C1300
Advanced circular chart recorder

The Company

We are an established world force in the design and manufacture of measurement products for industrial process control, flow measurement, gas and liquid analysis and environmental applications.

As a part of ABB, a world leader in process automation technology, we offer customers application expertise, service and support worldwide.

We are committed to teamwork, high quality manufacturing, advanced technology and unrivalled service and support.

The quality, accuracy and performance of the Company's products result from over 100 years experience, combined with a continuous program of innovative design and development to incorporate the latest technology.

Electrical Safety

This equipment complies with the requirements of CEI/IEC 61010-1:2001-2 'Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use'. If the equipment is used in a manner NOT specified by the Company, the protection provided by the equipment may be impaired.

Symbols

One or more of the following symbols may appear on the equipment labelling:

⚠	**Warning** – Refer to the manual for instructions	⎓	Direct current supply only
⚡	**Caution** – Risk of electric shock	∿	Alternating current supply only
⏚	Protective earth (ground) terminal	≈	Both direct and alternating current supply
⏚	Earth (ground) terminal	▢	The equipment is protected through double insulation

Information in this manual is intended only to assist our customers in the efficient operation of our equipment. Use of this manual for any other purpose is specifically prohibited and its contents are not to be reproduced in full or part without prior approval of the Technical Publications Department.

Health and Safety

To ensure that our products are safe and without risk to health, the following points must be noted:

1. The relevant sections of these instructions must be read carefully before proceeding.
2. Warning labels on containers and packages must be observed.
3. Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given.
4. Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.
5. Chemicals must be stored away from heat, protected from temperature extremes and powders kept dry. Normal safe handling procedures must be used.
6. When disposing of chemicals ensure that no two chemicals are mixed.

Safety advice concerning the use of the equipment described in this manual or any relevant hazard data sheets (where applicable) may be obtained from the Company address on the back cover, together with servicing and spares information.

Contents

1 Preparation

1.1 Preparing the Recorder for First Use

Prepare the recorder for first use as follows:

1. Install the recorder – see Section 4, page 59.

2. Connect the recorder – see Section 5, page 63.

> **Warning.** Ensure all connections are made correctly, especially to the earth (ground) stud – see Section 5.4, page 70.

3. Switch on the power supply to the recorder.

> **Note.** On power-up, the pen arm(s) is (are) moved to an off-chart position for automatic referencing. Pen chatter may occur on the pen(s) nearest the reference position. This is a normal function of the recorder.

4. Fit the pen capsule(s) – see Fig. 1.1.

> **Note.**
> - Ensure the correct colored capsule is fitted to the appropriate pen arm. Each pen arm is identified by a colored band – see Fig. 1.1.
> - If the violet, true-time line event option is fitted, the pen records on the same time line as the red pen, but on the outer edge of the chart.

5. Fit a chart – see Fig. 1.2 on page 3.
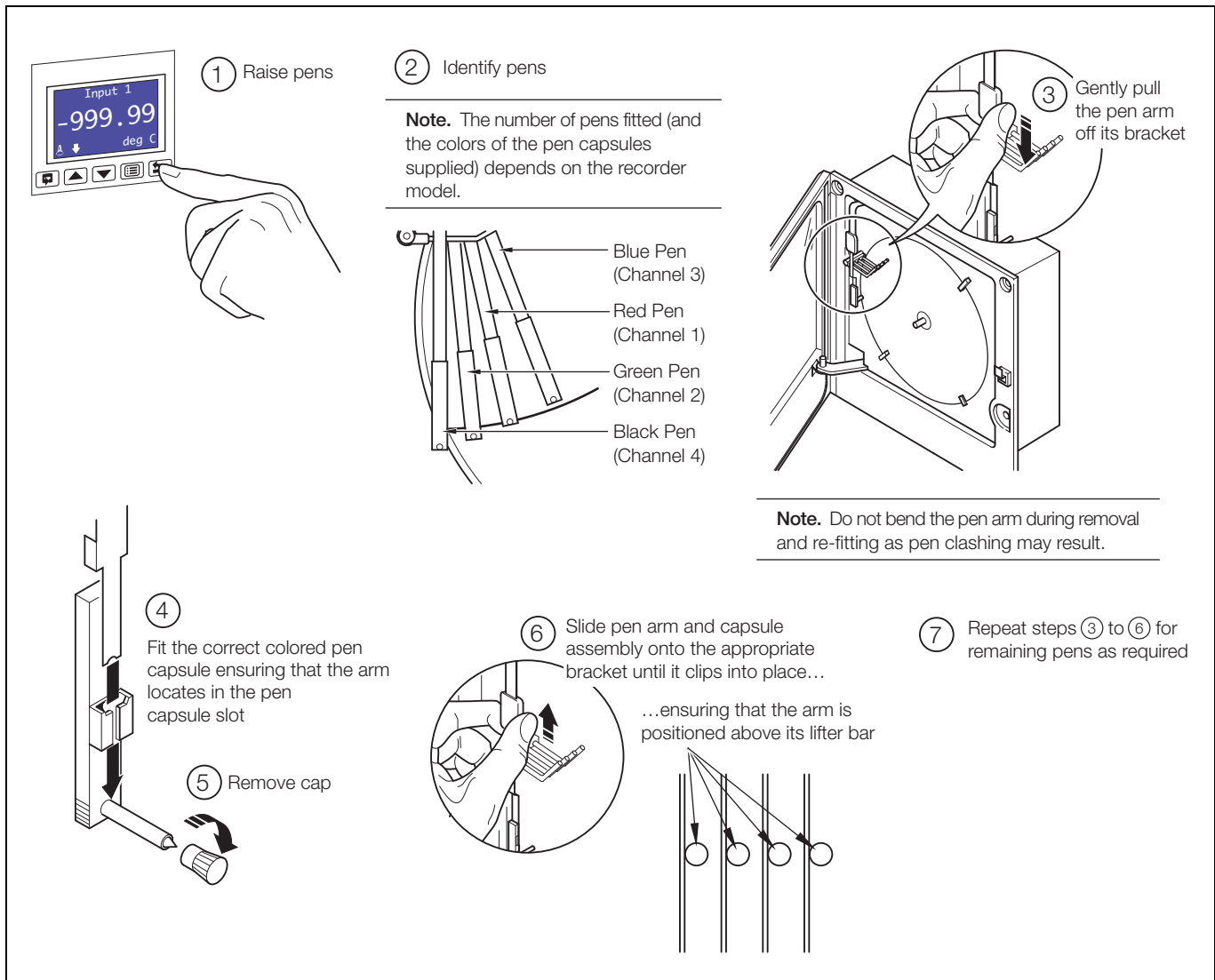
Fig. 1.1 Fitting the Pen Capsule(s)

① Ensure pen(s) in raised position

② Lift the chart clamp

③ Fit a chart ensuring that it is beneath the pen lifter bars

⑥ Lower the chart clamp and press down firmly to ensure that the 2 locating pins pierce the paper

④ Locate chart under guides

⑦ Lower pen(s)

Red Pen

⑤ Rotate chart to align the time line with the red pen

⑧ Switch off the power supply to the recorder
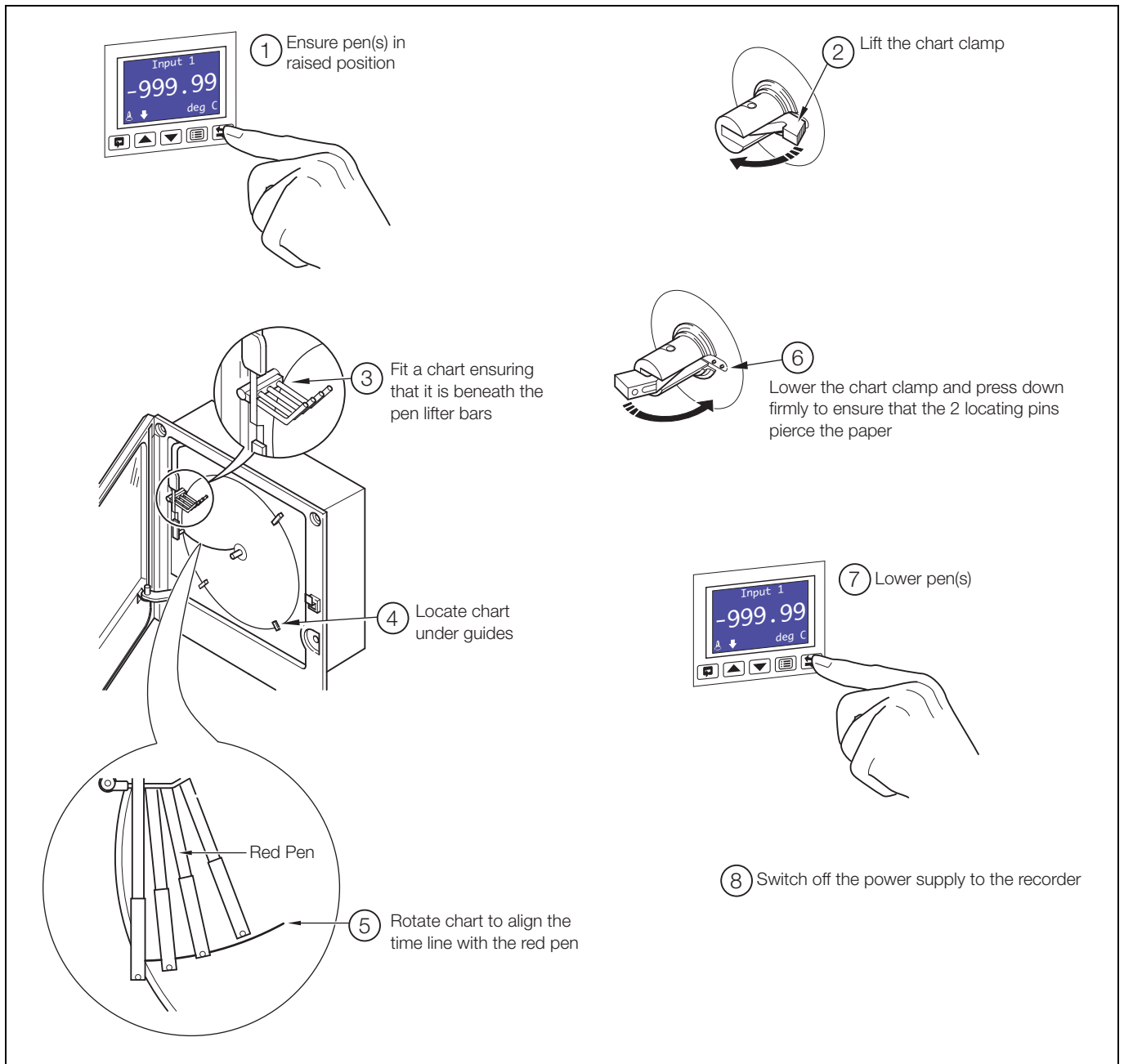
Fig. 1.2 Fitting a Chart

1.2 Powering up the Recorder

To power up the recorder:

1. Switch on the supply to the recorder, any power-operated control circuits and the input signals. Wait for the pens to settle.

2. The start-up self-test sequence shown in Fig. 1.3 is shown on display screen 1 when the power supply is first switched on.


```
C1314J
Software Issue
1
```

Instrument Type and Software Version

```
Main: CFG Test  :Pass
SKey:Type B     :Pass
Mod2:Not Fitted
Mod3:Not Fitted
Mod4:Not Fitted
Mod5:Not Fitted
Mod6:Not Fitted
```

Self Tests, Software Key and
Module Identification
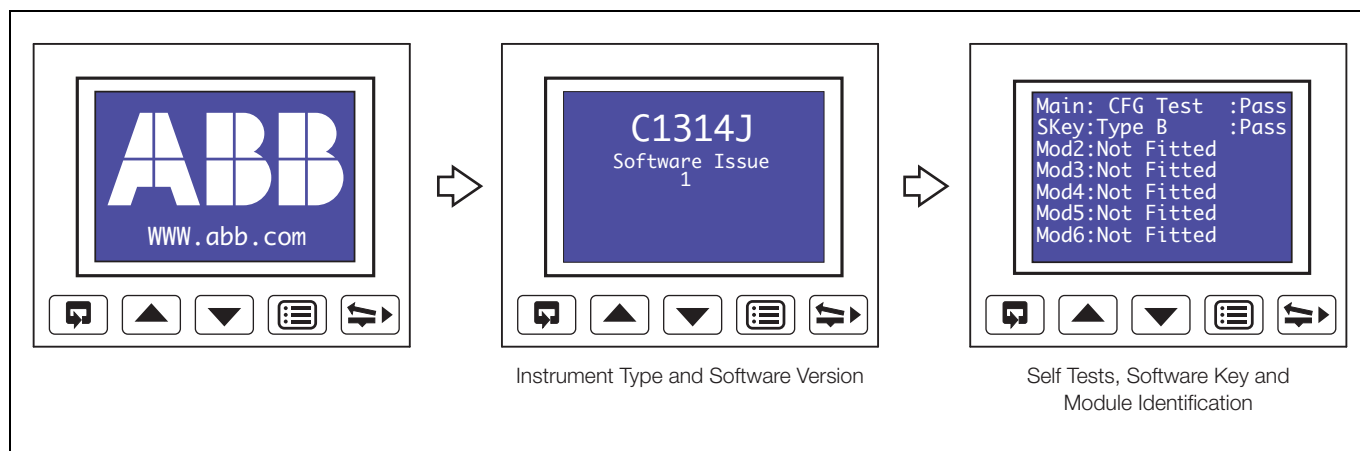
Fig. 1.3 Recorder Start-up Self-test Sequence

1.2.1 Recorder Status and Error Page
If any of the start-up self-tests (see Fig. 1.3) fail, the error message 'Fail' is displayed. Refer to Fig. 1.4 for possible cause and remedial action information.

Component	Possible Cause	Action
Module in position 2		
Module in position 3		
Module in position 4	Analog input and/or analog output calibration is corrupt.	Check and correct program data.\nIf the fault persists, contact the Company.
Module in position 5		
Module in position 6		
Main Board		
Software Key	Configuration stored in non-volatile memory is corrupt.	Power down and then up again.\nIf the fault persists, contact the Company.

Note. The software key is optional hardware that is fitted to enable optional software features – Totalizers, Math Blocks, System Clock and Timers.

Note. Acknowledging an Error Message clears the error state but does not rectify the fault. After acknowledging an error, carry out the appropriate action detailed in the above table.

Fig. 1.4 Start-up Error Messages

2 Operation

2.1 Display Screens and Operator Keys

Up to two faceplates are fitted to the front of the recorder, each comprising a display screen and associated operator keys – see Fig. 2.1.

Each high resolution, dot matrix display screen shows the operating and programming information for up to two input channels in a variety of formats.

Alarm states are indicated by icons in the lower left corner of the display screen(s) – see Fig. 2.3 on page 7.

Fig. 2.1 Display Screen and Operator Keys

The recorder has dedicated *Operating Pages* in the **Operating Level** – see Sections 2.3 to 2.6. These pages display the process measurements and are not affected by the security system which inhibits access to the **Configuration Pages** – see Section 3.3, page 19.

2.2 Input Error Messages and Alarm Icons

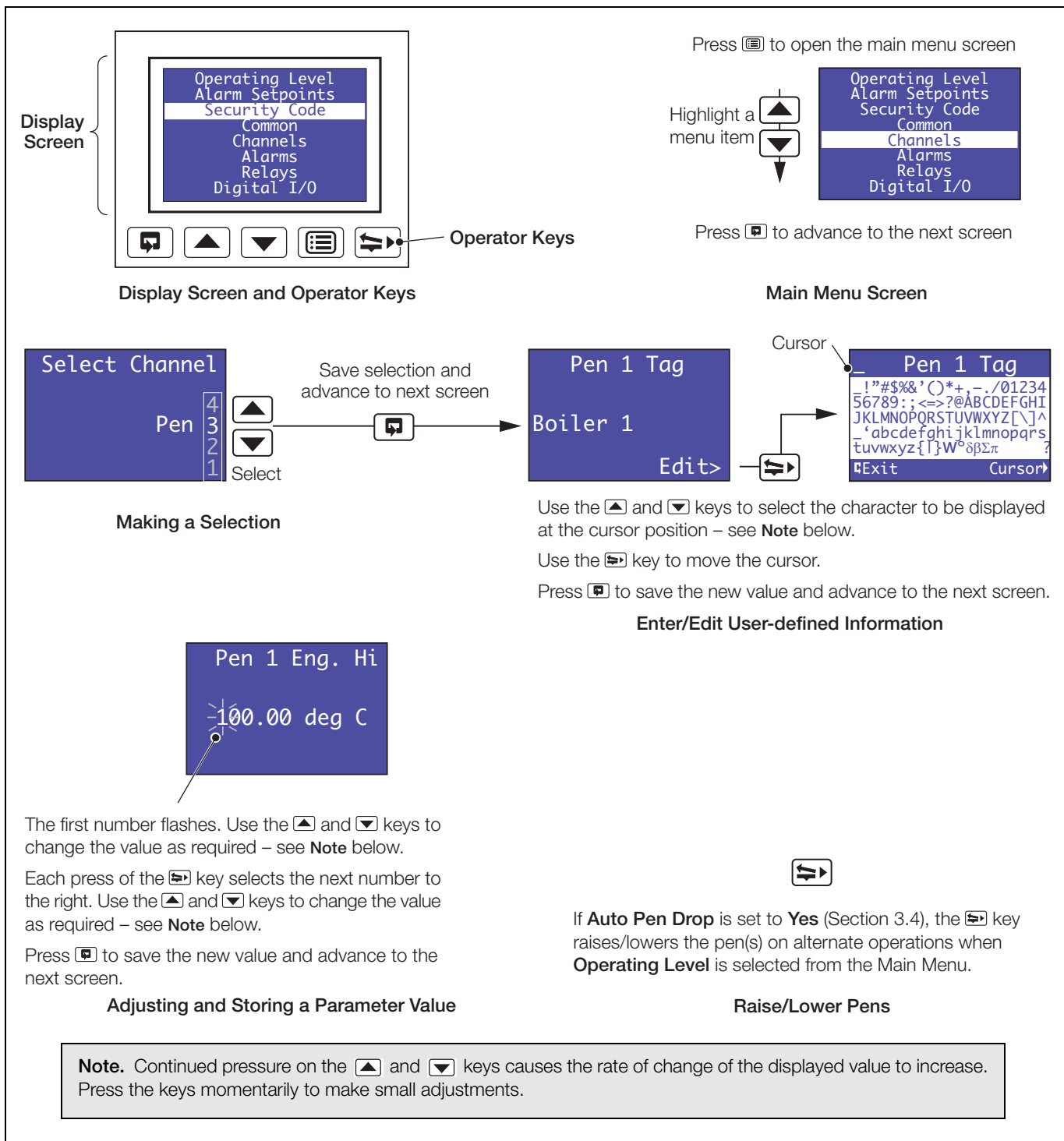| Message	Reason	Action
Error1	Unspecified error from the Analog to Digital Converter	• Check that the input/output board is located correctly in its socket – see Section 5.1
Error2	Corrupt data from the Analog to Digital Converter	• Power down and up
Error3	No reply from the Analog to Digital Converter	If the error message is still present, contact the Company
F–inpt	Input is above or below fault detection level **or** Input exceeds the limits for the linearizer selected	• Check input source for possible broken sensor • Check input connections • Check input link position • Check input configuration – see Section 3.5

Examples

Boiler 1 **Error3** *gal/d*	Hardware failure on Process Variable 1

Boiler 1 **F-inpt** *gal/d*	Input out of range on Process Variable 1

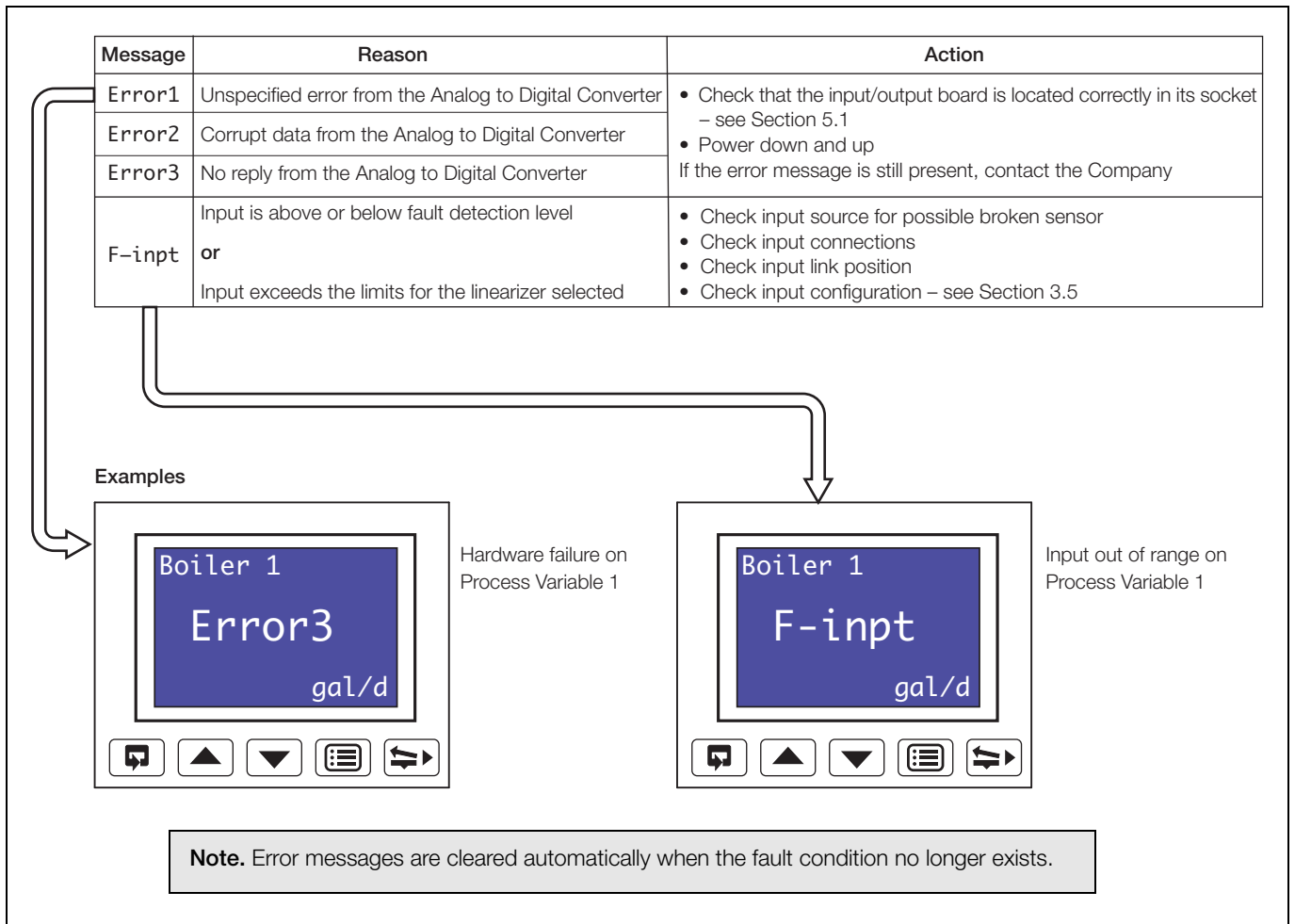**Note.** Error messages are cleared automatically when the fault condition no longer exists.

