *d.rnd*
Range: *1* to *5000*
Default Value: *1*
Default Access Level *CAL*
Function number *4360*

Displays and sets the display rounding value. This value may be set to 1 - 5000 displayed units. Display rounding is useful for reducing the instrument resolution without loss of accuracy in applications where it is undesirable to display to a fine tolerance. To set the display rounding value go to the *drnd* function and use the ▲ or ▼ push buttons to set the required value then press **F** to accept this selection.

5.56 Digital filter

Section: *ın ı*
Display: *FLtr*
Range: *0*, *1*, *2*, *3*, *4*, *5*, *6*, *7*, *8*
Default Value: *0*
Default Access Level *CAL*
Function number *43C0*

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

5.57 Display polarity

Section:	ı n ı
Display:	Ch.PL
Range:	both, PoS, NEG, AbS
Default Value:	both
Default Access Level	CAL
Function number	4dA0

Applicable in URL mode only. If set to **both** then the display will be able to indicate both positive and negative values. If set to **PoS** the display will allow only positive values with any values below zero being rounded to zero. If set to **NEG** then the display will allow only negative values with any value above zero being rounded to zero. If set to **AbS** then the absolute value will be displayed i.e. both positive and negative input values will be displayed as positive values.

5.58 Modbus address

Section:	ı n ı
Display:	Addr
Range:	0 to 255
Default Value:	ı
Default Access Level	CAL
Function number	4d05

Seen only when **CodE** function is set to **n.buS**. An address (0 to 255) must be selected to correspond to the address selected at the host device when Modbus communications is being used. Note: address 0 is available but should not be used with Modbus communications.

5.59 Display timeout

Section:	ı n ı
Display:	dS.to
Range:	0 to 1000 secs
Default Value:	10
Default Access Level	4
Function number	4d18

This function allows the user to set a timeout value for a valid display. Valid times are **0** to **1000** seconds, a setting of **0** disables the timeout i.e. the last value received will be displayed until a new number is sent. If a new data stream is not received before the timeout value is reached then the display will be blanked.

5.60 Data string timeout

Section:	ı n ı
Display:	t.out
Range:	0.1 to 10.0 secs
Default Value:	1.0
Default Access Level	CAL
Function number	4d19

This function allows the user to set a timeout value for the data stream. Valid times are **0.1** to **10.0** seconds. The timeout will cause the current data stream to be ignored if the time gap between characters in the stream exceeds the **t.out** value. This function helps to prevent false displays when the data stream is interrupted.

5.61 Display units

Section: *IПI*
Display: *Unıt*
Range: *ПS*, *ƘPh*, *ПPh*, *Ƙnot*
Default Value: *ПS*
Default Access Level *4*
Function number *4d09*

In *ППЕ Я* wind sensor mode this function allows the display units to be set for the wind speed. Choices are *ПS* (metres per second), *ПPH* (miles per hour), *ƘPH* (kilometers per hour) or *Ƙnot* (knots).

5.62 Default display

Section: *IПI*
Display: *dFIt dıSP*
Range: *SƘАП*, *SPEd*, *dır*
Default Value: *SƘАП*
Default Access Level *ƘАL*
Function number *4d0А*

In *ППЕ Я* wind sensor mode this function the default display to be chosen. Select from the following choices: *dır* (wind direction), *SPEd* (wind speed) or *SƘАП* (automatically toggles display between direction and speed at the rate set by the *dFIt dıSP* function). For example if this function is set to *dır* then the operator will need to push the ▲ or ▼ button to display speed, the display will then automatically revert back to direction after approximately 30 seconds.

5.63 Display scan time

Section: *IПI*
Display: *dıSP SEcS*
Range: *0* to *200* secs
Default Value: *10*
Default Access Level *2*
Function number *4dIE*

When the display is set for *ППЕ Я* wind sensor mode and the *dFIt dıSP* is set to *SƘАП* this function sets the number of seconds the display will hold a reading before changing to the alternate reading. e.g. if set for 4 seconds then the display will alternate between the speed and direction displays every 4 seconds. Note the *dS.to* function must be set to a high enough value to ensure that the display does not time out whilst waiting for the next update, this could be seen as display flashing or display intermittently on then off for periods of time.