Fig. 2.2 Input Error Messages Displayed in the Operating Page

🔔	Global Alarm Indicator – displayed if **any** alarm in **any** channel is active
⬆	High Process
⬇	Low Process
◢	Fast Rate
◣	Slow Rate

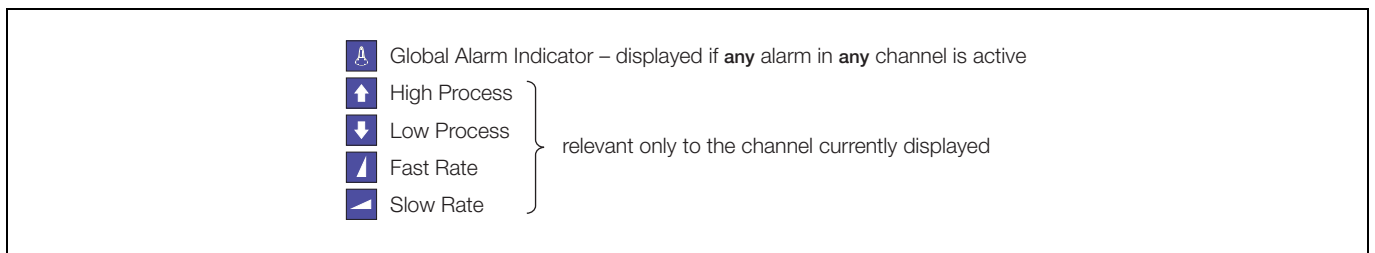relevant only to the channel currently displayed

Fig. 2.3 Alarm Icons

2.3 Operating Pages
Overview.

- ■ The following information is displayed in the Operating Pages:
  - – Input (pen) channel readings
  - – Data logging status (if data logging option is enabled by installation of the appropriate hardware)
  - – System time/date (if any one of the Totalizer, Math or Timers software options are enabled by installation of the appropriate software key)
  - – Totalizer readings (if the totalizer software option is enabled by installation of the appropriate software key)
  - – Totalizer log (if the totalizer software option is enabled by installation of the appropriate software key)
  - – Totalizer control (if the totalizer software option is enabled *and* **Totalizer Reset** is set to **YES** – see Section 3.4, page 20.)
  - – Alarm set points (if **Alarm Adjust** is set to **Yes** – see Section 3.4, page 20.)

- ■ The Input (pen) channel and totalizer displays are configured separately (see **Pen Ch Display** and **Totals Display** in Section 3.4) and each can be displayed in one of several ways. Input channel information can be displayed without totalizer information and vice-versa.

- ■ Input channel 1 and 2 information and system time/date is shown on display screen 1.

- ■ If the recorder is fitted with the optional second faceplate:
  - – Input channel 3 and 4 information, together with system time/date is shown on display screen 2
  - – Totalizer logs, totalizer control and alarm set point adjustment for pens 3 and 4 and associated totalizers are accessed from the menu shown on display screen 2 when the 🔳 key is pressed on faceplate 2.

- ■ Totalizer information is shown on the same display screen as the pen to which the totalizer is assigned.

- ■ All channel and totalizer configuration is done using faceplate 1.

2.3.1 Accessing the Operating Pages

Operating Level Totalizer Log Totalizer Control Alarm Setpoints Security Code Common Channels Alarms	▲ ▼	Press the 🔳 key to open the **Main Menu**. Highlight **Operating Level**.
🔁	Input 1 -999.99 deg C	see Section 2.3.3, page 10.

2.3.2 Autoscroll

```
┌─────────────────┐
│    Input 1      │
│  -999.99        │
│ A ↓      deg C  │
└─────────────────┘
        ▲
        ↓
┌─────────────────┐
│  Autoscroll On  │
│   Slow Rate     │
└─────────────────┘
        ▲
        ↓
┌─────────────────┐
│  Autoscroll On  │
│   Fast Rate     │
└─────────────────┘
        ▼
        ↓
┌─────────────────┐
│  Autoscroll On  │
│   Slow Rate     │
└─────────────────┘
        ▼
        ↓
┌─────────────────┐
│  Autoscroll Off │
│                 │
└─────────────────┘
```
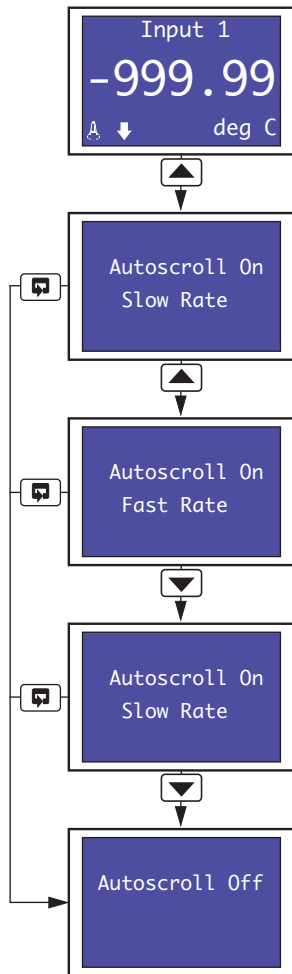
Autoscroll

When **Autoscroll** is set to **On**, each *Operating Page* screen is displayed in turn for a period of time determined by the rate selected:

> Slow Rate – each screen is displayed in turn for 10 seconds

> Fast Rate – each screen is displayed in turn for 5 seconds

Press the ▲ key from any *Operating Page* screen to initiate Autoscroll in Slow Rate mode.

Press the ▲ key again to switch to Fast Rate mode.

When in Fast Rate mode, press the ▼ key to switch to Slow Rate mode.

When in Slow Rate mode, press the ▼ key to switch Autoscroll off.

Press the 🖵 key at any time to switch Autoscroll off.

2.3.3 Input (Pen) Channel Display – Separate
The following screens are displayed only if **Pen Ch Display** is set to **Separate** – see Section 3.4, page 20.

```
 Input 1        
-999.99         
🌡 ⬇    deg C
```

Input Channel 1 (Pen 1)

Channel tag.

Measured value.

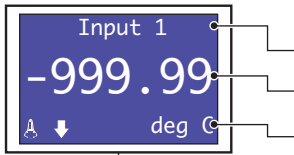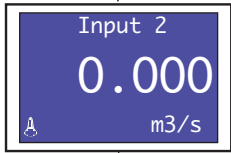Alarm icons and measured value units.

Note. If **Pen 1 Source** is set to **None** (Section 3.14), only a measured value of 0 is displayed.

```
 Input 2        
 0.000          
🌡        m3/s
```

Input Channel 2 (Pen 2)

Note. If **Pen 2 Source** is set to **None** (Section 3.14), only a measured value of 0 is displayed.

```
 Input 1        
-999.99         
🌡 ⬇    deg C
```

Totalizer, Math or Timers software options not enabled by installation of the appropriate software key *and* optional Data Logging hardware not installed – return to top of page.

```
 Totalizer 1    
 000000000      
```

Totalizer software option enabled by installation of the appropriate software key *and* **Totals Display** not set to **Off** (Section 3.4) – see Sections 2.3.6 to 2.3.10.

```
 Data Logging   
 Status: Online 
```

Optional Data Logging hardware installed – see Section 2.3.11, page 15.

```
 System Time    
 Tuesday        
 25th May 2004  
 14:33:48       
```

Optional Data Logging hardware not installed *and* Totalizer software option enabled by installation of the appropriate software key *and* **Totals Display** set to **Off** (Section 3.4) – continued below.

```
 System Time    
  Tuesday       
 25th May 2004  
  14:33:48      
```

System Time/Date Display

Notes.

- Available only if any one of the Totalizer, Math or Timers software options are enabled by installation of the appropriate software key, or the optional Data Logging hardware is installed.

- If **Pen Ch Display** *and* **Totals Display** are set to **Off** (Section 3.4) and any of the above software options are enabled and the optional Data Logging hardware is not installed, the **System Time Display** is the only *Operating Page* screen available.

```
 Input 1        
-999.99         
🌡 ⬇    deg C
```

Return to top of page.

2.3.4 Input (Pen) Channel Display – Dual

The following screens are displayed only if **Pen Ch Display** is set to **Dual** – see Section 3.4, page 20.

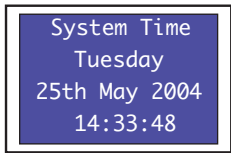|	
Input 1 **0.0** l/s **Input 2** **0.000** m3/s	**Input Channels 1 and 2 (Pens 1 and 2)** Channel tag. Measured value and units. **Note.** If **Pen X Source** (where **X** is the pen number) is set to **None** (Section 3.14), only a measured value of 0 is displayed for that channel.
Input 1 0.0 l/s Input 2 0.000 m3/s	Totalizer, Math or Timers software options not enabled by installation of the appropriate software key **and** optional Data Logging hardware not installed – return to top of page.
Totalizer 1 000000000	Totalizer software option enabled by installation of the appropriate software key **and** **Totals Display** not set to **Off** (Section 3.4) – see Sections 2.3.6 to 2.3.10.
Data Logging Status: Online	Optional Data Logging hardware installed – see Section 2.3.11, page 15.
System Time Tuesday 25th May 2004 14:33:48	Optional Data Logging hardware not installed **and** Totalizer software option enabled by installation of the appropriate software key **and** **Totals Display** set to **Off** (Section 3.4) – see Section 2.3.3, page 10.

2.3.5 Input (Pen) Channel Display – Separate and Dual
The following screens are displayed only if **Pen Ch Display** is set to **Separate & Dual** – see Section 3.4, page 20.
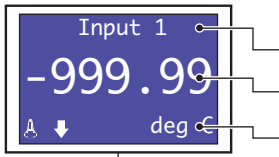
Input Channel 1 (Pen 1)

Channel tag.

Measured value.

Alarm icons and measured value units.

Note. If **Pen 1 Source** is set to **None** (Section 3.14), only a measured value of 0 is displayed.
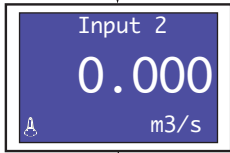
Input Channel 2 (Pen 2)

Note. If **Pen 2 Source** is set to **None** (Section 3.14), only a measured value of 0 is displayed.
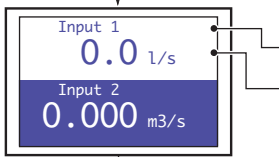
Input Channels 1 and 2 (Pens 1 and 2)

Channel tag.

Measured value and units.

Note. If **Pen X Source** (where **X** is the pen number) is set to **None** (Section 3.14), only a measured value of 0 is displayed for that channel.
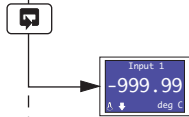
Totalizer, Math or Timers software options not enabled by installation of the appropriate software key **and** optional Data Logging hardware not installed – return to top of page.
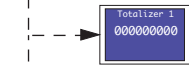
Totalizer software option enabled by installation of the appropriate software key **and** **Totals Display** not set to **Off** (Section 3.4) – see Sections 2.3.6 to 2.3.10.
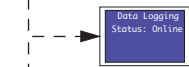
Optional Data Logging hardware installed – see Section 2.3.11, page 15.

Optional Data Logging hardware not installed **and** Totalizer software option enabled by installation of the appropriate software key **and** **Totals Display** set to **Off** (Section 3.4) – see Section 2.3.3, page 10.

2.3.6 Totalizer Display – Separate
The following screens are displayed only if **Totals Display** is set to **Separate** (Section 3.4) *and* **Tot X Source** (where **X** is the totalizer number) is set to anything other than **None** – see Section 3.7, page 35.

Totalizer 1	**Totalizer 1**
000000000	Totalizer tag.
Ml	Totalizer value.
	Totalizer value units.

Totalizer 2	**Totalizer 2**
000000000	
gal	

Data Logging Status: Online — Optional data logging hardware installed – see Section 2.3.11, page 15.

System Time Tuesday 25th May 2004 14:33:48 — Optional data logging hardware not installed – see Section 2.3.3, page 10.
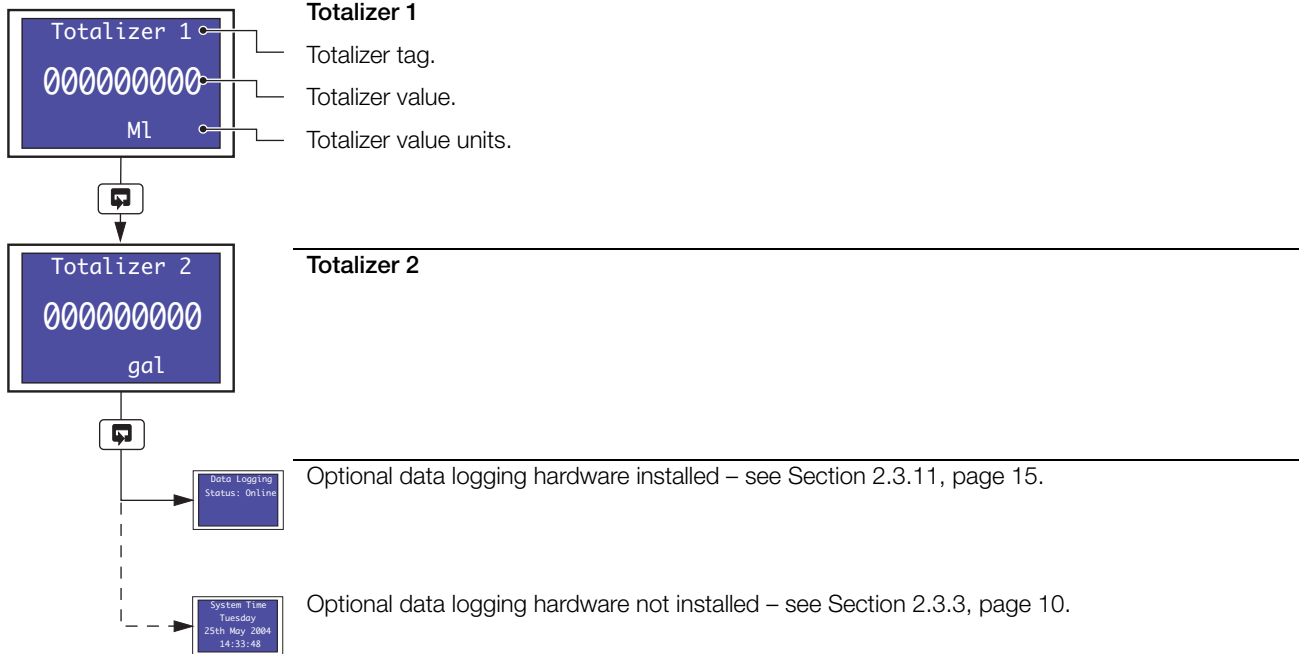
2.3.7 Totalizer Display – Rate with Total
The following screens are displayed only if **Totals Display** is set to **Rate with Total** (Section 3.4) *and* **Tot X Source** (where **X** is the totalizer number) is set to anything other than **None** – see Section 3.7, page 35.

Input 1	**Totalizer 1**
87.6 gal	Channel tag.
000005320	Measured value and measured value units.
gal	Totalizer value.
	Totalizer value units.

Input 2	**Totalizer 2**
856.35 Ml	
000027839	
Ml	

Data Logging Status: Online — Optional data logging hardware installed – see Section 2.3.11, page 15.

System Time Tuesday 25th May 2004 14:33:48 — Optional data logging hardware not installed – see Section 2.3.3, page 10.
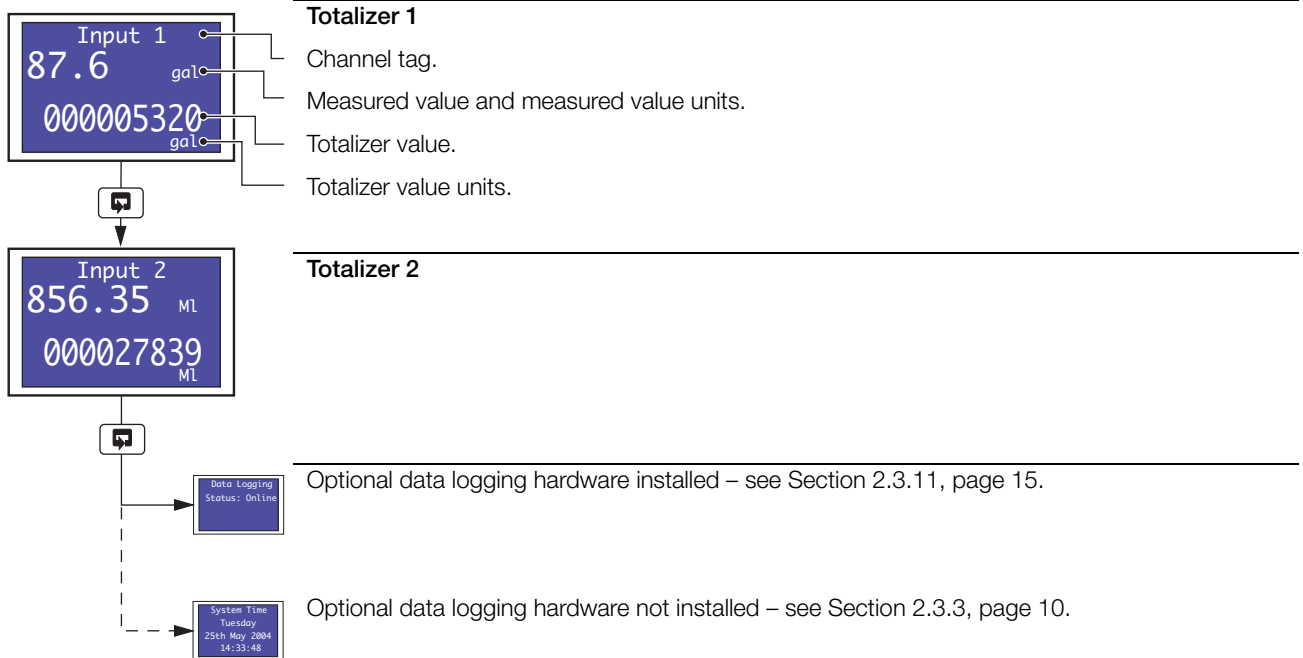
2.3.8 Totalizer Display – Total with Rate
The following screens are displayed only if **Totals Display** is set to **Total with Rate** (Section 3.4) *and* **Tot X Source** (where **X** is the totalizer number) is set to anything other than **None** – see Section 3.7, page 35.

Totalizer 1

Totalizer tag.

Totalizer value.

Totalizer units.

Measured value and measured value units.
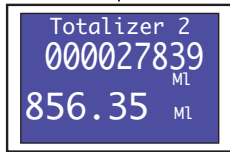
Totalizer 2

Optional data logging hardware installed – see Section 2.3.11, page 15.

Optional data logging hardware not installed – see Section 2.3.3, page 10.

2.3.9 Totalizer Display – Dual Total
The following screen is displayed only if **Totals Display** is set to **Dual Total** (Section 3.4) *and* **Tot X Source** (where **X** is the totalizer number) is set to anything other than **None** – see Section 3.7, page 35.
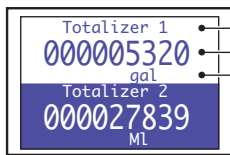
Totalizers 1 and 2

Totalizer tag.

Totalizer value.

Totalizer units.

Optional data logging hardware installed – see Section 2.3.11, page 15.

Optional data logging hardware not installed – see Section 2.3.3, page 10.

2.3.10 Totalizer Display – Dual + Flow Rate

The following screen is displayed only if **Totals Display** is set to **Dual + Flow Rate** (Section 3.4) *and* **Tot X Source** (where **X** is the totalizer number) is set to anything other than **None** – see Section 3.7, page 35.
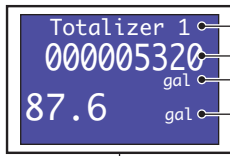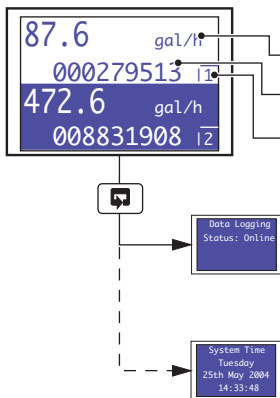
Totalizers 1 and 2

Measured value and measured value units.

Totalizer value.

Totalizer units and channel number.

Optional data logging hardware installed – see Section 2.3.11, below.

Optional data logging hardware not installed – see Section 2.3.3, page 10.

2.3.11 Data Logging
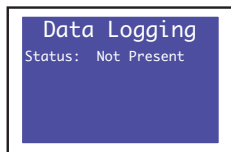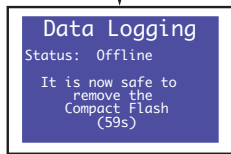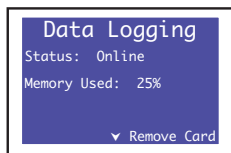
Data Logging Status

Provides information on current data logging status.

Press the ▼ key to place data logging off-line.

When data logging is off-line, the Compact Flash card can be removed safely.

If the card is not removed within 1 minute, data logging is placed on-line automatically. A timer indicates the number of seconds remaining before data logging resumes.

This screen is displayed when a Compact Flash card is not inserted.

Data logging starts automatically when a Compact Flash card is inserted.

see Section 2.3.3, page 10.

2.4 Totalizer Log

Note.

- The totalizer log is available only if the totalizer software option is enabled by installation of the appropriate software key.

- The recorder can store up to 21 log entries for each enabled totalizer. When the maximum number of entries has been reached, the oldest data is overwritten by the newest.

- A new log entry is created for each totalizer at the interval selected in the **Tot X Log Enable** parameter (where **X** is the totalizer number) – see Section 3.7, page 35.

```
Operating Level
  Totalizer Log
 Totalizer Control
  Alarm Setpoints
  Security Code
     Common
     Channels
      Alarms
```
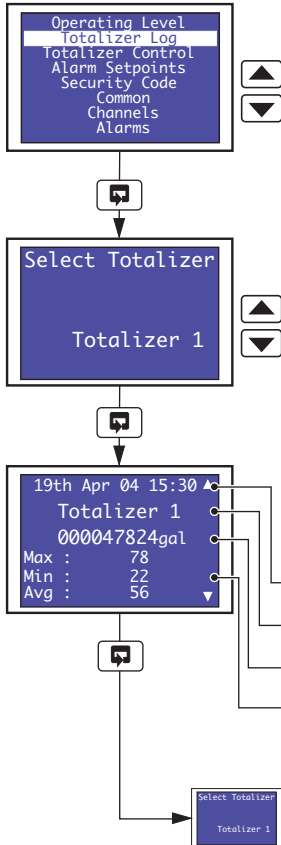
Press the 🔳 key to open the **Main Menu**.

Highlight **Totalizer Log**.

```
Select Totalizer



   Totalizer 1
```

Select Totalizer

Select the totalizer log to display.

```
19th Apr 04 15:30 ▲
    Totalizer 1
   000047824gal
Max :    78
Min :    22
Avg :    56      ▼
```

Totalizer Log

The first log displayed for the selected totalizer is the most recent. Use the ▼ key to display each log in descending date order.

Date and time.

Totalizer tag.

Current value and units.

Maximum, minimum and average values.

Note. If no log entries exist, `Log is empty` is shown on the display screen.

Return to top of page.

2.5 Totalizer Control

> **Note.** Totalizer control is available only if the totalizer software option is enabled by installation of the appropriate software key *and* **Totalizer Reset** is set to **YES** – see Section 3.4, page 20.