5.64 Polling function

Section: *POLL*
Display: *IПPt*
Range: *on* or *OFF*
Default Value: *OFF*
Default Access Level *ƘАL*
Function number *4dI6*

Used only when *ƘodE* function = *URL*. The instrument has the ability to transmit up to eight characters for polling purposes. This ability to poll is used when the instrument is to display data from a source which requires a polling command before it will communicate. The characters are set by functions *P.ch.1* to *P.ch.8* and the

repeat rate for this polling is set by the **POLL dLAY** function. If **POLL ı nPt** is set to **OFF** then no characters will be transmitted and the other polling functions will not be seen. If set to on then the characters selected will be transmitted at the rate selected by the **POLL dLAY** function. This ability to poll is used when the instrument is to display data from a source which requires a polling command before it will communicate.

5.65   Polling delay time

Section:	**POLL**
Display:	**dLAY**
Range:	**0.0** to **10.0**
Default Value:	**1.0**
Default Access Level	**CAL**
Function number	**4d17**

Used only when **CodE** function = **UAL** and **POLL ı nPt** function is set to on. When the polling facility is being used the **POLL dLAY** function sets the repeat rate, in seconds, of the poll command. The time may be set from **0.0** seconds (as fast as the baud rate will allow) to **10.0** seconds.

5.66   First polling character

Section:	**POLL**
Display:	**P.Ch. ı**
Range:	**- ı** to **255**
Default Value:	**- ı**
Default Access Level	**CAL**
Function number	**4d30**

Used only when **CodE** function = **UAL** and **POLL ı nPt** function is set to on. Each of the eight poll command characters can be set from **- ı** to **255** decimal. If set to **- ı** then the character is ignored, if set to any other number then the equivalent ASCII character for that number will be sent. Characters 0 to 31 are special control characters such as "carriage return" and "start of text". Use as many **P.ch** characters as required by your system and set the remaining characters to **- ı** so that they are ignored. For example to poll an instrument with the command <STX>P!<CR> (for AIC instruments this means get primary display value from unit with address 1) set **P.ch. ı** to 2 (this correspond to <STX>), **P.ch.2** to 80 (this corresponds to P), **P.ch.3** to 33 (this corresponds to address 1), **P.ch.4** to 13 this corresponds to <CR>, **P.ch.5** , **P.ch.6** , **P.ch.7** and **P.ch.8** are all set to -1.

5.67   Second polling character

Section:	**POLL**
Display:	**P.Ch.2**
Range:	**- ı** to **255**
Default Value:	**- ı**
Default Access Level	**CAL**
Function number	**4d3 ı**

Second polling character, refer to function 5.66.

5.68 Third polling character

Section: POLL
Display: P.Ch.3
Range: - 1 to 255
Default Value: - 1
Default Access Level CAL
Function number 4d32

Third polling character, refer to function 5.66.

5.69 Fourth polling character

Section: POLL
Display: P.Ch.4
Range: - 1 to 255
Default Value: - 1
Default Access Level CAL
Function number 4d33

Fourth polling character, refer to function 5.66.

5.70 Fifth polling character

Section: POLL
Display: P.Ch.5
Range: - 1 to 255
Default Value: - 1
Default Access Level CAL
Function number 4d34

Fifth polling character, refer to function 5.66.

5.71 Sixth polling character

Section: POLL
Display: P.Ch.6
Range: - 1 to 255
Default Value: - 1
Default Access Level CAL
Function number 4d35

Sixth polling character, refer to function 5.66.

5.72 Seventh polling character

Section:	*POLL*
Display:	*P.Ch.7*
Range:	*-1* to *255*
Default Value:	*-1*
Default Access Level	*CAL*
Function number	*4d36*

Seventh polling character, refer to function 5.66.

5.73 Eighth polling character

Section:	*POLL*
Display:	*P.Ch.8*
Range:	*-1* to *255*
Default Value:	*-1*
Default Access Level	*CAL*
Function number	*4d37*

Eighth polling character, refer to function 5.66.

5.74 Scan channel poll address

Section:	*CH1* to *CH8*
Display:	*Poll Addr*
Range:	*1* to *255*
Default Value:	*1*
Default Access Level	*CAL*
Function number	*4d90* to *4d97*

Seen when the *CONF CodE* function is set to *SCAN*. This function selects the serial address of the instruments to be scanned. For example if 2 instruments are to be scanned one could be given an address (*Addr*) of 1 and the second an address of 2.

5.75 Scan channel command

Section:	*CH1* to *CH8*
Display:	*Cmd*
Range:	*Pri*, *SEc*, *tEr*, *quAd*, *CH0*, *CH1*, *CH2*, *CH3*, *CH4*, *CH5*, *CH6*, *CH7*, *CH8*, *AbUS*
Default Value:	*Pri*
Default Access Level	*CAL*
Function number	*4d80* to *4d87*

Seen when the *CONF CodE* function is set to *SCAN*. This function sets the value to be returned from the polled instrument. See individual instruction manuals for the instruments being scanned to determine which choice below is suitable e.g. some instruments may only have a primary display value available. Choices are:

Pri - instructs the scanned instrument to return its primary display value.
SEc - instructs the scanned instrument to return its secondary display value.
tEr - instructs the scanned instrument to return its tertiary display value.
quAd - instructs the scanned instrument to return its quadinary display value.

CH0 - instructs the scanned instrument to return its channel zero display value.

CH1 to **CH8**) - instructs the scanned instrument to return its channel one or two etc. up to channel eight display value.

AbUS - if communicating with an instrument capable of AIC ABUS communication it is possible to use this option to request a particular value by sending the ABUS value e.g. 800 hex is the ABUS value required to request the primary display value from the instrument being scanned.

5.76   ABUS command value

Section:	**CH1** to **CH8**
Display:	**AbuS CodE**
Range:	**0000** to **FFFF**
Default Value:	
Default Access Level	**CAL**
Function number	**4dF0** to **4dF7**

Seen when the **CONF CodE** function is set to **SCAN**. This function sets the ABUS command used when **Cmd** is set to **AbUS** e.g. **0800** is the command for the primary display value. Thousands of commands are available some of which are not useful in this software. A complete list is not available, contact supplier if a different command is required.

5.77   Channel decimal point

Section:	**CH1** to **CH8**
Display:	**d.Pnt**
Range:	**0**, **0.1**, **0.02**, **0.003**
Default Value:	**0**
Default Access Level	**CAL**
Function number	**4100** to **4107**

Seen when the **CONF CodE** function is set to **SCAN**. This function sets the decimal point placement for the selected channel.

5.78   Channel display rounding

Section:	**CH1** to **CH8**
Display:	**d.rnd**
Range:	**1** to **5000**
Default Value:	**1**
Default Access Level	**CAL**
Function number	**43b0** to **43b7**

Seen when the **CONF CodE** function is set to **SCAN**. This function sets the display rounding for the selected channel. e.g. if set to **0.2** the display will only show multiples of 0.2.

5.79 Channel display filter

Section:	`CH 1` to `CH8`
Display:	`FLtr`
Range:	`0`, `1`, `2`, `3`, `4`, `5`, `6`, `7`, `8`
Default Value:	`0`
Default Access Level	`CAL`
Function number	`43C0` to `43C7`

Seen when the `CONF CodE` function is set to `SCAN`. Displays and sets the digital filter value for the selected channel. 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.

5.80 Channel display polarity

Section:	`CH 1` to `CH8`
Display:	`Ch.PL`
Range:	`both`, `PoS`, `NEG`, `AbS`
Default Value:	`both`
Default Access Level	`CAL`
Function number	`4dA0` to `4dA7`

Seen when the `CONF CodE` function is set to `SCAN`. Displays and sets the polarity selection for the display for the selected for channel. If set to **`both`** then both positive and negative values can be displayed. If set to **`PoS`** the display will allow only positive values with any values below zero being rounded to zero. If set to **`NEG`** then the display will allow only negative values with any value above zero being rounded to zero. If set to **`AbS`** then both positive and negative values received will be displayed as positive values.

5.81 Channel display on or off

Section:	`CH 1` to `CH8`
Display:	`di SP`
Range:	`OFF` or `ON`
Default Value:	`On`
Default Access Level	`4`
Function number	`44F0` to `44F7`

Allows selection of which channels will be seen and which not seen on the display. If set to `OFF` that selected channel will not be seen on the display. If set to `ON` that channel will be seen on the display. For example when adding two channels together using a calculated channel it may be required that channel 1 and channel 2 not be seen on the display so that only the sum (produced by the calculated channel) is seen.

5.82 Calculation channel function

Section:	`CC 1` to `CC 8`
Display:	`Func`
Range:	`Hi`, `Lo`, `di FF`, `AUG`, `d.AUG`, `P.AUG`, `N.AUG`, `S.di F`, `Add`, `PC 1`, `PC 2`, `Sub`, `Prod`, `di u`, `Si nE`, `CoS`, `r.AUG`, `F.AUG`
Default Value:	`Hi`
Default Access Level	`4`
Function number	`4E 10` to `4E 17`

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

OFF - calculated channel not used.