Operating Level Totalizer Log **Totalizer Control** Alarm Setpoints Security Code Common Channels Alarms	Press the ▣ key to open the **Main Menu**. Highlight **Totalizer Control**.
Select Totalizer Totalizer 1	**Select Totalizer** Select the totalizer to reset.
Totalizer 1 Reset - NO 000000913	**Reset Totalizer** Select **YES** to reset the totalizer.
Totalizer 1 Confirm - NO 000000913	**Confirm Reset Totalizer** Select **YES** to reset the totalizer. **Note.** If **YES** is selected, the totalizer is reset when the ▣ key is pressed.
Totalizer 1 Reset - NO 000000913	Return to previous frame.

2.6 Alarm Set Point Adjustment

> **Note.** Alarm set point adjustment is available only if **Alarm Adjust** is set to **YES** – see Section 3.4, page 20.
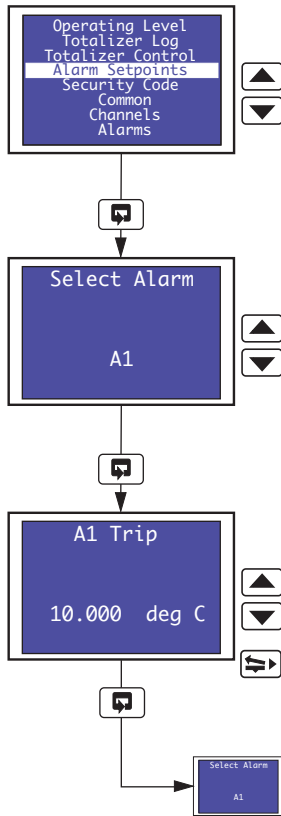
Operating Level / Totalizer Log / Totalizer Control / **Alarm Setpoints** / Security Code / Common / Channels / Alarms	Press the 🔲 key to open the **Main Menu**. Highlight **Alarm Adjust**.
Select Alarm A1	**Select Alarm** Select the alarm to adjust.
A1 Trip 10.000 deg C	**Alarm Set Point** Adjust the alarm set point.
Select Alarm A1	Return to top of page.

3 Configuration

3.1 Introduction
The configuration procedures are used to make changes to the operating parameter values and for scale adjustment. Configuration of all channels is performed from faceplate 1.

The configuration settings can be backed up to a PC and restored to the recorder as required – see Section 3.16, page 57.

An overview of the **Configuration Pages** is on the rear cover fold-out.

When changing the input type, it may be necessary to reposition the input selector links accordingly – see Section 5.2.1, page 66.

3.2 Preparation for Configuration

Note.

■ Isolate any external alarm/control circuits if inadvertent operation during configuration is undesirable.

■ The recorder responds instantly to parameter changes. These are saved automatically when either the 🖵 or 🗐 key is pressed.

■ The display screen of faceplate 2 (if fitted) shows `Configuration Mode` when the configuration pages are accessed by scrolling past **Security Code** in the Main Menu on the display screen of faceplate 1.

3.3 Configuration Level Security
Unauthorized access to the configuration pages is prevented by the use of a security code.

The security code, set to '0' when the recorder is despatched, can be set to any value from 0 to 9999 – see **Configure Password** in Section 3.4 on pgae 20. When set to anything other than '0', access to all configuration menus (i.e. all menus below **Security Code**) is prevented. Enter the correct code to enable access to the configuration menus.
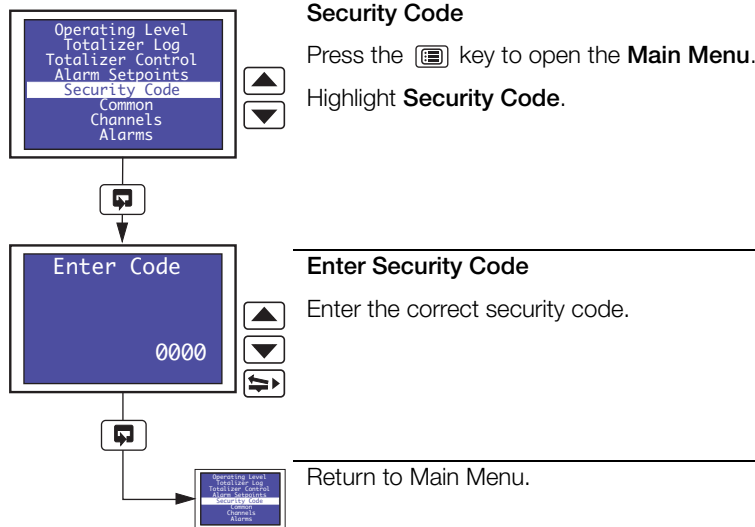
Security Code

Press the 🗐 key to open the **Main Menu**.

Highlight **Security Code**.

Enter Security Code

Enter the correct security code.

Return to Main Menu.

3.4 Common Configuration
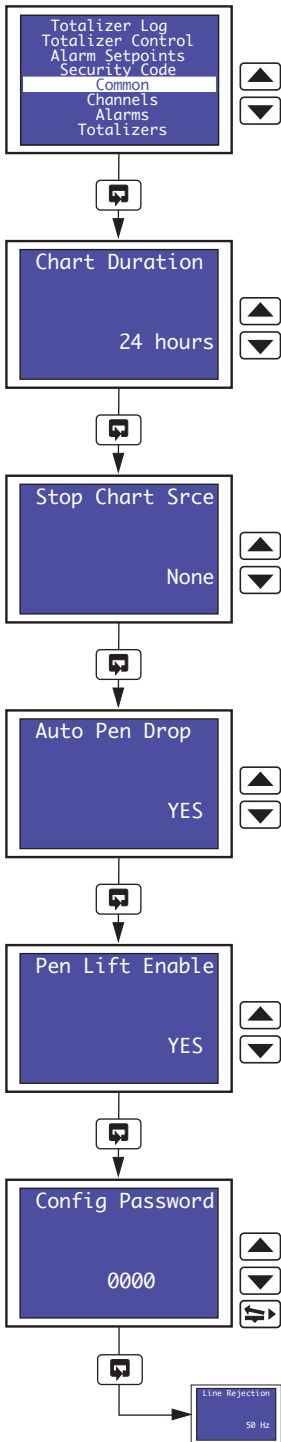
Totalizer Log Totalizer Control Alarm Setpoints Security Code **Common** Channels Alarms Totalizers	**Common Configuration** Press the ▦ key to open the **Main Menu**. Highlight **Common**.

Chart Duration 24 hours	**Chart Duration** Select the chart duration required per revolution of the chart: between 1 and 167 hours in 1 hour increments between 7 and 32 days in 1 day increments

Stop Chart Srce None	**Stop Chart Source** Select the source required for stopping the chart. Refer to Appendix A on page 76 for a description of sources.

Auto Pen Drop YES	**Auto Pen Drop** Select **YES** to enable the pen(s) to drop automatically onto the chart 5 minutes after they are lifted. If **NO** is selected, the pen(s) remain lifted until they are dropped manually by the operator.

Pen Lift Enable YES	**Pen Lift Enable** Select **YES** to enable the pen(s) to be raised and lowered using the pen lift key (⮀).

Config Password 0000	**Configure Password** Select a code between 1 and 9999.

Line Rejection 50 Hz	Continued on next page.

```
Line Rejection


       50 Hz
```
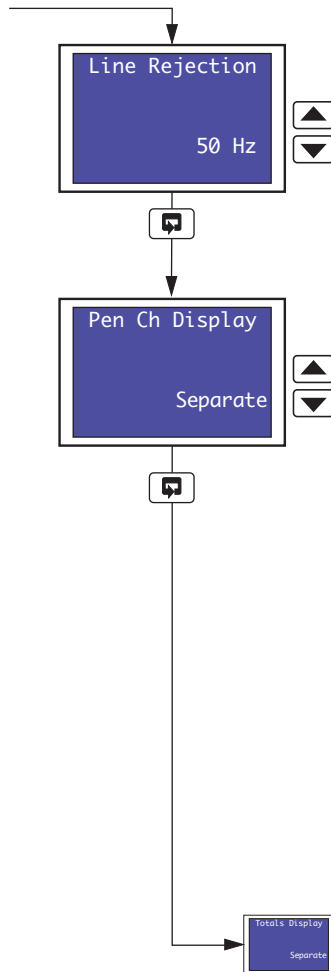
Line Rejection

Select the frequency of the mains supply to ensure maximum noise rejection on analog inputs.

```
Pen Ch Display


       Separate
```

Pen Channel Display

Select the style of input (pen) channel display required in the *Operating Page* – see Sections 2.3.3 to 2.3.5.

Off	– input channel information is not displayed in the *Operating Page*
Separate	– input channel information for channels 1 and 2 is shown separately on display screen 1. Input channel information for channels 3 and 4 (3 and 4 pen recorders only) is shown separately on display screen 2 – see Section 2.3.3, page 10
Dual	– input channel information for channels 1 and 2 is shown simultaneously on display screen 1. Input channel information for channels 3 and 4 (3 and 4 pen recorders only) is shown simultaneously on display screen 2 – see Section 2.3.4, page 11
Separate & Dual	– input channel information for channels 1 and 2 is first shown separately, then simultaneously on display screen 1. Input channel information for channels 3 and 4 (3 and 4 pen recorders only) is first shown separately, then simultaneously on display screen 2 – see Section 2.3.5, page 12

```
Totals Display

   Separate
```

Continued on next page.

Totals Display

Separate
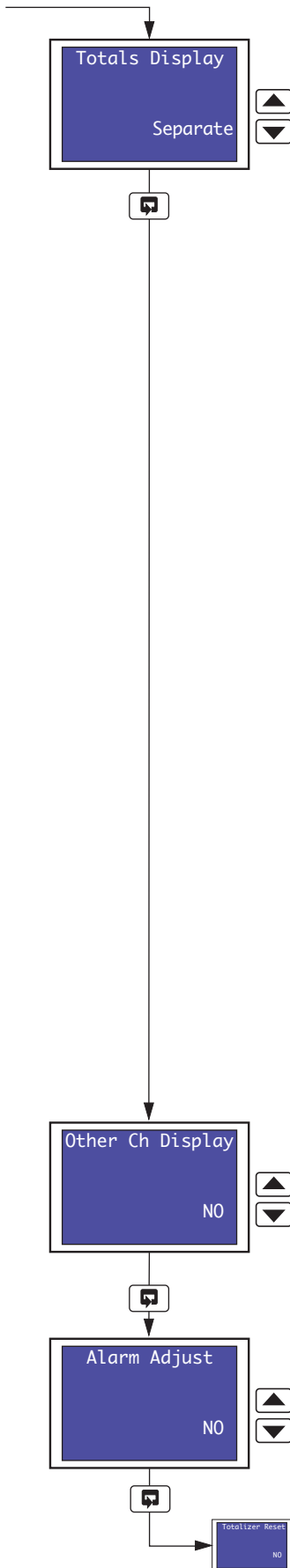
Totalizers Display

Note. Displayed only if the totalizer software option is enabled by installation of the appropriate software key.

Select the style of totalizer display required in the *Operating Page* – see Sections 2.3.6 to 2.3.10.

Off	– totalizer values are not displayed in the *Operating Page*
Separate	– totalizer values for totalizers assigned to channels 1 and 2 are shown separately on display screen 1. Totalizer values for totalizers assigned to channels 3 and 4 (3 and 4 pen recorders only) are shown separately on display screen 2 – see Section 2.3.6, page 13
Rate with Total	– totalizer values for totalizers assigned to channels 1 and 2, together with the current measured values for channels 1 and 2, are shown separately on display screen 1. Totalizer values for totalizers assigned to channels 3 and 4 (3 and 4 pen recorders only), together with the current measured values for channels 3 and 4, are shown separately on display screen 2 – see Section 2.3.7, page 13
Total with Rate	– the current measured values for channels 1 and 2, together with totalizer values for totalizers assigned to channels 1 and 2, are shown separately on display screen 1. The current measured values for channels 3 and 4 (3 and 4 pen recorders only), together with totalizer values for totalizers assigned to channels 3 and 4, are shown separately on display screen 2 – see Section 2.3.8, page 14
Dual Total	– totalizer values for totalizers assigned to channels 1 and 2 are shown simultaneously on display screen 1. Totalizer values for totalizers assigned to channels 3 and 4 (3 and 4 pen recorders only) are shown simultaneously on display screen 2 – see Section 2.3.9, page 14
Dual + Flow Rate	– totalizer values for totalizers assigned to channels 1 and 2, together with the current measured values for channels 1 and 2, are shown simultaneously on display screen 1. Totalizer values for totalizers assigned to channels 3 and 4 (3 and 4 pen recorders only), together with the current measured values for channels 3 and 4, are shown simultaneously on display screen 2 – see Section 2.3.10, page 15

Note. Do not select Dual + Flow Rate if a totalizer is not assigned to each of the channels to be displayed – see Section 3.7, page 35.

Other Ch Display

NO

Other Channels Display

Select **YES** to display information for input channels not assigned to pens.

Alarm Adjust

NO

Alarm Adjust

Select **YES** to enable alarm set point adjustment in the *Operating Page* – see Section 2.6, page 18.

Totalizer Reset

NO

Continued on next page.

Totalizer Reset

Note. Displayed only if the totalizer software option is enabled by installation of the appropriate software key.

Select **YES** to enable the totalizers to be reset in the *Operating Page* – see Section 2.5, page 17.

Contrast 1

Select the required contrast setting for display screen 1, between 0 and 100%.

Contrast 2

Note. Shown only if faceplate 2 is fitted.

Select the required contrast setting for display screen 2, between 0 and 100%.

Brightness 1

Select the required brightness setting for display screen 1, between 0 and 100%.

Brightness 2

Note. Shown only if faceplate 2 is fitted.

Select the required brightness setting for display screen 2, between 0 and 100%.

Return to top of page.

3.5 Channels Configuration
Overview.

- **Universal inputs** – mV, mA, V, THC, RTD and resistance.
- **Internal cold junction compensation**.
- **Linearization** – enables use of non-linearizing temperature transmitters or any electrical input.
- **Programmable fault levels and actions**.
- **Digital filter** – reduces the effect of noise on inputs.

Example A – setting up:

- a current input of 4 to 20mA
- displaying a range of 0 to 200psi
- a fault detection level 10% above 200psi (engineering/display range) and 10% below 0psi (engineering/display range)
- in the event of a fault being detected and/or the fault detection level being exceeded, the process variable is driven downscale.
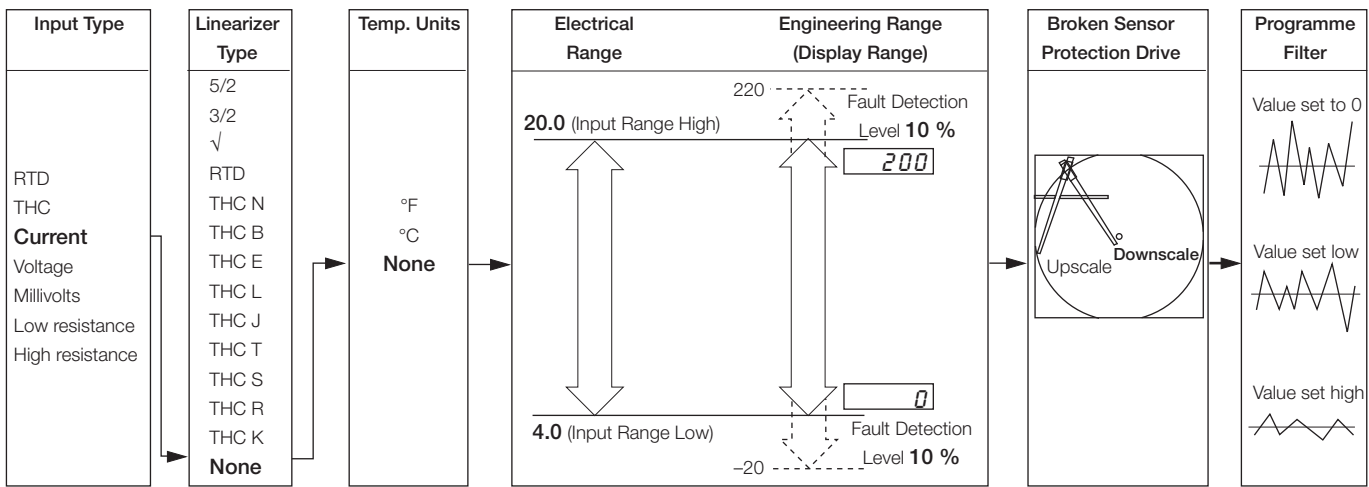
Example B – setting up:

- a Type K thermocouple
- displaying temperature in °F
- displaying a range of 0 to 2000°F
- a fault detection level 10% above 2000°F (engineering/display range) and 10% below 0°F (engineering/display range)
- in the event of a fault being detected and/or the fault detection level being exceeded, the process variable is driven upscale.

Totalizer Control
Alarm Setpoints
Security Code
Common
Channels
Alarms
Totalizers
Relays
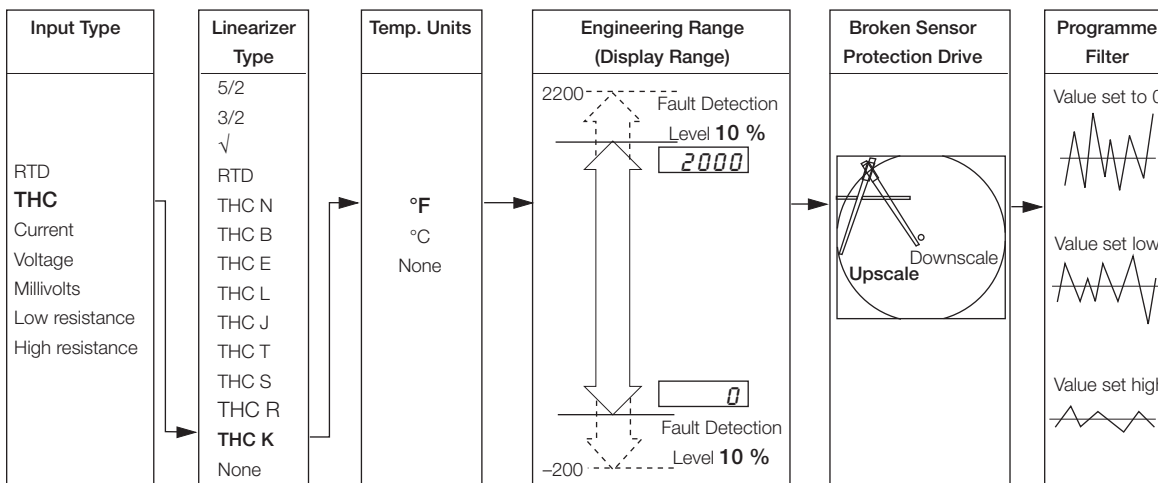
Channels Configuration

Press the ▣ key to open the **Main Menu**.

Highlight **Channels**.

Select Channel

Pen 1

Select Channel

Select the channel to configure.

Note. If **Pen X Function** or **Pen X Source** (where **X** is the pen number) is set to **Off** or **None** respectively (Section 3.14), that pen cannot be selected.

Pen 1 Tag

Input 1
Edit>

Pen X Function set to **Trend** (Section 3.14) – continued on next page.

Pen 1 Off Tag

Pen 1 Event Off
Edit>

Pen X Function set to **Event** (Section 3.14) – continued on page 30.

Pen X Function
set to **Trend**
(Section 3.13)

```
Pen 1 Tag


Input 1
        Edit>
```

Channel Tag

Press the ⇥ key to open the Edit screen.

Use the ▲ , ▼ and ⇥ keys to enter the channel tag required – see Fig. 2.1 on page 6.

Note. Any characters not permitted in this tag are skipped when scrolling through the selection.

Press the ▣ key to close the edit screen and save the tag.

```
Pen 1 Input Type


High Ohm
```

Channel Input Type

Select the required channel input type:

None	–	None
Millivolt	–	Millivolt (≤150mV)
Milliamp	–	Current
High Ohm	–	High resistance (>750Ω)
Low Ohm	–	Low resistance (≤750Ω)
Volts	–	Voltage
Thermocouple	–	Thermocouple
Rtd	–	Resistance thermometer

None

```
Select Channel

        Pen 1
```

Return to top of page.

Millivolt
Milliamp
High Ohm
Low Ohm
Volts
Thermocouple
Rtd

```
Pen 1 Lin. Type


Type K
```

Linearizer Type

Select the required linearizer type.

None	–	No linearizer
Type K	–	Type K thermocouple
Type R	–	Type R thermocouple
Type S	–	Type S thermocouple
Type T	–	Type T thermocouple
Type J	–	Type J thermocouple
Type E	–	Type E thermocouple
Type N	–	Type N thermocouple
Type B	–	Type B thermocouple
Rtd	–	Resistance thermometer
Square Root	–	Square root
3/2	–	$X^{3/2}$ (Open channel flow applications)
5/2	–	$X^{5/2}$ (Open channel flow applications)

```
Pen 1 Units

101   mV
```

Continued on next page.

Pen 1 Units

101   mV
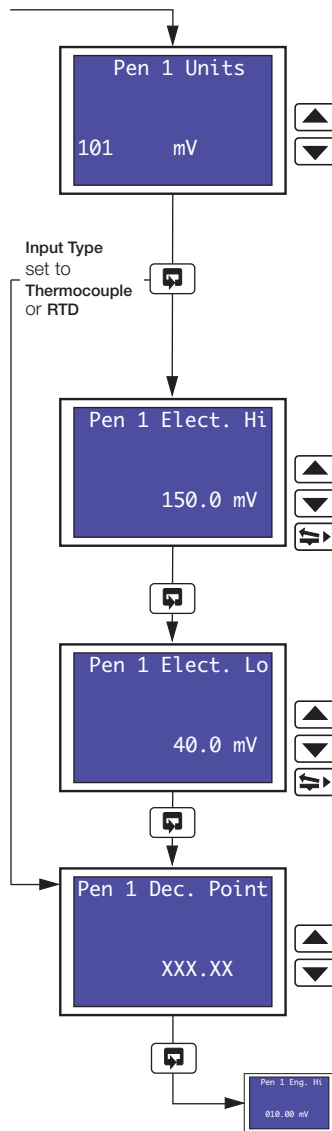
Channel Units

Select any of the units pre-programmed into the recorder or select **113 Custom** and the ▲,
▼ and ⮂ keys to enter the units required – see Fig. 2.1 on page 6.

Notes.

- Any characters not permitted in user-defined units are skipped when scrolling through the selection.

- Refer to Appendix B on page 77 for a description of the units pre-programmed into the recorder.

Input Type
set to
Thermocouple
or **RTD**

Pen 1 Elect. Hi

150.0 mV

Electrical Input Range High

Set the maximum electrical input value required, within the limits shown in Table 3.1.

Pen 1 Elect. Lo

40.0 mV

Electrical Input Range Low

Set the minimum electrical input value required, within the limits shown in Table 3.1.

Pen 1 Dec. Point

XXX.XX

Decimal Point

Select the decimal point position for the engineering and chart ranges.

Pen 1 Eng. Hi

010.00 mV

Continued on next page.

Input Type	Electrical Range Low	Electrical Range High	Minimum Span (Low to High)
Millivolts	0	150	5.0
Milliamps	0	50	1.0
Resistance (High)	0	9999	400
Resistance (Low)	0	750	20
Volts	0	5	0.1

Table 3.1 Limits of Electrical Ranges

```
Pen 1 Eng. Hi

010.00 mV
```
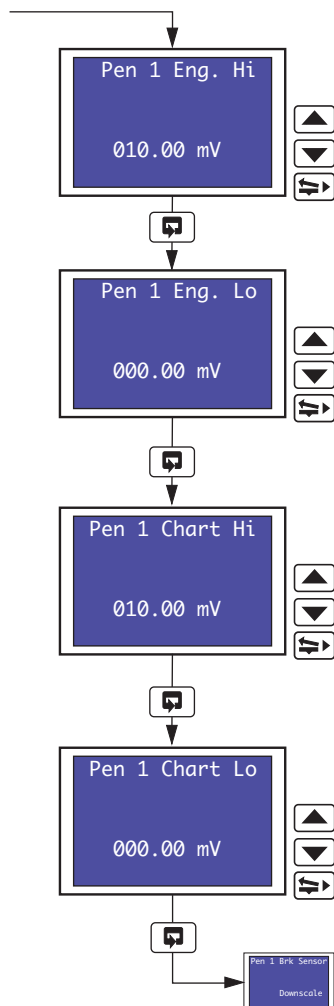
Engineering Range High

Set the maximum engineering value required, within the limits shown in Table 3.2.

```
Pen 1 Eng. Lo

000.00 mV
```

Engineering Range Low

Set the minimum engineering value required, within the limits shown in Table 3.2.

```
Pen 1 Chart Hi

010.00 mV
```

Chart Range High

Set the maximum value, in engineering units, required on the chart.

Note. If the **Engineering Range High** setting is changed, the **Chart Range High** setting is reset automatically to the same value.

```
Pen 1 Chart Lo

000.00 mV
```

Chart Range Low

Set the minimum value, in engineering units, required on the chart.

Note. If the **Engineering Range Low** setting is changed, the **Chart Range Low** setting is reset automatically to the same value.

```
Pen 1 Brk Sensor

Downscale
```

Linearizer Type	Degrees Celsius			Degrees Fahrenheit		
	Minimum	Maximum	Minimum Span	Minimum	Maximum	Minimum Span
Type K	−100	1300	65	−148	2372	117
Types R & S	−18	1700	320	0	3092	576
Type T	−250	300	60	−418	572	108
Type J	−100	900	50	−148	1652	90
Type E	−100	900	45	−148	1652	81
Type N	−200	1300	90	−328	2372	162
Type B	−18	1800	710	0	3272	1278
Rtd	−200	600	25	−328	1112	45

Performance accuracy is not guaranteed below 400°C (725°F) for types B, R and S thermocouples.

Minimum span below zero for Type T thermocouples is 70°C (126°F).

Minimum span below zero for Type N thermocouples is 105°C (189°F).

THC standard DIN 4730 IEC 584.

RTD standard DIN 43760 IEC 751.

Linearizer Type	Engineering Range High and Low	
	Minimum	Maximum
Square Root	−999	9999
3/2		
5/2		
None		

Table 3.2 Limits of Engineering Ranges

Pen 1 Brk Sensor
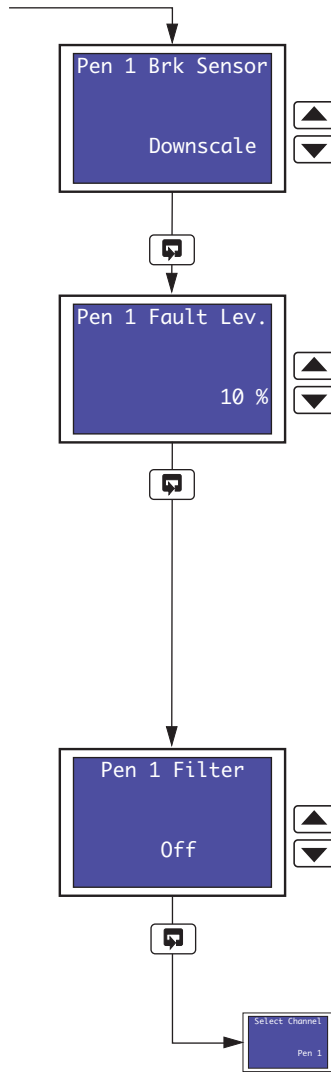
Downscale

Broken Sensor Protection Drive

In the event of an input failure, the process variable is driven in the direction selected:

Downscale – Process variable driven below zero

None – Process variable driven in direction of failure

Upscale – Process variable driven beyond full scale

Pen 1 Fault Lev.

10 %

Fault Detection Level Percentage

Set a tolerance level, between 0 and 100% of the engineering range, to allow for deviation of the input signal above or below the input span before an input failure is detected.

Example – setting the fault detection level to 10% on input range of 50 (**Engineering Range Low**) to 250 (**Engineering Range High**) bar causes an analog input failure fault to be detected below 30 bar and above 270 bar.

Notes.

- On some ranges the input circuitry may saturate before the fault level setting is reached. In this case, an error is detected below the level set.

- If an input exceeds the minimum or maximum value for the selected linearizer, an error is detected regardless of the fault level setting.

Pen 1 Filter

Off

Pen Filter

Filters the process variable input, i.e. if the input is stepped it smooths the transition between steps and may also be used for some degree of cleaning of noisy inputs. The filter time represents the time a step in the input takes to change the displayed process variable from 10 to 90% of the step.

Set the value required, between Off and 60 seconds in 1 second increments.

Select Channel

Pen 1

Return to top of page.

Pen X Function
set to **Event**
(Section 3.13)

```
Pen 1 Off Tag


Pen 1 Event Off
          Edit>
```

▲ ▼ ⇥
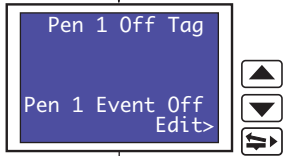
Pen Off Tag

Press the ⇥ key to open the Edit screen.

Use the ▲, ▼ and ⇥ keys to enter the pen off tag required – see Fig. 2.1 on page 6.

Note. Any characters not permitted in this tag are skipped when scrolling through the selection.

Press the ↵ key to close the edit screen and save the tag.

```
Pen 1 In Tag


Pen 1 Event In
          Edit>
```

▲ ▼ ⇥
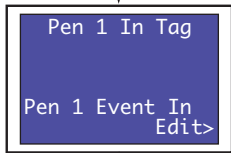
Pen In Tag

Press the ⇥ key to open the Edit screen.

Use the ▲, ▼ and ⇥ keys to enter the pen in tag required – see Fig. 2.1 on page 6.

Note. Any characters not permitted in this tag are skipped when scrolling through the selection.

Press the ↵ key to close the edit screen and save the tag.

```
Pen 1 Out Tag


Pen 1 Event Out
          Edit>
```

▲ ▼ ⇥
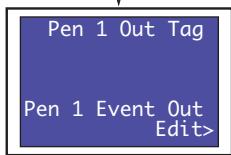
Pen Out Tag

Press the ⇥ key to open the Edit screen.

Use the ▲, ▼ and ⇥ keys to enter the pen out tag required – see Fig. 2.1 on page 6.

Note. Any characters not permitted in this tag are skipped when scrolling through the selection.

Press the ↵ key to close the edit screen and save the tag.

```
Pen 1 In Source


           None
```

▲ ▼
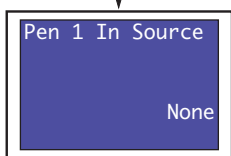
Pen In Source

Select a digital source to move the pen inwards on the chart.

Refer to Appendix A on page 76 for a description of sources.

```
Pen 1 Out Source


           None
```

▲ ▼
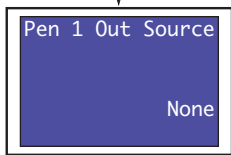
Pen Out Source

Select a digital source to move the pen outwards on the chart.

Refer to Appendix A on page 76 for a description of sources.

```
Select Channel

     Pen 1
```

Return to top of page.

3.6 Alarms Configuration
Overview.

- **Four alarms per channel** – identified A1 to D1 (for channel 1) up to A4 to D4 (for channel 4).

- **High/Low process alarms**.

- **Fast/Slow rate alarms**.

- **Adjustable hysteresis value** – prevents oscillation of alarm state.

- **Time hysteresis** – enables delayed triggering of alarms.
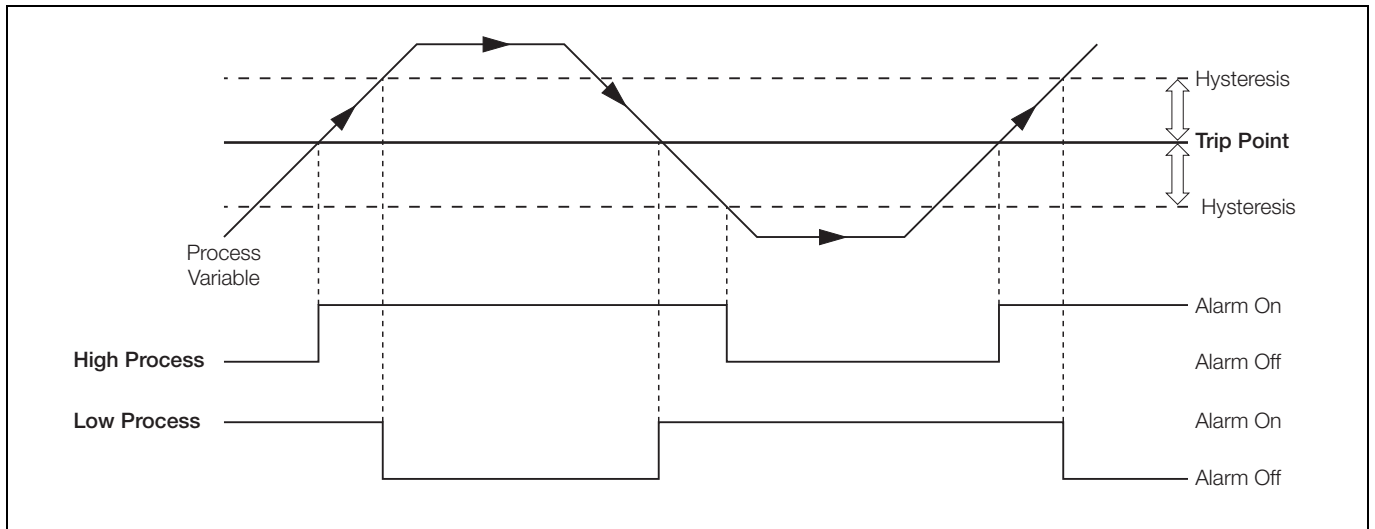
Fig. 3.1 High and Low Process Alarm with Hysteresis
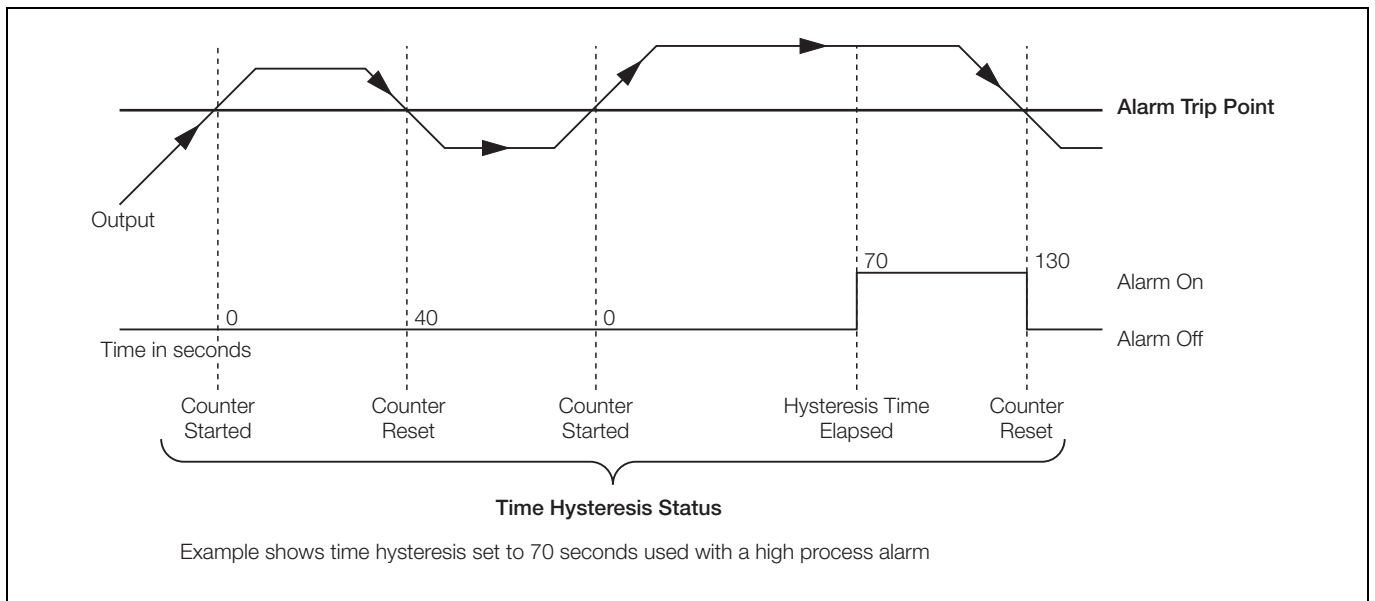
Fig. 3.2 Time Hysteresis Alarm

The maximum time it takes to detect an alarm condition is present (T), in seconds, is calculated as follows:

$$T = \left[10.81 + \frac{1800}{\text{Trip Value}} \right] \times 2$$

The time it takes for the alarm state to be cleared once the alarm condition has been removed is also equal to T.

Examples shown are for a trip value of 10%/hour on a PV engineering range of 0.0 to 100.0

$$T = \left[10.81 + \frac{1800}{10} \right] \times 2 \qquad T = 382 \text{ seconds}$$
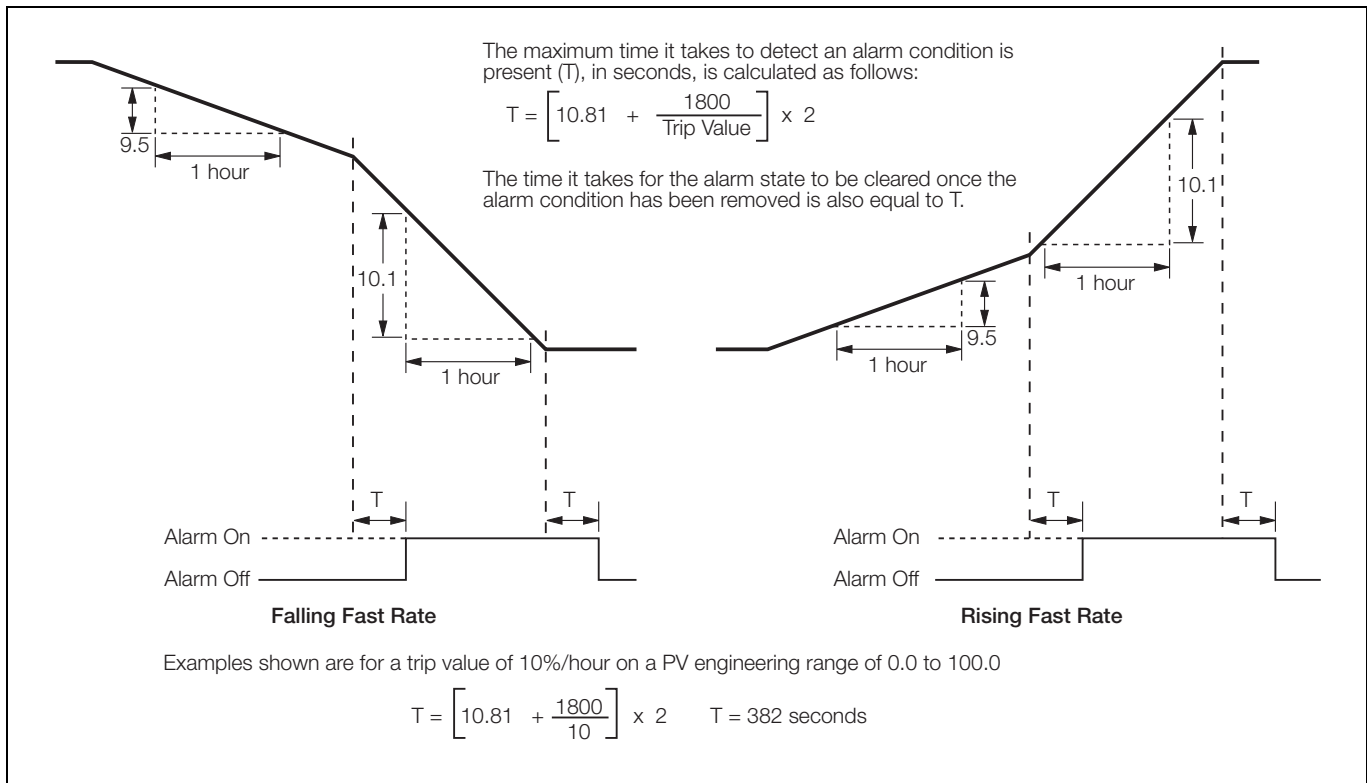
Fig. 3.3 Fast Rate Alarms with Hysteresis

The maximum time it takes to detect an alarm condition is present (T), in seconds, is calculated as follows:

$$T = \left[10.81 + \frac{1800}{\text{Trip Value}} \right] \times 2$$

The time it takes for the alarm state to be cleared once the alarm condition has been removed is also equal to T.

Examples shown are for a trip value of 10%/hour on a PV engineering range of 0.0 to 100.0

$$T = \left[10.81 + \frac{1800}{10} \right] \times 2 \qquad T = 382 \text{ seconds}$$
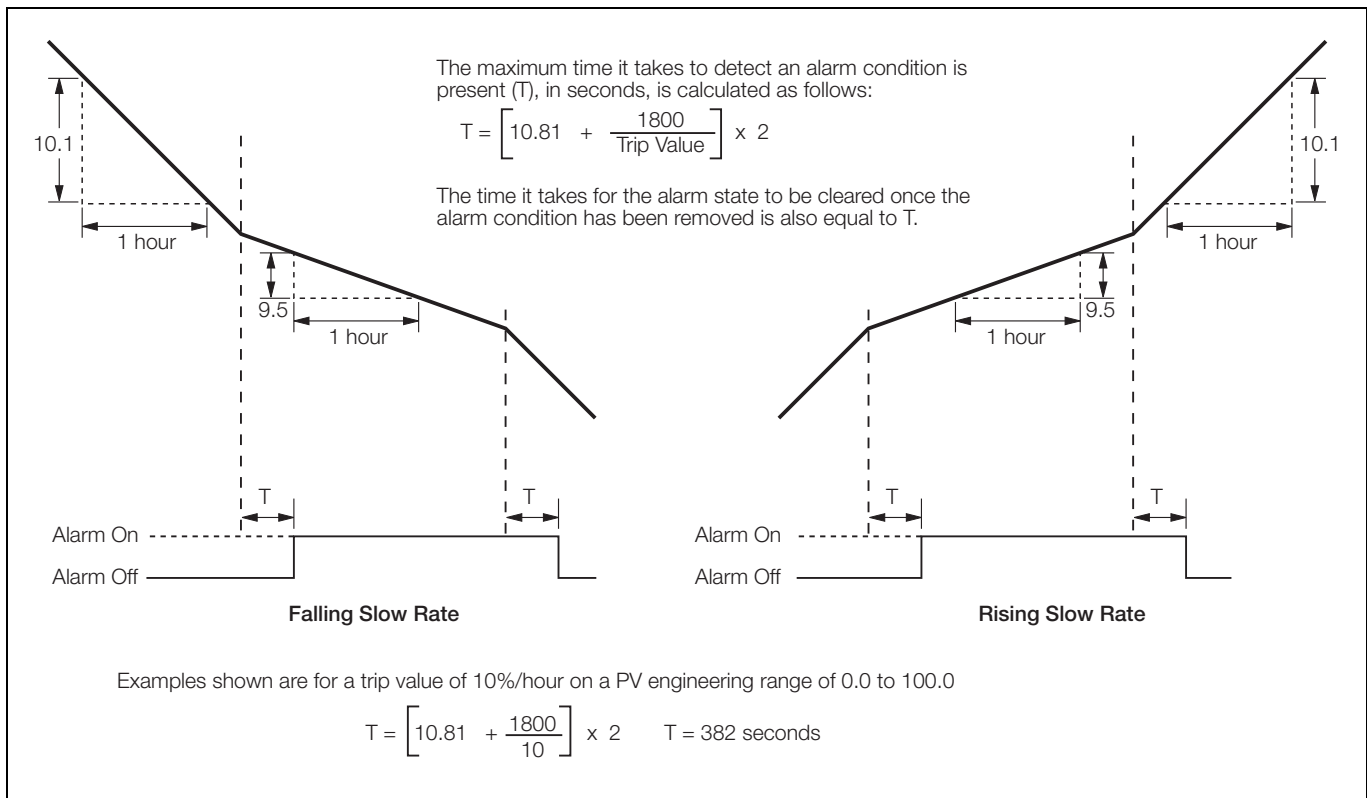
Fig. 3.4 Slow Rate Alarms with Hysteresis

```
Alarm Setpoints
 Security Code
    Common
   Channels
    Alarms
  Totalizers
    Relays
  Digital I/O
```
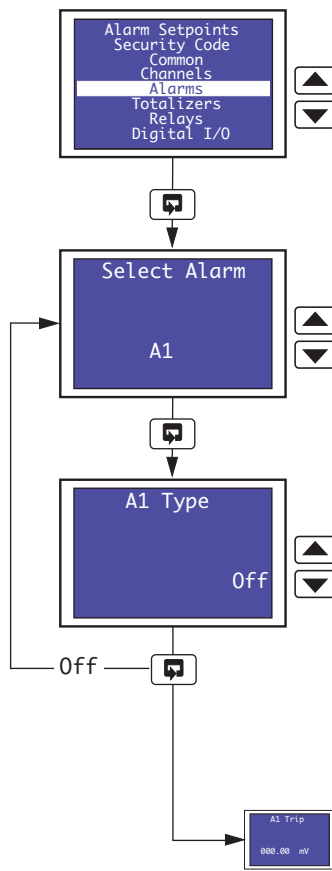
Alarms Configuration

Press the ▤ key to open the **Main Menu**.

Highlight **Alarms**.

```
Select Alarm


    A1
```

Select Alarm

Select the alarm to be configured.

```
A1 Type



        Off
```

Off ──

Alarm Type

Select the alarm type required:

Off	– No alarm
High Process	– See Fig. 3.1 on page 31
Low Process	– See Fig. 3.1 on page 31
Fast Rate	– See Fig. 3.3 on page 32
Slow Rate	– See Fig. 3.4 on page 32

```
A1 Trip

000.00  mV
```

A1 Trip

000.00 mV
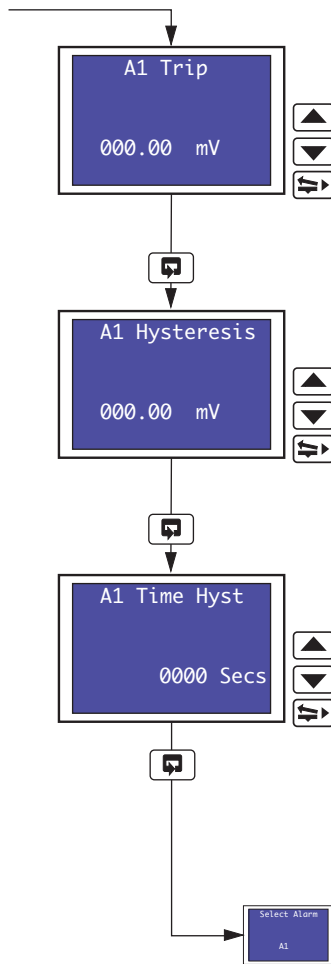
Trip Level

Set the value at which the alarm is to activate.