Hi - 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.

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

AU9 - calculated channel shows the average of all selected input channel readings.

d.AU9 - calculated channel shows a value equal to the highest positive or negative value and the average of the selected channels.

P.AU9 - calculated channel shows a value equal to the highest positive value and the average of the selected channels.

n.AU9 - calculated channel shows a value equal to the average minus the lowest value of the selected channels.

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

Add - calculated channel shows the arithmetic sum of all the selected channels.

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

PC 1 - 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 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 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 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 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 this result will be multiplied by the cosine of the value of the next channel etc.

r.AU9 - rolling average. The rolling average causes the display to show the 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.

F.AU9 - 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).

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 **CONF CHAN Cnt** function ensure that at least one calculation channel is set

- Set **AL 1Hi 9h** to **120**

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

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

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

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

- Set **CC 1ChAn 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 `CONF CHAN Cnt` function ensure that at least one calculation channel is set
- Set `AL 1Hi gh` to `20`
- Set `AL 1rLYS` to `rLY 1On`
- Set `AL 1OPEr` to `Hi.Lo`
- Set `AL 1Ch` and to `CC 1`
- Set `CC 1Func` to `diFF`
- Set `CC 1ChAn SEL` to `Ch 1On` 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 `AL 1 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 1 to show the fixed average of every 20 data strings:

- Set the `CALC Cnt` function in the configuration section to `1`
- Set the `Func` in the calculated channel section to `F.AVg`
- Set the `A.cnt` in the calculated channel section to `20`

The average of each 20 data strings will now be shown as the calculated channel 1 (`CC 1`) value.

5.83   Calculation channel data log

Section:	`CC 1` to `CC 8`
Display:	`d.Lo9`
Range:	`OFF` or `On`
Default Value:	`OFF`
Default Access Level	`4`
Function number	`4ES0` to `4ES7`

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`.

5.84   Calculation channel display

Section:	`CC 1` to `CC 8`
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. 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. 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. If it is required to only display the calculation channel result and not the input channel then the input channel display must be set to **OFF** (see **, Π 1** etc. functions). If the calculation channel is the only channel being viewed the the message **CC 1** will flash periodically approx. every 8 seconds if the **CONF SCAN dELAY** function is set to **0** if set to a value other than zero the message **CC 1** will not flash periodically.

5.85   Calculation channel decimal point

Section:	**CC 1** to **CC 8**
Display:	**d.Pnt**
Range:	**0**, **0. 1**, **0.02**
Default Value:	**0**
Default Access Level	**4**
Function number	**4E 70** to **4E 77**

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.

5.86   Calculation channel display rounding

Section:	**CC 1** to **CC 8**
Display:	**d.rnd**
Range:	**1** to **5000**
Default Value:	**1**
Default Access Level	**4**
Function number	**4E 80** to **4E 87**

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.

5.87   Calculation channel selection

Section:	**CC 1** to **CC 8**
Display:	**ChAn SEL**
Range:	**CH 1**, **CH 2**, **CH 3**, **CH 4**, **CH 5**, **CH 6**, **CH 7**, **CH 8**, **CC 1**, **CC 2**, **CC 3**, **CC 4**, **CC 5**, **CC 6**, **CC 7**, **CC 8**
Default Value:	n/a
Default Access Level	**4**
Function number	**4E 20** to **4E 27**

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 **CC 1 ChAn SEL** function set **CH 2**, **CH 4** and **CH 6** 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 **CH 2**, **CH 4**, **CH 6** or **CC 2** (calculated channel 2).

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

5.88 Calculation channel fixed average count

Section:	`CC 1` to `CC 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 fixed average operation (`F.Avg`).

5.89 Calculation channel multiplication scale

Section:	`CC 1` to `CC 8`
Display:	`Arth SCLE`
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 `Arth SCLE` 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.

5.90 Calculation channel offset value

Section:	`CC 1` to `CC 8`
Display:	`Arth OFSt`
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 `Arth OFSt` 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.

5.91 Calculation channel division

Section:	`CC 1` to `CC 8`
Display:	`Arth 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 `Arth 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.

5.92   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.

5.93   Display brightness

Section:	*di SP*
Display:	*br9t*
Range:	*1* to *64*
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).

5.94   Dimmed display brightness

Section:	*di SP*
Display:	*dul 1*
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 **dul 1** 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 **dul 1** 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.

5.95   Auto display brightness high level

Section:	*di SP*
Display:	*Auto Hi9h*
Range:	*16* to *64*
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.