For High and Low Process alarms, the value is set in engineering units.

For Fast and Slow Rate alarms, the trip level is set as a percentage of the engineering span (engineering range high – engineering range low) per hour, between 500 and 500% in 0.1% increments.

A1 Hysteresis

000.00 mV

Hysteresis

Set the hysteresis value, either in engineering units (High and Low Process alarms) or as a percentage of the engineering span (Fast and Slow Rate alarms).

Hysteresis is operational only when the alarm is active. The alarm is activated at the trip level but is de-activated only after the alarm variable has moved into the safe region by an amount equal to the hysteresis value. For rate alarms this setting is a percentage of the trip level.

A1 Time Hyst

0000 Secs

Time Hysteresis

Set the time hysteresis value required, between 0 and 9999 seconds.

If a **Time Hysteresis** value is set, the alarm becomes active only when the alarm condition is present continuously for the time set.

If a **Hysteresis** value is also set (see above) and an alarm is activated, the alarm remains active until the process variable moves outside the hysteresis band. When the alarm condition no longer exists the alarm becomes inactive immediately, i.e. time hysteresis does not affect turning off of alarm states.

Select Alarm
A1

Return to top of page.

3.7 Totalizer Configuration
Overview.

- **Up to four, 9-digit totalizers** – assignable to any pen, analog input or math block (if math software option enabled by installation of the appropriate software key).

- **Count up or count down**.

- **Automatic count rate calculation** – wherever possible, the recorder calculates the count rate automatically according to source units, totalizer units and engineering range, from 0.0001 to 99.9999 counts/second.

- **External counter pulse** – can be used to energize relays or digital outputs (a maximum of 4 pulses per second are generated).

- **Wrap function** – with external wrap pulse used to energize relays or digital outputs.

- **Programmable preset and predetermined count values** – for (batch) flow total.

- **Adjustable cut-off values**.

- **Operator level reset and stop/go**.

- **Digital signal reset and stop/go**.

When enabled by installation of the appropriate software key, the totalizer software provides indication and recording of flow rates from input signals with linear, square law or power law characteristics. Totalization is available for each channel and can be switched on or off as required.

The flow total for any channel can be viewed on the same display screen as the input (pen) channel to which it is assigned. The flow total can also be reset using the control keys on the associated faceplate. An additional internal 'Secure' total is also provided that can be reset only in the Totalizer Configuration level.

External counters with their own power supplies can be driven using 4 relay and digital output module options.

Count Rate

Totalizers are normally used in flow applications and their purpose is to summate the volume of process fluid passing the point of measurement. Totalizers have no relationship to time and continue to count up or down (dependant on setting) until instructed to reset. A trip meter on a typical family car is an example of a basic totalizer – the meter counts and displays the distance travelled by the vehicle until reset by the driver. In this example, the speedometer and trip meter read in the same unit of distance.

Flow totalization is more complex than that of a trip meter. In flow totalization, the flow recorder typically measures the instantaneous value in one flow unit whilst the totalizer counts in a larger flow unit. When configuring a totalizer, a count rate must be calculated and entered to compensate for the difference between the totalized measurement unit and the instantaneous measurement unit.

Where possible, the recorder calculates automatically the count rate for the most popular measurement units, e.g. gallons, cubic feet, liters and cubic meters. When configuring a totalizer, first ensure that the unit of measurement (**Channel Units**) selected for the channel to which the totalizer is assigned is a volumetric unit (i.e. quantity per unit of time, for example gallons per hour) – see Section 3.5, page 24. Finally, enter the required Totalizer unit of measurement. If the recorder holds the relationship data between the selected measurement and totalizer units, '**Automatic**' is displayed under the count rate to indicate that it has been set automatically. If the relationship data is not in the recorder's look-up table, '**Manual**' is displayed and the count rate must be set manually – see next page.

Calculating The Count Rate Manually

The count rate determines how many units the totalizer increments per second when the flow input signal is at 100%. To calculate this parameter manually, follow the procedure below:

1. **Calculate the volume relationship**

   Typically the unit of measure used by the totalizer is larger than that used for displaying the instantaneous flow-rate. Use standard conversion tables to calculate how many times the flow units used for the input will fit into the desired totalizer unit.

   Example: Measurement channel units is set to gallons/minute. Instantaneous process flow-rate (engineering range) is 0-300 imperial gallons/minute, totalizer is required to increment in cubic feet. From standard conversion tables, 1 cubic foot = 6.229 imperial gallons.

2. **Calculate the unit time**

   Ensuring that the time-base of the instantaneous flow-rate is used, the following equation determines how many seconds it will take at full scale flow for a single totalizer unit to pass the measurement point:

   $$\frac{\text{Volume relationship}}{\text{Full scale flow}} \times \text{number of seconds in time-base} = \text{Seconds to pass one totalizer unit}$$

   Example:

   $$\frac{6.229 \text{ (imperial gallons in } 1ft^3)}{300 \text{ (imperial gallons max. flow rate)}} \times 60 \text{ (seconds in 1 minute)} = 1.2458 \text{ seconds to pass } 1ft^3$$

3. **Calculate the count rate**

   The totalizer count rate is the reciprocal of the result of the calculation above:

   $$\frac{1}{\text{Seconds to pass 1 totalizer unit}} = \text{Totalizer count rate}$$

   Example:

   $$\frac{1}{1.2458} = 0.803$$

Note. Totalizer configuration is available only if the totalizer software option is enabled by installation of the appropriate software key.

Totalizers Configuration

Press the ▤ key to open the **Main Menu**.

Highlight **Totalizers**.

Security Code
Common
Channels
Alarms
Totalizers
Relays
Digital I/O
Retransmission

Select Totalizer

Select the totalizer to be configured.

Select Totalizer

T1 Configuration

T(1 to 4)
Secure Total

Secure Total 1
000000000
gal

T(1 to 4)
Configuration

Totalizer Source

Select the source for the totalizer.

Tot 1 Source

Pen 1

Note. Any of Pens 1 to 4, Analog Inputs 1 to 6 or Math Blocks 1 to 4 (if Math software option is enabled by installation of the appropriate software key) are assignable to a totalizer.

None

Tot 1 Tag
Totalizer 1
Edit>

```
┌─────────────────┐
│  Tot 1 Tag      │
│                 │
│  Totalizer 1    │
│          Edit>  │
└─────────────────┘
```

Totalizer Tag

Press the ⇥ key to open the Edit screen.

Use the ▲, ▼ and ⇥ keys to enter the totalizer tag required – see Fig. 2.1 on page 6.

Note. Any characters not permitted in this tag are skipped when scrolling through the selection.

Press the ⌕ key to close the edit screen and save the tag.

```
┌─────────────────┐
│ Tot 1 Count Dir │
│                 │
│           Up    │
│                 │
└─────────────────┘
```

Count Direction

Select the count direction:

Up – Incremental counter (Preset Value < Predetermined Value)

Down – Decremental counter (Preset Value > Predetermined Value)

```
┌─────────────────┐
│  Tot 1 Units    │
│                 │
│  18    gal/h    │
│         (Imp)   │
└─────────────────┘
```

Totalizer Units

Select any of the units pre-programmed into the recorder or select **113 Custom** and use the ▲, ▼ and ⇥ keys to enter the units required – see Fig. 2.1 on page 6.

Notes.

■ Any characters not permitted in user-defined units are skipped when scrolling through the selection.

■ Refer to Appendix B on page 77 for a description of the units pre-programmed into the recorder.

```
┌─────────────────┐
│ Tot 1 Count Rate│
│                 │
│      00.0000    │
│      Manual     │
└─────────────────┘
```

Continued on next page.

Tot 1 Count Rate

00.0000
Manual
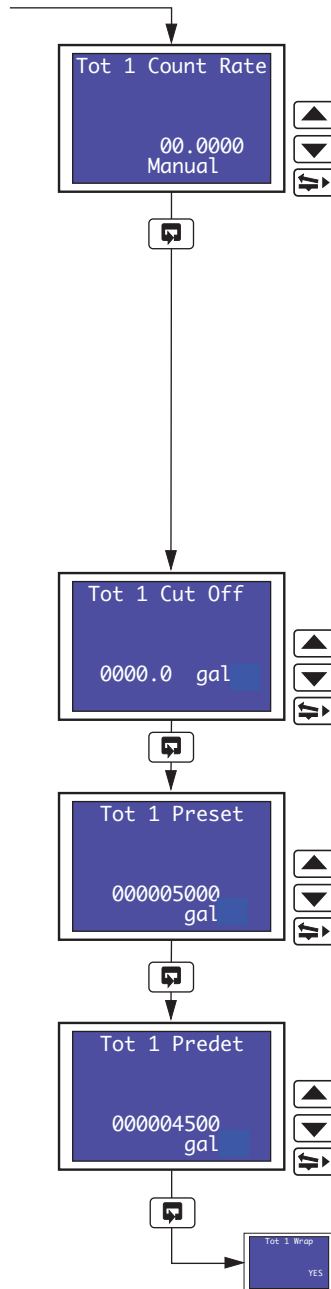
Totalizer Count Rate

Automatic – the recorder has calculated the count rate automatically. No further adjustment is possible.

Manual – the count rate must be calculated manually (see page 36). Use the ▲, ▼ and ⇥ keys to enter the calculated count rate in pulses per second, from 00.0000 to 99.9999 in 0.0001 increments.

Note. To configure the totalizer for Automatic count rate calculation:

1. Ensure that the unit of measurement (**Channel Units**) selected for the channel to which the totalizer is assigned is a volumetric unit (i.e. quantity per unit of time, for example gallons per hour) – see Section 3.5, page 24.

2. Enter the required Totalizer unit of measurement (**Totalizer Units**) – see previous page.

If the recorder holds the relationship data between the selected measurement and totalizer units, Automatic is displayed under the count rate to indicate that it has been set automatically.

Tot 1 Cut Off

0000.0 gal

Totalizer Cut Off

Set the value, in engineering units, at which the totalizer is to stop counting.

Tot 1 Preset

000005000
gal

Totalizer Preset Value

Set the value, in engineering units, from which the totalizer is to start counting and the value that is applied when the totalizer is reset.

Tot 1 Predet

000004500
gal

Totalizer Predetermined Value

Set the value, in engineering units, at which the totalizer stops or wraps.

Tot 1 Wrap

YES

Continued on next page.

```
Tot 1 Wrap

        YES
```
▲ ▼
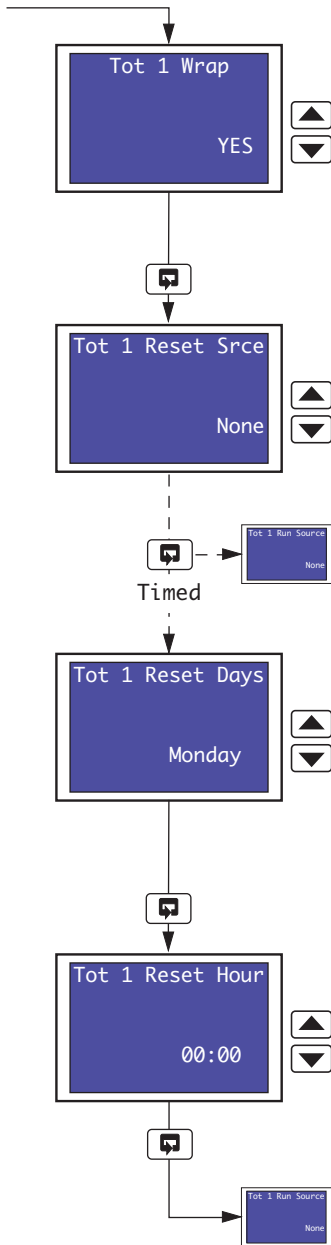
Totalizer Wrap

Select the required totalizer wrap action:

YES – the total is reset automatically to the preset value when the predetermined value is reached.

NO – the count stops when the predetermined value is reached

```
Tot 1 Reset Srce

        None
```
▲ ▼

Totalizer Reset Source

If required, select a digital signal to reset the totalizer or select **Timed** to configure the totalizer to reset at a predetermined time.

Refer to Appendix 1 for description of sources.

```
Tot 1 Run Source

        None
```

Anything other than **Timed** selected – continued on next page.

Timed

```
Tot 1 Reset Days

        Monday
```
▲ ▼

Totalizer Reset Day

Select the day or days on which the totalizer is to reset:

Monday to Sunday – the totalizer resets on the day selected

Mon-Fri – the totalizer resets every Monday to Friday inclusive

All – the totalizer resets every day

1st of Month – the totalizer resets on the 1st day of every month

```
Tot 1 Reset Hour

        00:00
```
▲ ▼

Totalizer Reset Time

Select the time of day at which the totalizer is to reset, from 00:00 (midnight) to 23:00 (11 pm) in 1 hour increments.

```
Tot 1 Run Source

        None
```

Continued on next page.

Tot 1 Run Source

None
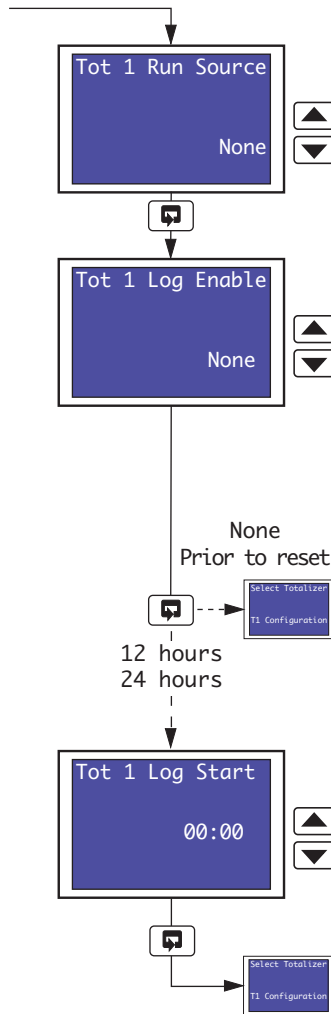
Totalizer Run Source

If required, select a digital signal to start the totalizer.

Refer to Appendix A on page 76 for a description of sources.

Tot 1 Log Enable

None

Totalizer Log Enable Source

If required, select the frequency at which the addition of the current totalizer values to the totalizer log is triggered:

None	– current totalizer values are not added to the totalizer log
Prior to reset	– current totalizer values are added as the totalizer resets
12 hours	– current totalizer values are added every 12 hours
24 hours	– current totalizer values are added every 24 hours

None
Prior to reset

Select Totalizer
T1 Configuration

Return to top of page.

12 hours
24 hours

Tot 1 Log Start

00:00

Totalizer Log Start Time

Enter the time at which logging is to start.

Select Totalizer
T1 Configuration

Return to top of page.

Select Totalizer
set to
T1 Secure Total

Secure Total 1
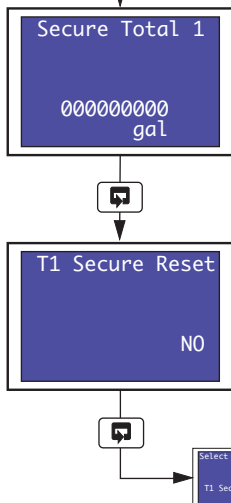
000000000
gal

Totalizer Secure Total

T1 Secure Reset

NO

Secure Total Reset

Select **YES** to reset the secure total.

The secure total is reset to either 000000000 (**Count Direction** set to **Up**) or 999999999 (**Count Direction** set to **Down**).

Select Totalizer
T1 Secure Total

Return to top of page.

3.8 Relay Configuration
Overview.

- **Relays** – can be energized by alarms, logic equation results (math software option enabled by installation of the appropriate software key), digital inputs, real time events (timer software option enabled by installation of the appropriate software key) and totalizer wrap signal (totalizer software option enabled by installation of the appropriate software key)

- **External totalizer count function** – external counter can be driven only by Module Type 3 (4-relay module) fitted in module positions 4, 5 or 6 (see Section 5.2, page 65).

- **Polarity** – allows fail-safe settings
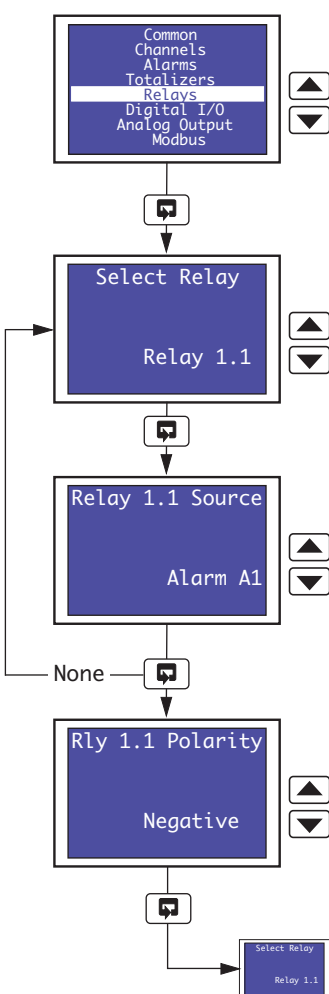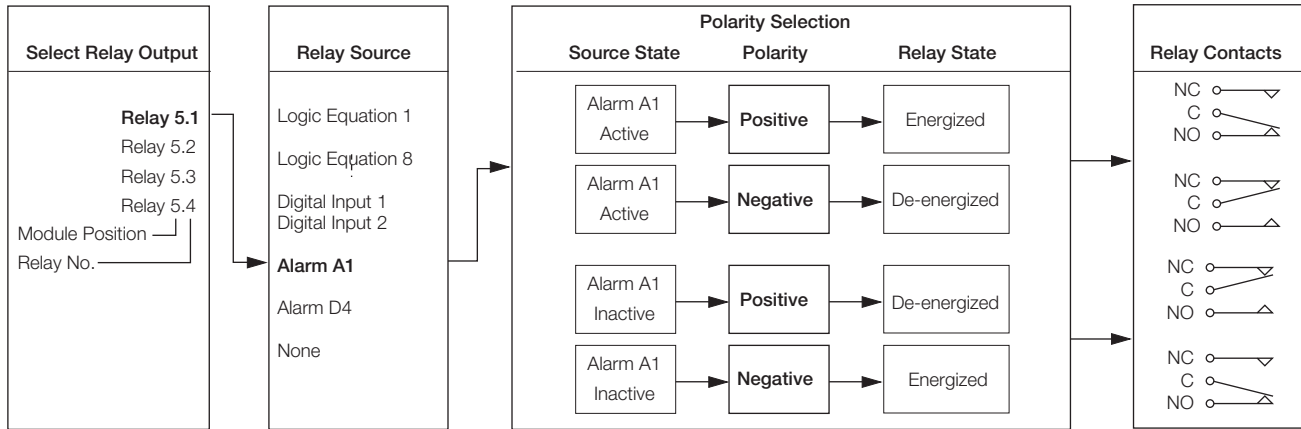
Relay Configuration

Press the 🔲 key to open the **Main Menu**.

Highlight **Relays**.

Select Relay

Select the relay to be configured.

Relay Source

Select the source required to activate the selected relay.

Refer to Appendix A on page 76 for a description of sources.

Relay Polarity

Select the polarity required for the selected relay:

    Positive – relay is energized when the relay source is active (On)

    Negative – relay is energized when the relay source is inactive (Off)

Return to top of page.

3.9 Digital Input and Output Configuration
Overview.

- The **Digital I/O** menu selection is displayed only if a digital input/output module is fitted – see Section 5.3.3, page 69.

- **Up to 24 digital outputs available** – depending on the module types fitted.

- **Digital outputs** – can be energized by alarms, logic equation results (math software option enabled by installation of the appropriate software key), digital inputs, real time events (timer software option enabled by installation of the appropriate software key) and totalizer wrap signal (totalizer software option enabled by installation of the appropriate software key).

- **External Totalizer count function** – external counter can be driven only by Module Type 5 (8-digital output module) fitted in module positions 4, 5 or 6 (see Section 5.2, page 65).

- **Polarity** – inverts the effect of the selected source on the output state.
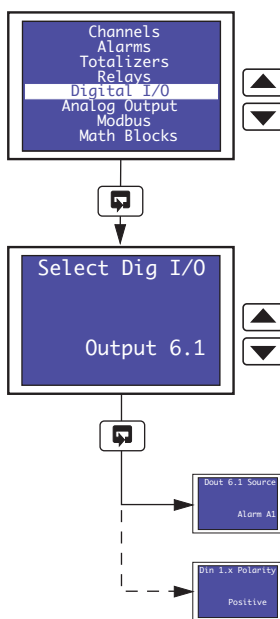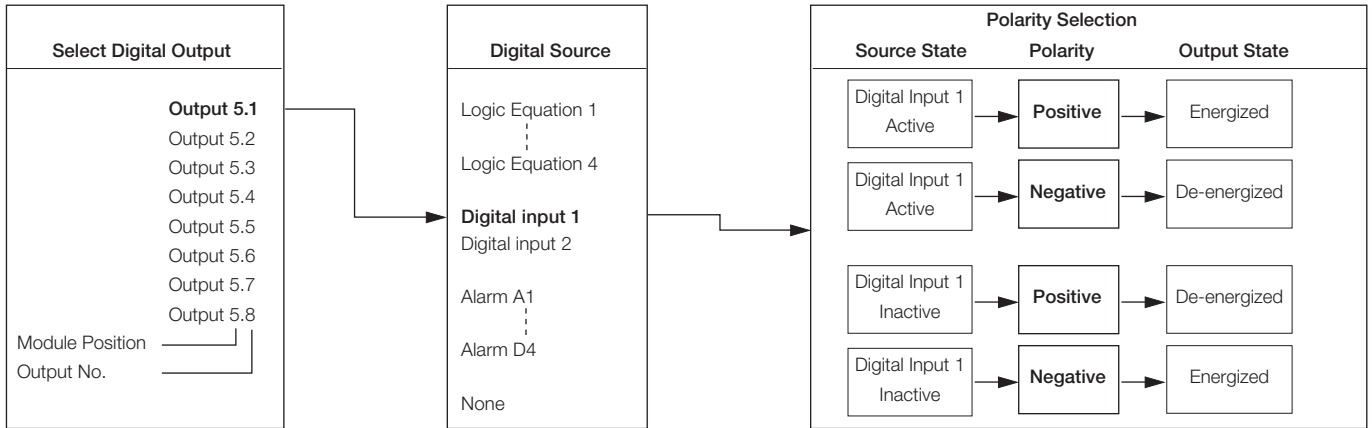
Digital I/O Configuration

Press the ▣ key to open the **Main Menu**.

Highlight **Digital I/O**.

Select Digital Input/Output

Select the digital input or output to be configured.

Output X.X selected – continued on next page.

Input X.X selected – continued on next page.