5.96 Auto display brightness low level

Section:	*di SP*
Display:	*Auto Lo*
Range:	*1* to *64*
Default Value:	*7*
Default Access Level	*2*
Function number	*22Eb*

Automatic brightness low level - seen only when **brჳt 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.

5.97 Serial comms. operation mode

Section:	*SEri*
Display:	*OPEr*
Range:	*nOnE, Cont, Poll, A.buS, di SP, m.buS*
Default Value:	*nOnE*
Default Access Level	*4*
Function number	*4480*

Allows selection of the operating mode to be used for RS232 or RS485 serial output communications. See the "LD5/LE5 Series Large Digit Display Output Addendum" for more information and wiring details of optional isolated serial communications.

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** - Modbus RTU (RS232/RS485) is used. See **COnF CodE** function for further description.

- **ChAn** - not currently applicable to this instrument.

5.98 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.

5.99 Serial parity

Section:	*SEri*
Display:	*Prty*
Range:	*8n*, *8E*, *8o*, *7E*, *7o*
Default Value:	*8n*
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.

5.100 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.

5.101 Front P button operation mode

Section:	*r.inP*
Display:	*P.but*
Range:	*nonE*, *P.Hi*, *P.Lo*, *Hi.Lo*, *AL.Ac*
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.in.1* function.

5.102 Remote input 1 operation mode

Section:	*r.inP*
Display:	*r.in.1*
Range:	*nonE*, *P.HI d*, *d.HI d*, *P.Hi*, *P.Lo*, *Hi.Lo*, *AL.Ac*, *AccS*, *P.but*, *F.but*,
	U.but, *d.but*, *duii*, *b.inc*, *b.dEc*
Default Value:	*nonE*
Default Access Level	*4*
Function number	*4721*

Sets the operation mode for remote input 1 terminal at the rear of the instrument. Choices are as follows:

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

- **P.Hol d** - 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.HL d** will appear briefly every 8 seconds whilst the input terminals are short circuited to indicate that the peak hold function is active.

- **d.Hol d** - display hold. The display value will be held whilst the remote input terminals are short circuited. The message **d.HL d** will appear briefly every 8 seconds whilst the input terminals are short circuited to indicate that the display hold function is active.

- **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.

- **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.

- **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.

- **Al .Ac** - alarm acknowledge. Allows the remote input to be used to acknowledge a latching alarm. See the **Ltch** function.

- **ACCSS** - remote input access. Allows the remote input to be used for access control purposes. See the **r.i nP LEuL** function.

- **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 i** - display brightness control. The remote input can be used to change the display brightness. When this mode is selected the display brightness can be switched, via the remote input terminals, between the brightness level set at the function and the brightness level set at the function.

- **b.i 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.i 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.

5.103 Remote input 2 operation mode

Section:	*r.i nP*
Display:	*r.i n.2*
Range:	*nOnE*, *P.Hi d*, *d.Hi d*, *P.Hi*, *P.Lo*, *Hi .Lo*, *AL.Ac*, *ACCS*, *P.but*, *F.but*,
	U.but, *d.but*, *dul l*, *b.i nc*, *b.dEc*
Default Value:	*nOnE*
Default Access Level	4
Function number	*4722*

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

5.104 Remote input 3 operation mode

Section:	*r.i nP*
Display:	*r.i n.3*
Range:	*nOnE*, *P.Hi d*, *d.Hi d*, *P.Hi*, *P.Lo*, *Hi .Lo*, *AL.Ac*, *ACCS*, *P.but*, *F.but*,
	U.but, *d.but*, *dul l*, *b.i nc*, *b.dEc*
Default Value:	*nOnE*
Default Access Level	4
Function number	*4723*

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

5.105 Remote input 4 operation mode

Section:	*r.i nP*
Display:	*r.i n.4*
Range:	*nOnE*, *P.Hi d*, *d.Hi d*, *P.Hi*, *P.Lo*, *Hi .Lo*, *AL.Ac*, *ACCS*, *P.but*, *F.but*,
	U.but, *d.but*, *dul l*, *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.

5.106 Easy access mode

Section:	*ACCES*
Display:	*EASY LEUL*
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 🄵 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.

5.107 Remote input access mode

Section: ACCES
Display: r.inP LEVL
Range: NONE, 1, 2, 3, 4, 5, 6, CAL
Default Value: NONE
Default Access Level 5.CAL
Function number AC01

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**.

5.108 PIN code 1

Section: ACCES
Display: USr.1 P.n
Range: 0 to 65535
Default Value: 0
Default Access Level 5.CAL
Function number AC09

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.

5.109 PIN code 1 access level

Section: ACCES
Display: USr.1 LEVL
Range: NONE, 1, 2, 3, 4, 5, 6, CAL
Default Value: NONE
Default Access Level 5.CAL
Function number AC02

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**.

5.110   PIN code 2

Section:	*ACCES*
Display:	*USr.2 Pin*
Range:	*0* to *65535*
Default Value:	*0*
Default Access Level	*S.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.

5.111   PIN code 2 access level

Section:	*ACCES*
Display:	*USr.2 LEUL*
Range:	*NONE*, *1*, *2*, *3*, *4*, *5*, *6*, *CAL*
Default Value:	*NONE*
Default Access Level	*S.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*.

5.112   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.2CodE* 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.

5.113 User assignable access 1 level value

Section:	ACCES
Display:	Fn.1 LEUL
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.

5.114 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.

5.115 User assignable access 2 level value

Section:	ACCES
Display:	Fn.2 LEUL
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.

5.116 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	0C12

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.

5.117 User assignable access 3 level value

Section:	ACCES
Display:	Fn.3 LEUL
Range:	dFlt, 1, 2, 3, 4, 5, 6, CAL, 5.CAL
Default Value:	dFlt
Default Access Level	5.CAL
Function number	0C42

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.

5.118 User assignable access 4 function number

Section:	ACCES
Display:	Fn.4 CodE
Range:	0000 to FFFF hex.
Default Value:	0000
Default Access Level	5.CAL
Function number	0C13

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.

5.119 User assignable access 4 level value

Section:	ACCES
Display:	Fn.4 LEUL
Range:	dFlt, 1, 2, 3, 4, 5, 6, CAL, 5.CAL
Default Value:	dFlt
Default Access Level	5.CAL
Function number	0C43

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.

5.120 User assignable access 5 function number

Section:	ACCES
Display:	Fn.5 CodE
Range:	0000 to FFFF hex.
Default Value:	0000
Default Access Level	5.CAL
Function number	0C14

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.

5.121 User assignable access 5 level value

Section:	ACCES
Display:	Fn.5 LEUL
Range:	dFlt, 1, 2, 3, 4, 5, 6, CAL, S.CAL
Default Value:	dFlt
Default Access Level	S.CAL
Function number	0C44

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.

5.122 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	0C15

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.

5.123 User assignable access 6 level value

Section:	ACCES
Display:	Fn.6 LEUL
Range:	dFlt, 1, 2, 3, 4, 5, 6, CAL, S.CAL
Default Value:	dFlt
Default Access Level	S.CAL
Function number	0C45

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.

5.124 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	0C16

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.

5.125   User assignable access 7 level value

Section:	ACCES
Display:	Fn.7 LEUL
Range:	dFit, 1, 2, 3, 4, 5, 6, CAL, S.CAL
Default Value:	dFit
Default Access Level	S.CAL
Function number	0C46

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

5.126   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	0C17

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.

5.127   User assignable access 8 level value

Section:	ACCES
Display:	Fn.8 LEUL
Range:	dFit, 1, 2, 3, 4, 5, 6, CAL, S.CAL
Default Value:	dFit
Default Access Level	S.CAL
Function number	0C47

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

6 Technical specifications

Display: 6 digit 38mm red LED or 5 digit 45mm red LED or 4 digit 57mm or 58mm red LED
or 4 or 6 digit 100mm red LED
or 4 digit 200mm red LED type Count/Rate
High contrast versions 38mm 6 digit, 58mm 4 digit, 100mm 4 or 6 digit and 200mm 4 digit
available in red, green, white or amber led.

Input: LD5 models RS232 or RS485 (factory configured)
LE5 models Ethernet plus either RS232 or RS485 (factory configured)

Baud rate: 300, 600, 1200, 2400, 4800, 9600 or 19.2k programmable

Ambient Temperature: -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

DC output supply: 5 or 24VDC @ 50mA max.
Output (standard): 4 x relays, 1 x Form C, 3 x Form A rated 5A resistive. Programmable N.O. or N.C.

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, can be used with Modbus TCP
Web page with Ethernet option
USB port, type B

Physical characteristics - see chapter 2

7 Guarantee and service

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

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

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

When returning the product for service or repair a full description of the fault and the mode of operation used when the product failed must be given. In any event the manufacturer has no other obligation or liability beyond replacement or repair of this product.

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