Select Dig I/O
set to
Output X.X

```
Dout 6.1 Source


       Alarm A1
```

▲ ▼
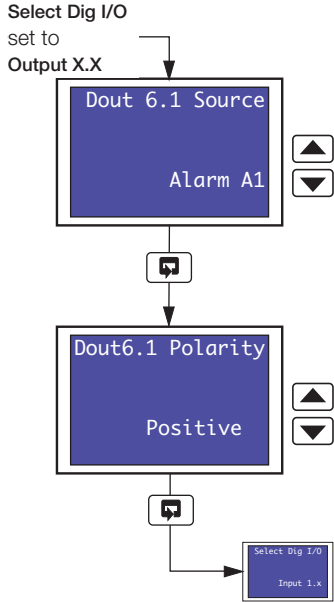
Digital Output Source

Select the channel source for the digital output.

Refer to Appendix A on page 76 for a description of sources.

```
Dout6.1 Polarity


     Positive
```

▲ ▼

Digital Output Polarity

Select the polarity required for the selected digital output:

Positive – digital output is energized when the relay source is active (On)

Negative – digital output is energized when the relay source is inactive (Off)

```
Select Dig I/O

     Input 1.x
```

Return to top of page.

Select Dig I/O
set to
Input X.X

```
Din 1.x Polarity


     Positive
```

▲ ▼

Digital Input Polarity

Select the polarity required for the selected digital input:

Positive – digital output state is unchanged

Negative – digital output state is inverted

```
Select Dig I/O

     Input 1.x
```

Return to top of page.

3.10 Analog Output Configuration
Overview.

- **Fitted analog outputs** – assignable to retransmit any process variable

- **Selectable analog output range** – allows maximum resolution on range of interest

- **Adjustable output range** – for non-standard and reversed outputs

The example below shows analog output 1 programmed to retransmit part of process variable 1's engineering range (250 to 750°C) as a 4.0 to 20.0 mA current output.

Select Analog Output	Select Output Source	Setting Output Ranges
Position 1 ┊ Positiont 6	**PV1** PV2 PV3 PV4	**1000°C** (Engineering Range High) **750°C** (Analog Output Range High) — **20.0mA** (Output Range High) Range to be transmitted **4.0mA** (Output Range Low) **250°C** (Analog Output Range Low) **0°C** (Engineering Range Low)
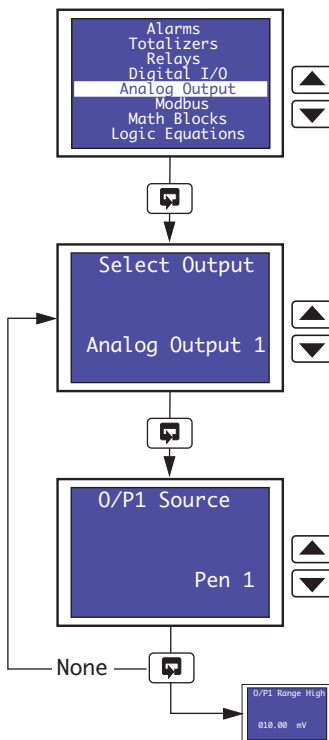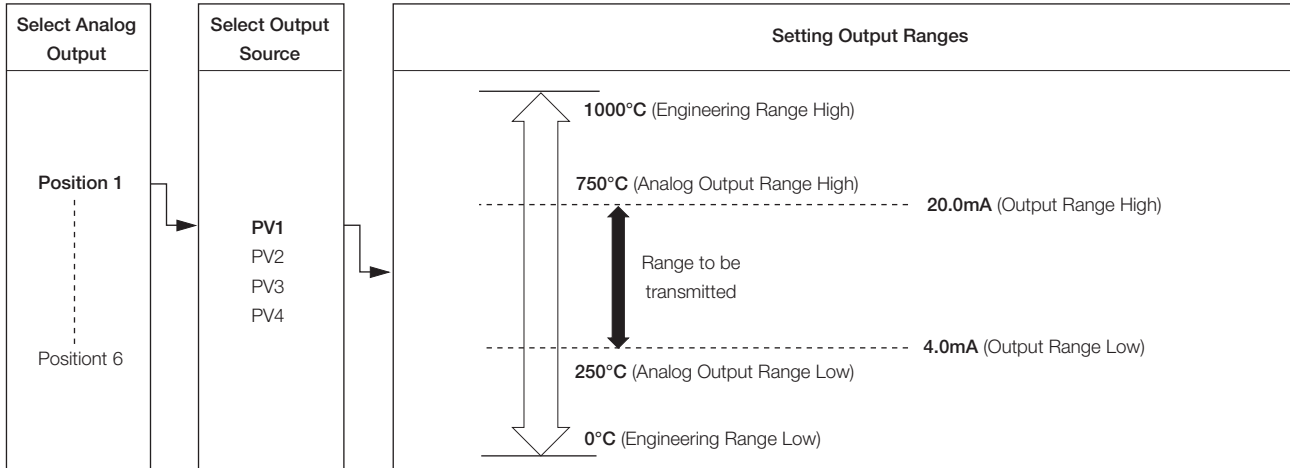
Analog Output Configuration

Press the ▦ key to open the **Main Menu**.

Highlight **Analog Output**.

```
Alarms
Totalizers
Relays
Digital I/O
Analog Output
Modbus
Math Blocks
Logic Equations
```

Select Analog Output

Select the analog output to be configured.

```
Select Output


Analog Output 1
```

Analog Output Source

Select the source for the analog output.

Refer to Appendix A on page 76 for a description of sources.

```
O/P1 Source



Pen 1
```

None

```
O/P1 Range High

010.00  mV
```

Continued on next page.

O/P1 Range High

010.00 mV

Analog Output Range High

Set the engineering range value, in engineering units, at which maximum output is required.

O/P1 Range Low

000.00 mV

Analog Output Range Low

Set the engineering range value, in engineering units, at which minimum output is required.

O/P1 Elect High

020.0 mA

Analog Electrical Range High

Set the maximum current output value to correspond with the **Analog Output Range High**, between 0.0 and 20.0 mA in 0.1 mA increments.

O/P1 Elect Low

004.0 mA

Analog Electrical Range Low

Set the minimum current output value to correspond with the **Analog Output Range Low**, between 0.0 and 20.0 mA in 0.1 mA increments.

Select Output
Analog Output 1

Return to top of page.

3.11 Logic Equation Configuration
Overview.

- **8 logic equations**

- **Up to 4 operands and 3 operators per equation**

- **OR/AND/XOR/NAND/NOR/NOT operators**

- **Can combine internal and external digital signals** – i.e. alarms, digital inputs, other logic equation results and real-time events (if timer software option enabled by installation of the appropriate software key)

For each equation, the logic elements 1 to 7 are arranged sequentially, as shown below. Odd numbered elements are used for logic inputs (operands) and even numbered elements for logic gates (operators).

Logic inputs must be set to one of the digital sources in Appendix A on page 76.

Logic inputs may be inverted (set to NOT)

Logic gates must be set to AND, OR, XOR, NAND, NOR or END. Setting an element to END terminates the equation.
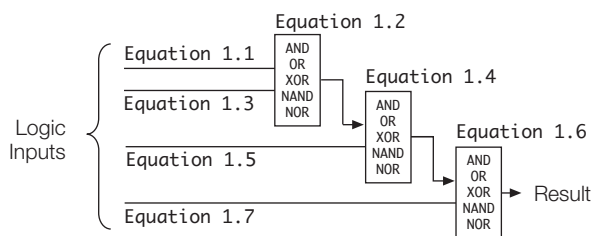
> **Note.** The elements of each equation are calculated sequentially, i.e. elements 1, 2 and 3 are evaluated first and the result combined with elements 4 and 5. This result is then combined with elements 6 and 7 to give the logic equation result.

Example – Reservoir level monitoring using:

- process variable 1 with an engineering range of 0 to 100 feet

- logic equation 1 result assigned to relay 1.1 that is used to operate the control valve.
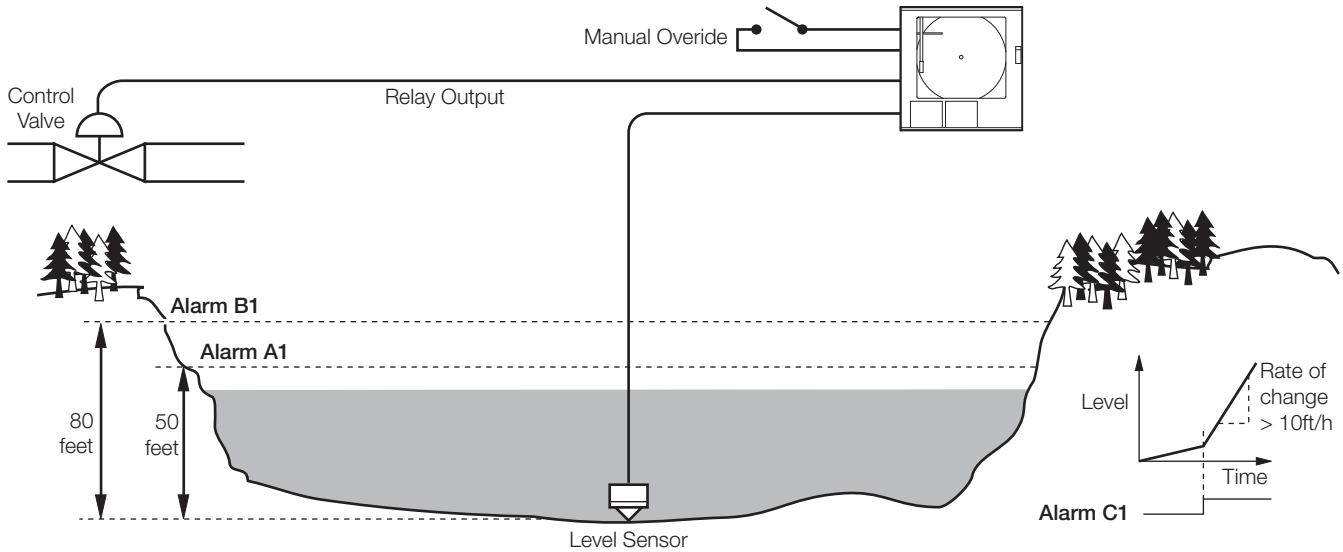
Flow Conditions
Close reservoir control valve if:
• Reservoir level >50 feet AND rate of change >10 ft/hr
OR
• Reservoir level >80 ft
OR
• Manual override switch operated

Input Elements
• **Alarm A1** – set to high process trip at 50 ft
• **Alarm B1** – set to high process trip at 80 ft
• **Alarm C1** – set to fast rate trip at 10% of range per hour (10 ft/hr)
• **Manual override switch**:
Connected to digital input 1.1
Digital input number
Module number
Negative polarity
Volt-free switching

Entering the Logic Equation
Equation 1.1 ⇨ Alarm A1
Equation 1.2 ⇨ AND
Equation 1.3 ⇨ Alarm C1
Equation 1.4 ⇨ OR
Equation 1.5 ⇨ Alarm B1
Equation 1.6 ⇨ OR
Equation 1.7 ⇨ Digin Main 1

Relays Digital I/O Analog Output Modbus **Logic Equations** Data Logging Clock Pen Function	▲ ▼	**Logic Equation Configuration** Press the 🔲 key to open the **Main Menu**. Highlight **Logic Equations**.

Select Equation Equation 1	▲ ▼	**Select Equation** Select the equation to be configured.

Equation 1.1 Alarm A1 Invert>	▲ ▼	**Equation n/Element 1** Select the source required for element 1. Refer to Appendix A on page 76 for a description of sources. Press the 🔁 key to logically invert the selected source (set to NOT)

NONE —

Equation 1.2 AND	▲ ▼	**Equation n/Element 2** Select the operator required to combine elements 1 and 3:

END	– Ends equation
AND	– Output is 1 if both inputs are 1, but 0 for all other possible inputs
OR	– Output is 1 if one or the other or both inputs are 1, but 0 if both inputs are 0
XOR	– Output is 1 if either, but not both, inputs are 1, but 0 if both inputs are 0 or 1
NAND	– Output is 0 if both inputs are 1, but 1 if one or the other or both inputs are 0
NOR	– Output is 1 if both inputs are 0, but 0 if one or the other or both inputs are 1

Equation 1.3 NOT Digin Main 1 Invert>	▲ ▼	**Equation n/Element 3** Repeat previous two steps for elements 3 to 7. Odd numbered elements = operands Even numbered elements = operators

Select Equation Equation 1	Return to top of page.

3.12 Data Logging Configuration

Trend pen channel data values and the contents of the totalizer log (if the totalizer option is enabled by installation of the appropriate software key) can be saved to a Compact Flash card if the optional data logging hardware is installed and data logging is on-line. Logged data is compatible with the Company's DataManager data analysis software package. DataManager is a Microsoft® Excel add-in that enables the analysis and validation of the recorder's pen channel data values and log files on a PC.

> **Note.**
>
> - The recorder is not equipped with an internal memory therefore recorded pen channel data values are **lost** if a Compact Flash card with *sufficient available free space* is not inserted.
>
> - Logging starts automatically when a card is inserted and continues until either the card is removed or becomes full.
>
> - The content of the totalizer log (if the totalizer option is enabled by installation of the appropriate software key) is saved automatically to the Compact Flash card when data logging is on-line.
>
> - Event pen data is not logged.

File Types

Files created by the recorder are given filenames automatically. Each type of file is given a different filename extension as shown in Table 3.3.

Type	Extension	Contents
Pen channel data files	*.D00	Digital recording channel data
Totalizer log files	*.TE0	The historical record of all totalizer and associated statistical values relating to a particular pen channel

Table 3.3 File Types

Filenames

Filenames are formatted as shown in Table 3.4.

Type	Format
Pen channel data files	<Start Time hh_mm> Start Date ddmmmyy><Instrument tag>.D00
Totalizer log files	<Start Time hh_mm> Start Date ddmmmyy><Instrument tag>.T00

Table 3.4 Filenames

Data Verification and Integrity

Each block of data in the pen channel data files has its own data integrity check. This enables the integrity of the data stored on the Compact Flash card to be verified when it is viewed using the DataManager software.

Totalizer log files also contain built-in integrity checks enabling the integrity of the data to be verified by the DataManager software.

Recording Duration

(4 Channels)	128MB	256MB	512MB	1GB
1 s	1.1 months	2.3 months	4.5 months	8.8 months
5 s	5.6 months	11.3 months	1.9 years	3.6 years
10 s	11.3 months	1.9 years	3.7 years	7.2 years
30 s	2.8 years	5.6 years	11.1 years	21.7 years
60 s	5.6 years	11.1 years	22.2 years	43.4 years
5 min.	27.8 years	55.5 years	111.0 years	216.8 years
10 min.	55.5 years	111.0 years	222.1 years	433.7 years
30 min.	166.5 years	333.1 years	666.2 years	1301.1 years
1 hour	333.1 years	666.2 years	1332.3 years	2602.2 years
6 hour	1998.5 years	3996.9 years	7993.9 years	15613.1 years

Table 3.5 Recording Duration

> **Note.** Data Logging is available only if the Data Logging option is enabled by installation of the optional hardware.

```
Digital I/O
Analog Output
   Modbus
Logic Equations
 Data Logging
    Clock
 Pen Function
  Calibration
```
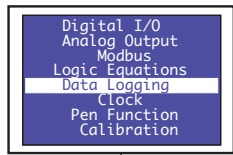
Data Logging Configuration
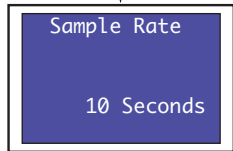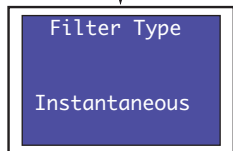
Press the ▤ key to open the **Main Menu**.

Highlight **Data Logging**.


```
Sample Rate


10 Seconds
```

Sample Rate

Select the sample rate to be applied to all recording channels.

Select from:
    1, 5, 10, 30 or 60 seconds
   5, 10 or 30 minutes
    1 or 6 hours

```
Filter Type


Instantaneous
```

Pre-logging Filter Type

Select the filter type to be applied to all recording channels prior to logging.

`Instantaneous` – A single value based on process conditions at the time of sampling

`Max/Min` – Two values are recorded to capture the maximum and minimum signal values since the previous sample

---

```
File Creation


On pen return
```
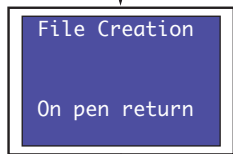
New File Creation

Select the interval at which new data logging files are created:

`Standard` – new files are created when:
    a file becomes full (i.e. it has reached 65,000 entries)
    or
    the Compact Flash card is removed and re-inserted
    or
    power to the recorder is restored after being interrupted
    or
    the recorder's configuration is changed

`On Pen Return` – In addition to the Standard file creation intervals, new files are also created when the pens are returned to their recording positions. This enables recorded files to match the chart record.

```
Instrument Tag


Boiler 1 Zone 3
          Edit>
```
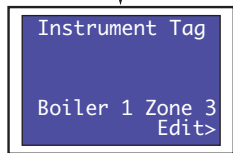
Instrument Tag

Use the ▲, ▼ and ⇥ keys to enter a tag of up to 16 characters – see Fig. 2.1 on page 6.

Note. Any characters not permitted in this tag are skipped when scrolling through the selection.

The tag is included in the archive files to identify the source of the data.

```
Pen 1 Short Tag


Pressure
          Edit>
```

Continued on next page.

Pen 1 Short Tag

```
Pen 1 Short Tag


Pressure
         Edit>
```

Note. This tag is required to provide compatibility with the Company's DataManager data analysis software package and is used to identify the column of data for Pen 1.

Use the ▲, ▼ and ⮊ keys to enter the a tag of up to 8 characters – see Fig. 2.1 on page 6.

Note. Any characters not permitted in this tag are skipped when scrolling through the selection.

The tag is included in the archive files to identify the channel.

Pens 2 to 4 Short Tag

```
Pen 4 Short Tag


Pressure
         Edit>
```

Notes.

■ Displayed only if the pen is fitted.

■ These tags are required to provide compatibility with the Company's DataManager data analysis software package and are used to identify the column of data for each pen.
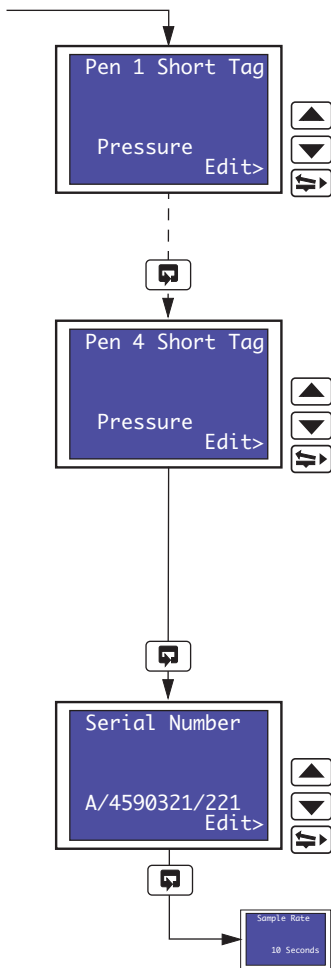
Use the ▲, ▼ and ⮊ keys to enter the a tag of up to 8 characters – see Fig. 2.1 on page 6.

Note. Any characters not permitted in this tag are skipped when scrolling through the selection.

The tag is included in the archive files to identify the channel.

Serial Number

```
Serial Number


A/4590321/221
         Edit>
```
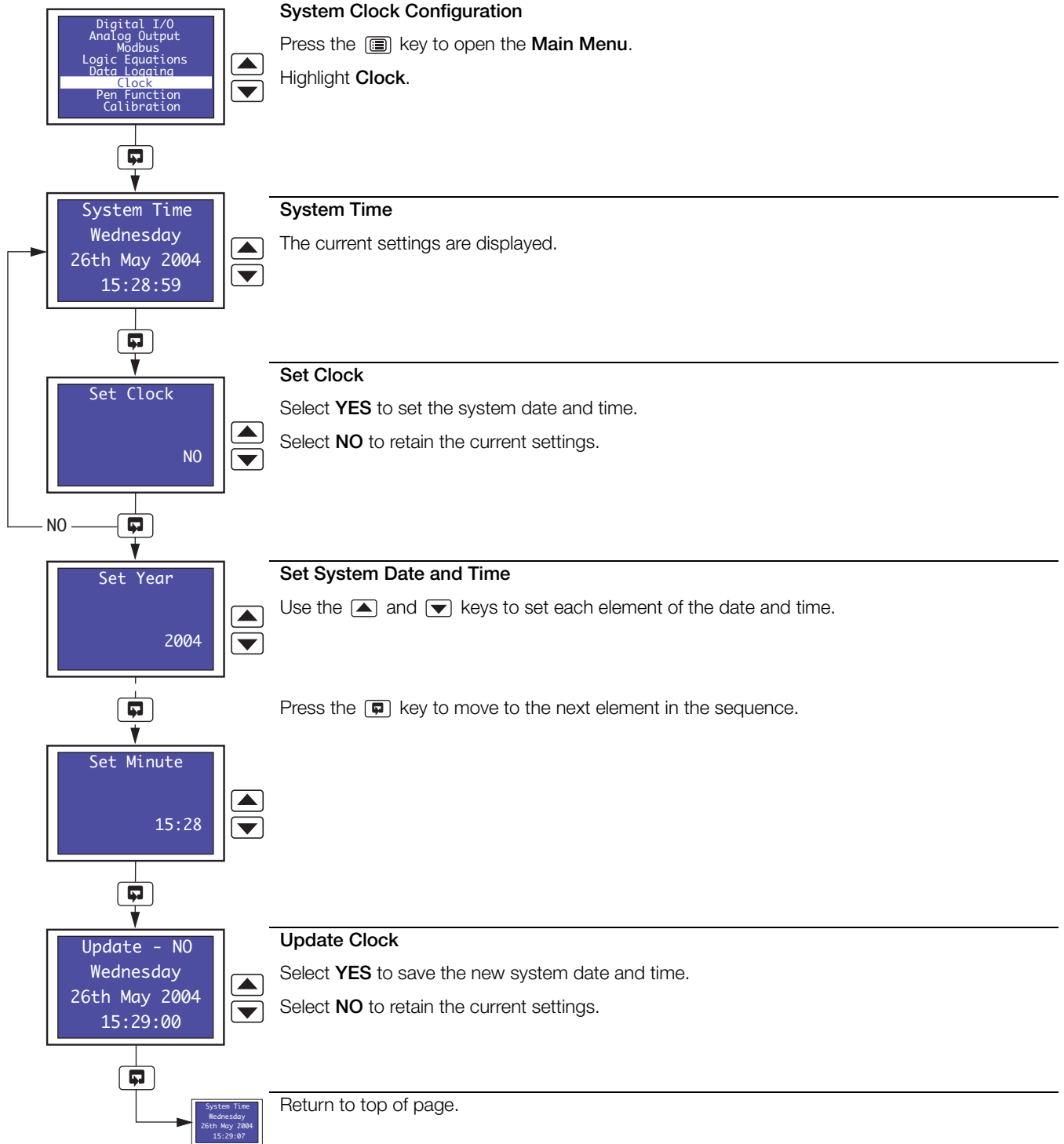
Use the ▲, ▼ and ⮊ keys to enter a serial number to be used to identify the recorder – see Fig. 2.1 on page 6.

Note. Any characters not permitted in this tag are skipped when scrolling through the selection.

```
Sample Rate

10 Seconds
```

Return to top of page.

3.13 System Clock Configuration

> **Note.** The System Clock is available only if any of the Totalizer, Math or Timers software options are enabled by installation of the appropriate software key, or the optional Data Logging hardware is installed.

```
Digital I/O
Analog Output
Modbus
Logic Equations
Data Logging
Clock
Pen Function
Calibration
```

System Clock Configuration

Press the ▤ key to open the **Main Menu**.

Highlight **Clock**.

```
System Time
Wednesday
26th May 2004
15:28:59
```

System Time

The current settings are displayed.

```
Set Clock


NO
```

Set Clock

Select **YES** to set the system date and time.

Select **NO** to retain the current settings.

NO

```
Set Year


2004
```

Set System Date and Time

Use the ▲ and ▼ keys to set each element of the date and time.

Press the ⊡ key to move to the next element in the sequence.

```
Set Minute


15:28
```

```
Update - NO
Wednesday
26th May 2004
15:29:00
```

Update Clock

Select **YES** to save the new system date and time.

Select **NO** to retain the current settings.

```
System Time
Wednesday
26th May 2004
15:29:07
```

Return to top of page.

3.14 Pen Function
Overview.

- **Trend Pens** – the chart range is configured independently of the engineering range (see Section 3.5, page 24) to enable a selected part of the engineering range to be used for display thus giving extra detail on the chart.

- **Event Pens** – assigned to digital inputs, alarms, logic equation results and real-time events (if timer software option enabled by installation of the appropriate software key).

Select Pen Range (in engineering units)	Select 'In' Source	Select 'Out' Source	Event Pen Chart Position

Record Function

Event Function

*With Real Time Event Pen option fitted, Pen 4 is above 100%
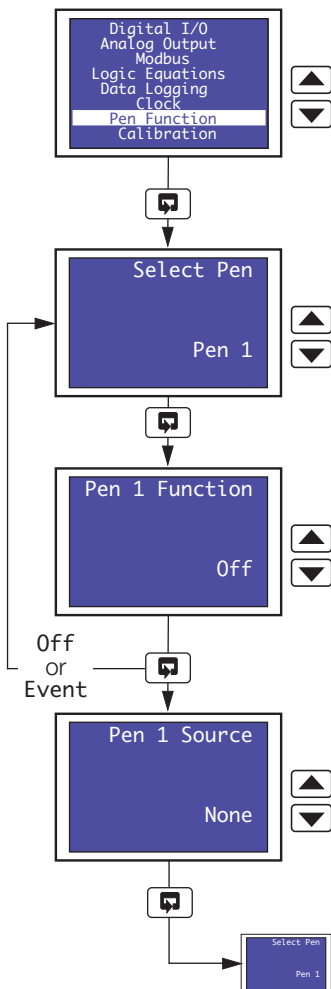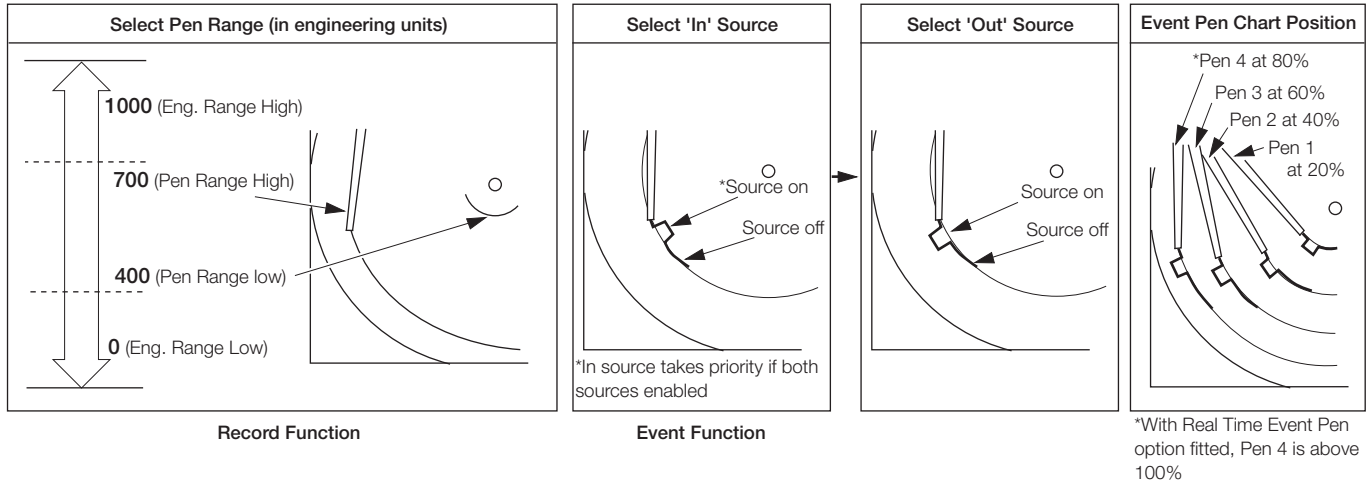
Pen Function

Press the ▤ key to open the **Main Menu**.

Highlight **Pen Function**.

Select Pen

Select the pen to configure.

Pen Function

Select the required pen function:

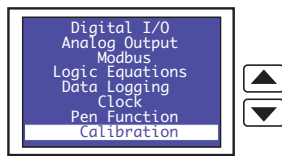- **Off** – No function
- **Trend** – Trend
- **Event** – Event

Pen Source

Select an input source or math block for the selected pen as required.
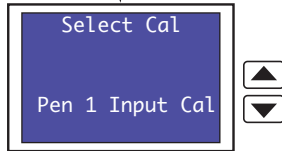
Return to top of page.

3.15 Calibration

		Calibration
Digital I/O / Analog Output / Modbus / Logic Equations / Data Logging / Clock / Pen Function / Calibration	▲ ▼	Press the ▤ key to open the **Main Menu**. Highlight **Calibration**.

		Select Cal
Select Cal / Pen 1 Input Cal	▲ ▼	Select the pen input channel or pen chart position to calibrate.

Pen X Chart Cal

Continued on next page.

Set Pen 1 High 0

Pen X Input Cal
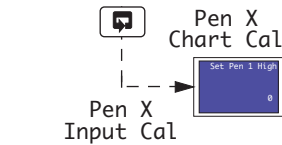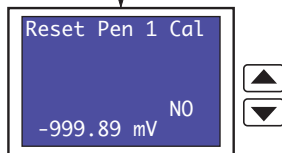
		Reset Pen Calibration
Reset Pen 1 Cal / NO / -999.89 mV	▲ ▼	Select **YES** to reset the offset and span values to their nominal values. Select **NO** to retain the current offset and span values.
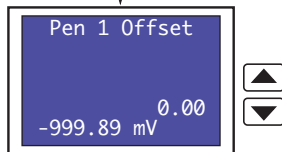
		Offset
Pen 1 Offset / 0.00 / -999.89 mV	▲ ▼	Set the required offset value for the selected pen or analog input.
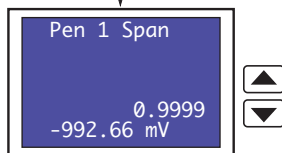
		Span
Pen 1 Span / 0.9999 / -992.66 mV	▲ ▼	Set the required span value for the selected pen or analog input.

Select Cal / Pen 1 Input Cal

Return to top of page.

Select Cal
set to
Pen X Chart Cal

```
Set Pen 1 High



            0
```
▲
▼
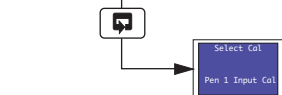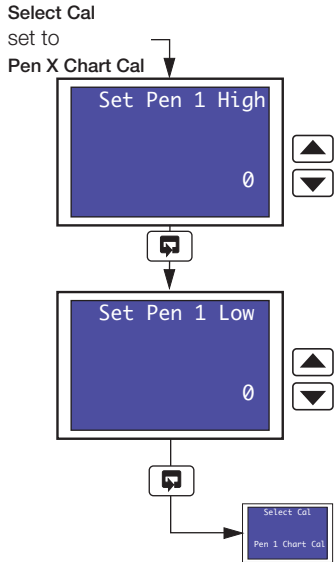
Pen High Value

Set the required chart high value for the selected pen, between 0 and 200.

```
Set Pen 1 Low



            0
```
▲
▼

Pen Low Value

Set the required chart low value for the selected pen, between 0 and 200.

```
Select Cal

Pen 1 Chart Cal
```

Return to top of page.

3.16 Backing Up and Restoring Configurations

A backup file of the recorder's configuration settings can be saved to a PC and restored to the recorder using the **C1300 Configuration Backup Utility Software** (download from www.abb.com/recorders) and **Configurator Cable** (part no. C100/0051 – available from the Company).

3.16.1 Backing Up a Configuration

1. Connect the Configurator Cable to the recorder's configuration backup port (see Fig. 3.5) and the PC's serial port.

Fig. 3.5 Configuration Backup Port
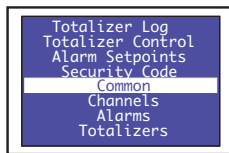
2. Press the ▤ key to open the **Main Menu**.

3. Highlight **Common** (or any of the Configuration level selections below Common).

4. Press the ▲ and ▼ keys simultaneously to place the recorder into **PC Config Mode**.

5. Run the software 'C1300 Configuration Backup Utility.exe' on the PC.

6. Save the current configuration – see Fig. 3.6.

7. Exit the **C1300 Configuration Backup Utility Software**.

8. Disconnect the **Configurator Cable**.

9. Press the ▤ key to return the recorder to normal operation – see Section 2.3.1, page 8.

Fig. 3.6 Backing Up a Configuration

3.16.2 Restoring a Configuration

① Connect the Configurator Cable to the recorder's configuration backup port (see Fig. 3.5) and the PC's serial port.

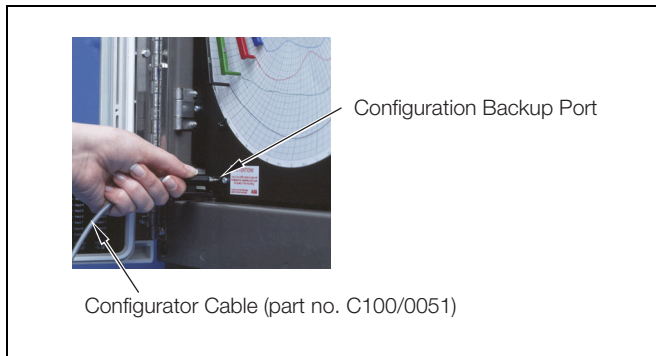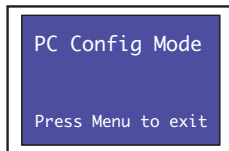② Press the ▦ key to open the **Main Menu**.

③ Highlight **Common** (or any of the Configuration level selections below Common).
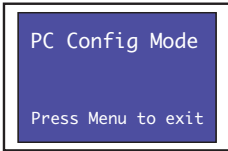
④ Press the ▲ and ▼ keys simultaneously to place the recorder into **PC Config Mode**.
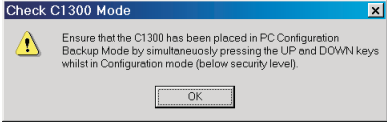
⑤ Run the software 'C1300 Configuration Backup Utility.exe' on the PC.

⑥ Restore the configuration – see Fig. 3.7.

⑦ Exit the **C1300 Configuration Backup Utility Software**.

⑧ Disconnect the **Configurator Cable**.

⑨ Press the ▦ key to return the recorder to normal operation – see Section 2.3.1, page 8.

---

① Select the port to which the configurator cable is connected

③ Select the configuration file to be restored
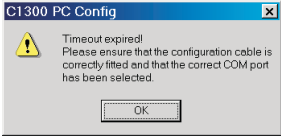
Ensure 'Download Config.' radio button selected ②

④ Click to restore the configuration backup file

⑤ The following message is displayed

Note. The following warning is displayed if an incorrect port was selected in step① or the recorder is not connected correctly to the PC.

⑥ The following is displayed when upload is complete
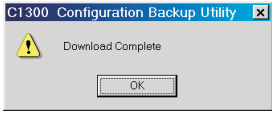
Fig. 3.7 Restoring a Configuration

4 Mechanical Installation

4.1 Siting
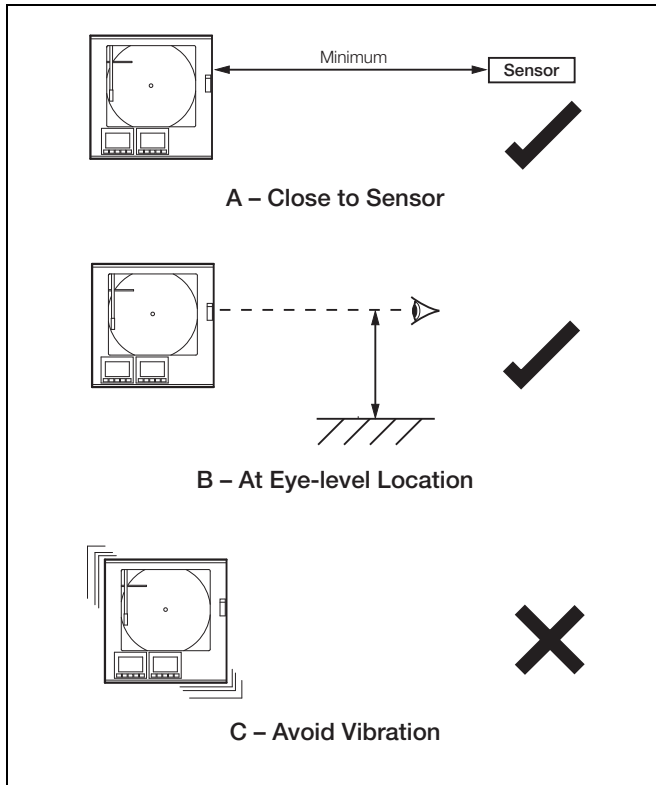
Fig. 4.1 General Requirements
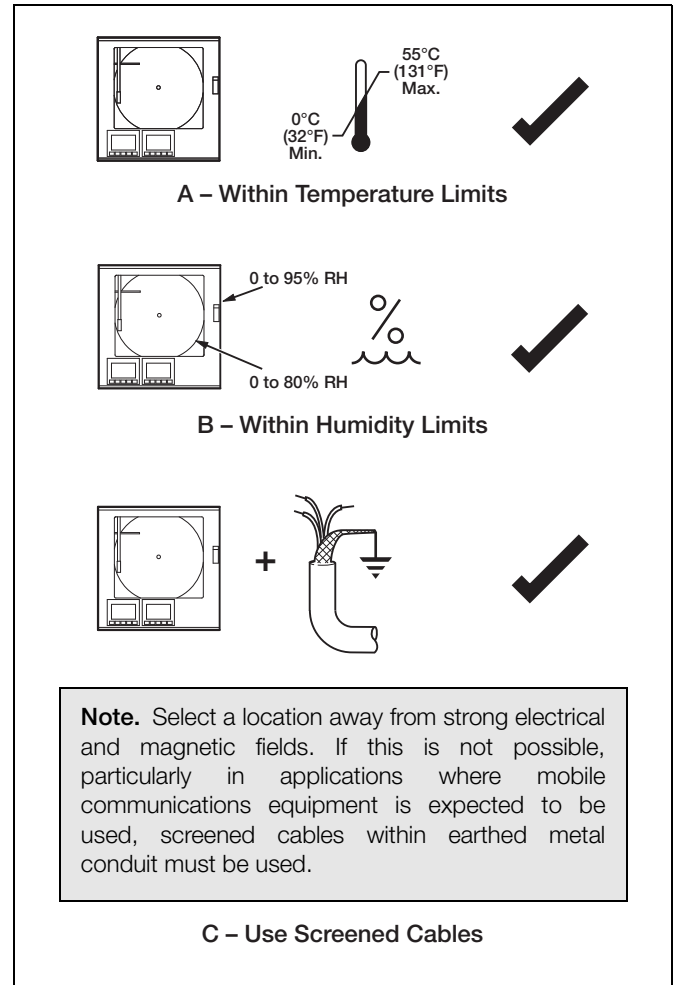
Fig. 4.2 Environmental Requirements

4.2 Mounting

Dimensions in inches (mm)

15.04 (382)

15.23
(386.8)

1.30 (33)

2.60 (66)

1.38 (35.1)

7.22
(183.4)

0.94 (22.4)

1.44 (36.6) – Typical Space Between
Adjacent Knockout Centers

Note. Remove knockouts by striking from the inside of
the case, taking great care not to damage any internal
components. Alternatively, drill out to 0.875 in.
(22.2mm) using a suitable drill bit.

12.63 (320.8)

0.32 (8.3)

12.63
(320.8)

2.23
(56.8)

1.18 (30.1)

1.18 (30.1)

Fig. 4.3 Overall Dimensions

4.2.1 Wall-/Pipe-Mounting
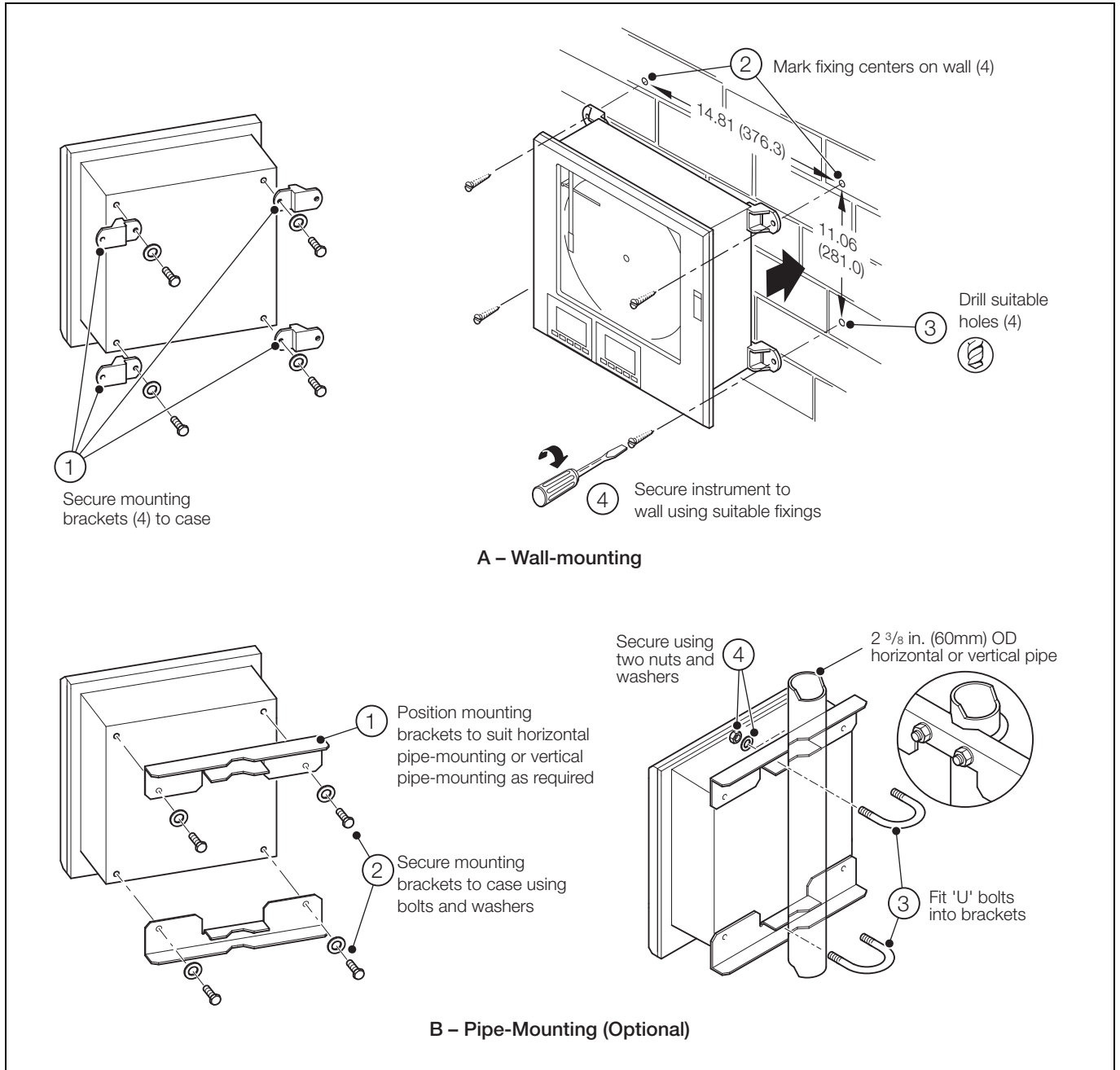
Fig. 4.4 Wall-/Pipe Mounting

4.2.2 Panel Mounting

Dimensions in inches (mm)

② Mark four mounting holes

4 holes 0.281 dia. or tap for 1/4 in. thread

14.00 (355.6)

12.72 (323.08) minimum

14.19 (360.4)

12.72 (323.1) minimum

11.25 (285.8)

1.70 (43.2)

0.64 (16.25)

① Cut hole in panel (see **Note 1** below)

Minimum Cut-out Dimensions

③ Drill four suitable holes

Optional gasket (see **Note 2** below)

④ Locate instrument in cut-out

⑤ Secure in panel using four bolts, nuts and washers

0.20 (5.0)

13.7 (348.0) maximum

14.6 (371.0) maximum

0.15 (3.8) minimum

0.15 (3.8) minimum

Ensure cut-out positioned centrally between mounting holes

Maximum Cut-out Dimensions

Notes.

1. The recorder can be inserted into a panel cut-out of any size between the minimum and maximum dimensions illustrated, provided the cut-out is positioned centrally relative to the fixing holes. If the panel cut-out is larger than the maximum, a locally manufactured adaptor plate is required.

2. If panel-mounting to NEMA 4X hosedown standard is required, a continuous bead of suitable silicon sealant **must** be applied between the case flange and the panel. **Do not** use the optional gasket.

Fig. 4.5 Panel Mounting

5 Electrical Installation

> **Warning.**
>
> - To comply with Underwriter Laboratories (UL) and Canadian Standards Association (CSA) certification, route signal leads and power cables in earthed (grounded), flexible metal conduit.
>
> - Recorders not fitted with the optional internal on/off switch and fuse must have an external fuse and disconnecting device such as a switch or circuit breaker conforming to local safety standards fitted to the final installation. They must be fitted in close proximity to the recorder within easy reach of the operator and must be marked clearly as the disconnection device for the recorder.
>
> - Remove all power from supply, relay and any powered control circuits and high common mode voltages before accessing or making any connections.
>
> - Use cable appropriate for the load currents. The terminals accept cables up to 14AWG (2.5mm2).
>
> - The power supply and all inputs and outputs conform to Insulation Category II, Pollution Degree II.
>
> - All connections to secondary circuits must have basic insulation.
>
> - After installation, there must be no access to live parts e.g. terminals.
>
> - Terminals for external circuits are for use only with equipment with no accessible live parts.
>
> - If the recorder is used in a manner not specified by the Company, the protection provided by the equipment may be impaired.
>
> - All equipment connected to the recorder's terminals must comply with local safety standards (IEC 60950, EN601010-1).

> **Note.**
>
> - Always route signal leads and power cables separately.
>
> - Use screened cable for signal inputs and relay connections. Connect the screen to the earth (ground) stud – see Fig. 5.9 on page 70.
>
> - The terminal blocks can be removed from the main PCB when making connections – see Fig. 5.1 on page 64. Before removing a module, note its position.
>
> - If wall- or pipe-mounting to NEMA 4X hosedown standard is required, suitable cable glands *must* be used to prevent water ingress.
>
> - The optional Software Key (if fitted), part number C1900/0463, contains a non-replaceable 3.0V lithium cell.
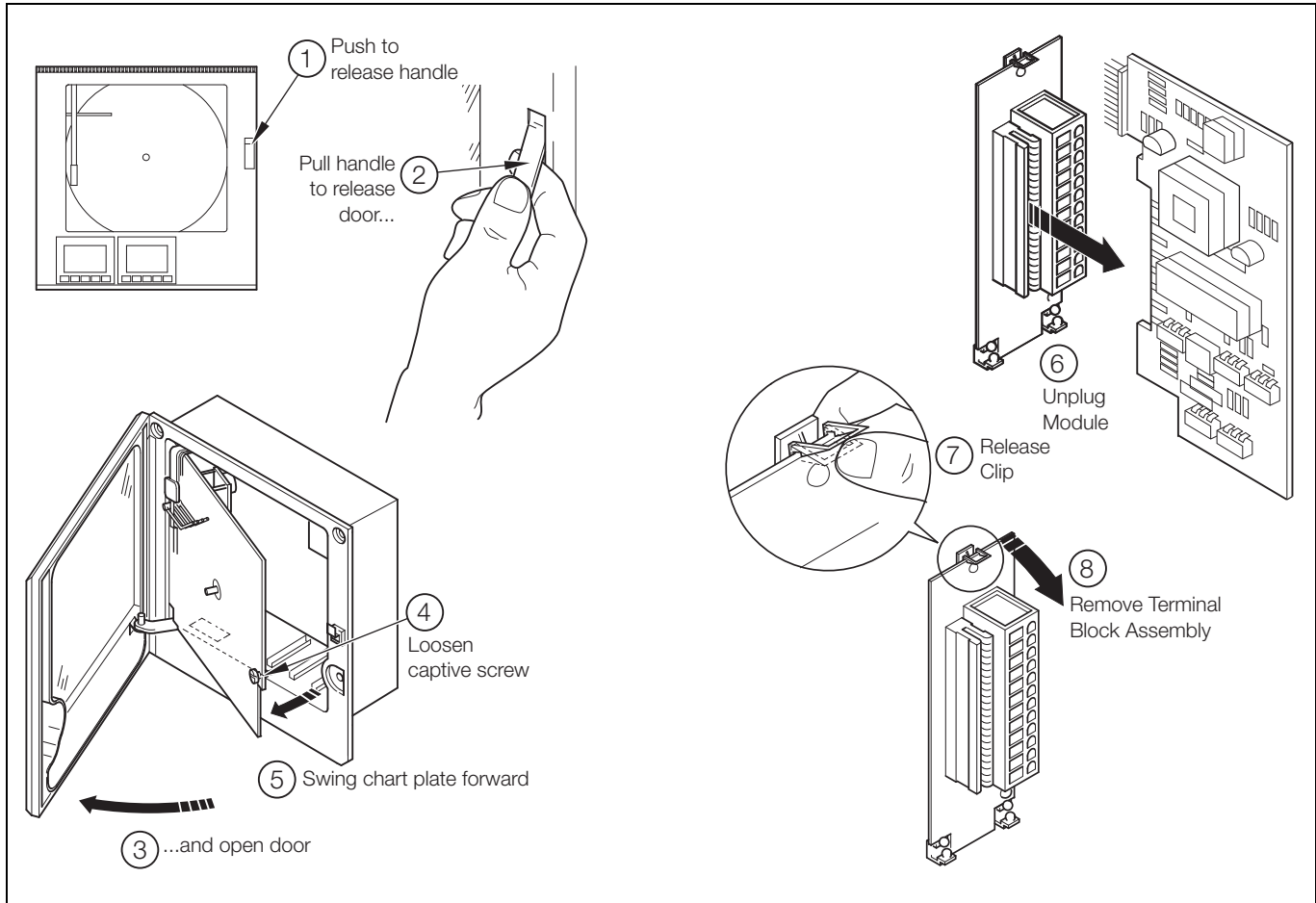
Fig. 5.1 Removing Terminal Block Assembly

5.1 Identifying the Input/Output Modules

To gain access to the modules, open the door and chassis – see Fig. 5.1 on page 64. There are five module positions (2 to 6) as shown in Fig. 5.2.

5.2 Channel Connections

Channel 1 connections are made directly to the terminal block mounted on the motherboard.

Other Channel connections are made to standard I/O modules, fitted in positions 2, 3 or 4 – see Fig. 5.2.

> **Warning.** The maximum channel to channel voltage (between any 2 channels) must not exceed 500V DC.
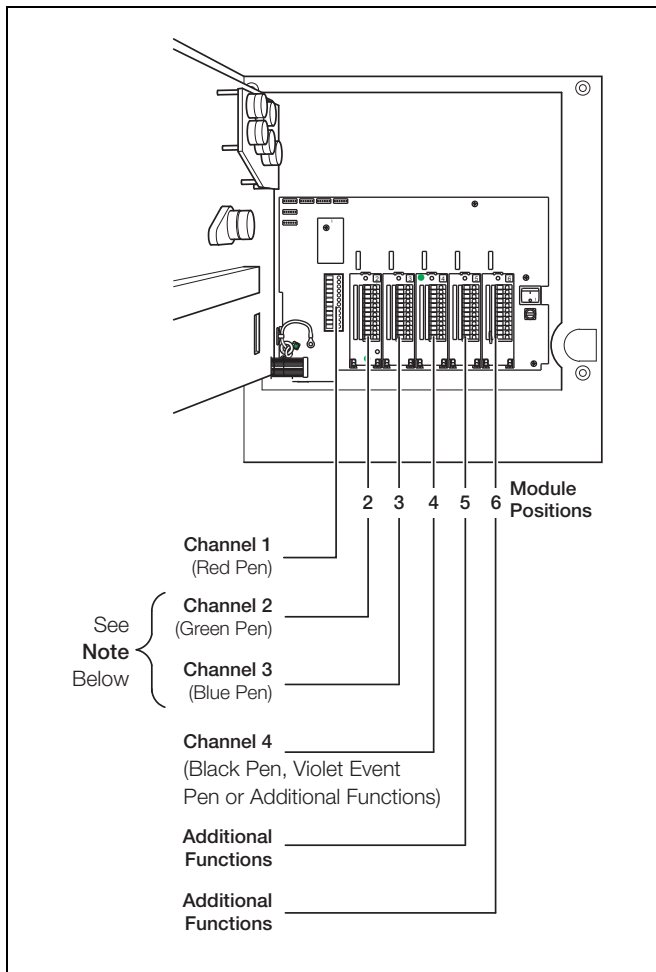
Fig. 5.2 Module Positions and Functions

> **Note.**
> - Module positions 2 and 3 can also be used for additional I/O modules (module types 1 and 2) for use with math functions.
> - The module type is marked on the component side of the PCB.

5.2.1 Selecting the Analog Input Type(s)

Plug-in links are used to select the input type:

Channel 1   PL1 & PL8 on the main PCB (Fig. 5.3)

Channels 2 to 4   PL1 & PL3 on the module (Fig. 5.4)
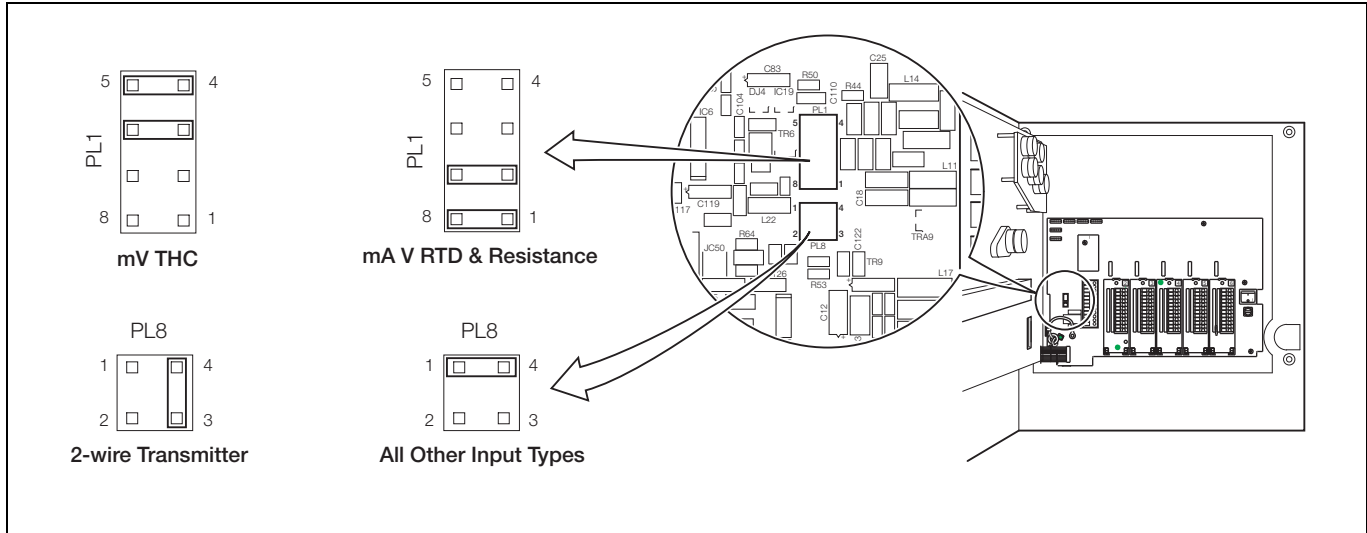
Fig. 5.3 Selecting the Input Type (Main Board)
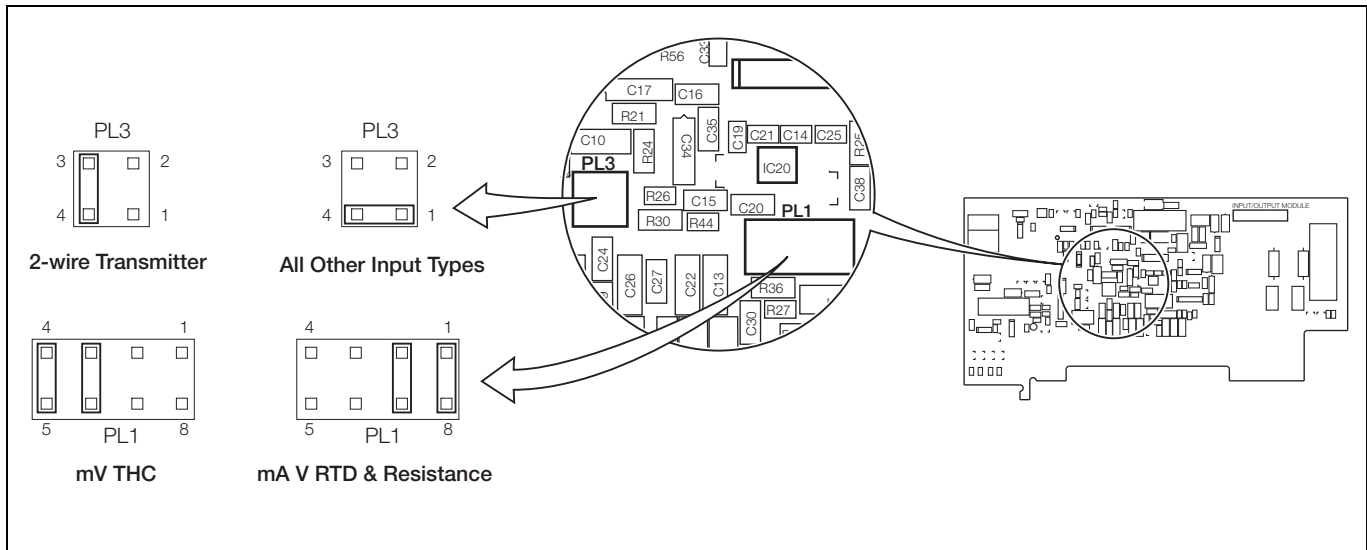
Fig. 5.4 Selecting the Input Type (I/O Modules)

Type of Thermocouple	Compensating Cable											
	BS1843			ANSI MC 96.1			DIN 43714			BS4937 Part No.30		
	+	–	Case	+	–	Case	+	–	Case	+	–	Case
Ni-Cr/Ni-Al (K)	Brown	Blue	Red	Yellow	Red	Yellow	Red	Green	Green	Green	White	Green*
Ni-Cr/Cu-Ni (E)		—			—			—		Violet	White	Violet*
Nicrisil/Nisil (N)	Orange	Blue	Orange	Orange	Red	Orange		—		Pink	White	Pink
Pt/Pt-Rh (R and S)	White	Blue	Green	Black	Red	Green	Red	White	White	Orange	White	Orange*
Pt-Rh/Pt-Rh (B)		—			—			—		Grey	White	Grey*
Cu/Cu-Ni (T)	White	Blue	Blue	Blue	Red	Blue	Red	Brown	Brown	Brown	White	Brown*
Fe/Con (J)	Yellow	Blue	Black	White	Red	Black	Red	Blue	Blue	Black	White	Black*
										* Case Blue for intrinsically safe circuits		
Fe/Con (DIN 43710)		—			—		DIN 43710				—	
							Blue/Red	Blue	Blue			

Table 5.1 Thermocouple Compensating Cable

5.2.2 Voltage and Current

Note. Input impedances:

Low voltage (mV)	>10MΩ
Voltage	>10MΩ
Current (mA)	100Ω

5.2.3 2-wire Transmitter Input)
Power for the transmitter is supplied by terminal 6.

Note. The voltage across terminals 4 and 6 is 20V (nominal). This is due to internal voltage drops across a shunt resistor and measurement circuitry.

5.2.4 Thermocouple
Use the correct compensating cable between the thermocouple and the terminals – see Table 5.1 on page 67.

An automatic cold junction (ACJC) is incorporated but an independent cold (reference) junction may be used.

5.2.5 Resistance Thermometer (RTD)
If long leads are necessary it is preferable to use a 3-lead resistance thermometer.

If 2-lead resistance thermometers are used each input must be calibrated to take account of the lead resistance.

5.2.6 Logic Inputs
The two logic inputs accept either volt-free (switch) or TTL (5V) input types and can be used for remote switching of many recorder functions, e.g. chart stop/go, alarm acknowledgment, totalizer reset etc. – see Section 3.11, page 47.

5.2.7 Analog Output

5.2.8 Relay Output

Note. Relay specification:

Type	single pole changeover	
Voltage	250V AC	250V DC
Current	5A AC	5A DC
Loading (non inductive)	1250VA	50W
Isolation, contacts to earth	2kV RMS	
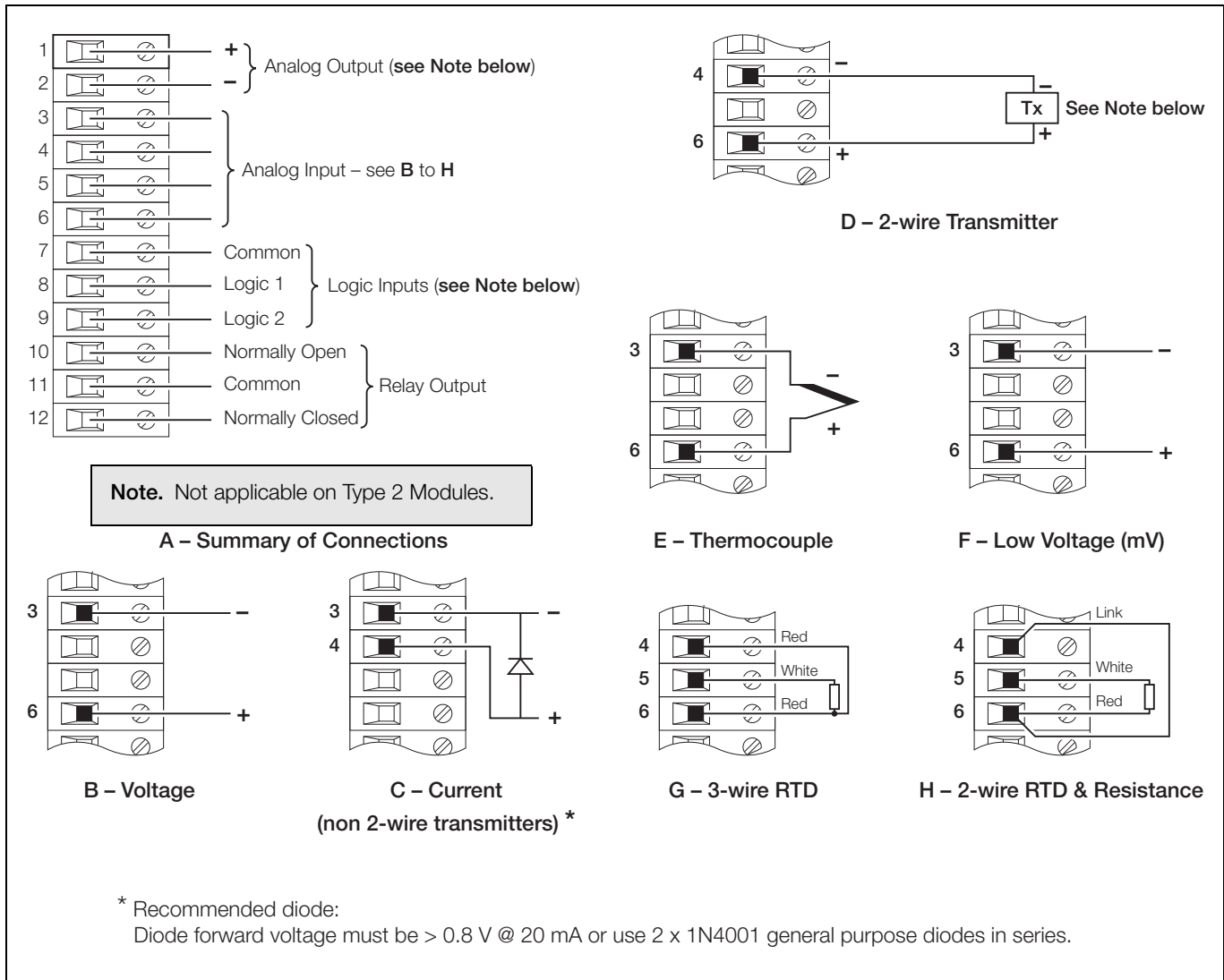
Fig. 5.5 Channel Connections

5.3 Module Connections

5.3.1 Standard I/O or Analog + Relay (Module Types 1, 2 and 7)

The connections are the same as Channel connections to the main board. Refer to Section 5.2.

5.3.2 Four Relay Module (Module Type 3)
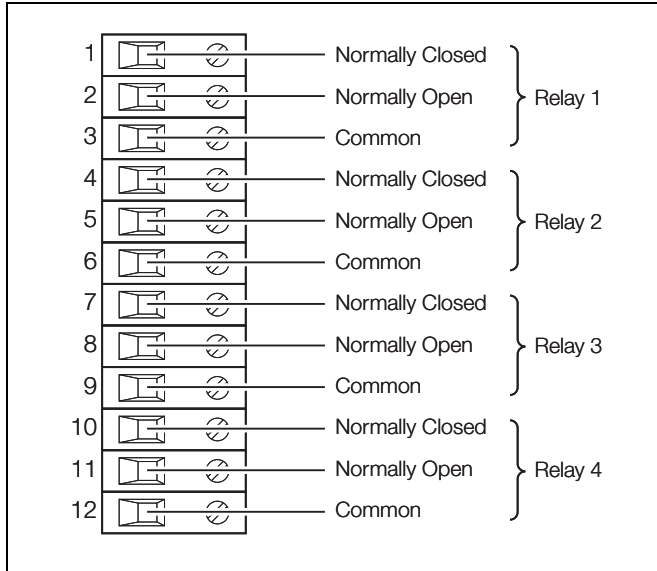
Fig. 5.6 Four Relay Module Connections (Module Type 3)

5.3.3 Eight Digital Inputs or Outputs (Module Types 4 and 5 respectively)

A plug-in link is used to select the board's function; digital inputs or digital outputs – see Fig. 5.7. The maximum current drain from each TTL output must not exceed 5mA.
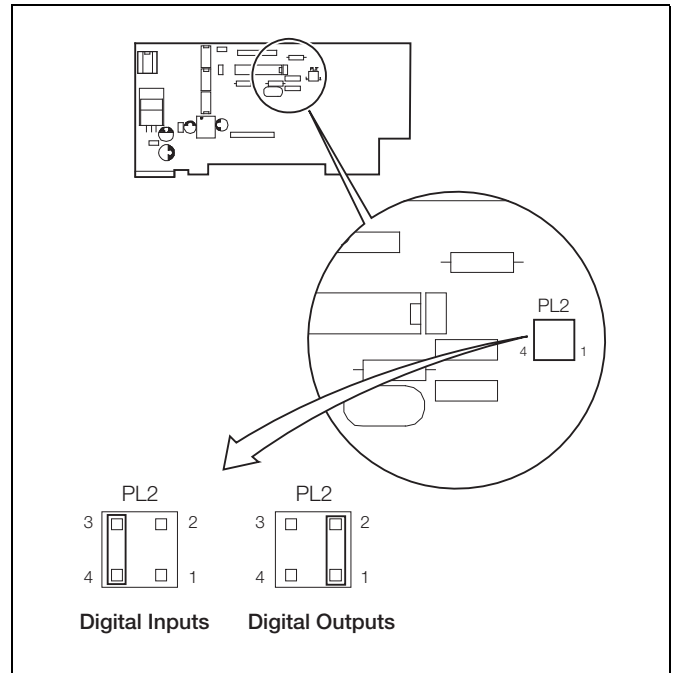
Fig. 5.7 Selecting the Digital Module Function (Module Types 4 and 5)
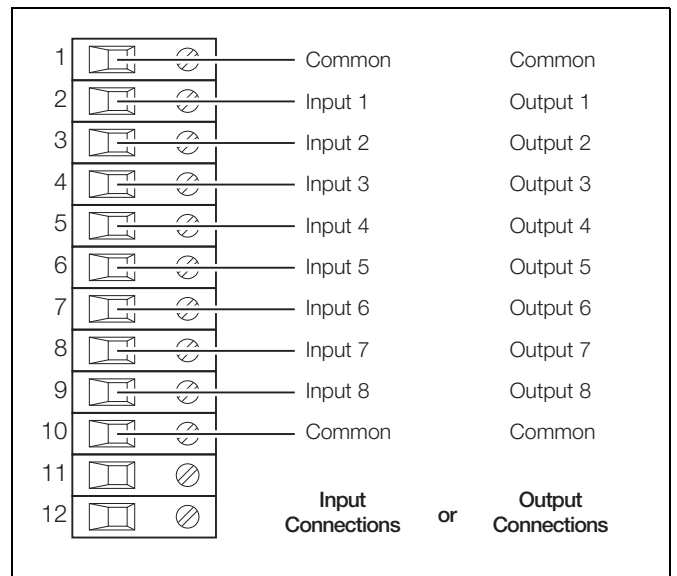
Fig. 5.8 Eight Digital Inputs or Outputs Connections (Module Types 4 and 5)

5.4 Power Supply Selection and AC Connections

Power Switch (Optional)

Fuse (Optional)
– see **Note 1** below

Line

Neutral

Earth (Ground) Stud –
see **Note 2** below

Remove Plug, Connect
Power Supply Leads to
Plug and Refit Plug

Warning. If the optional internal power switch and fuse are not fitted, an external disconnection device and fuse must be fitted – see also **Warnings** on Page 63.

Line

Neutral

Warning. Before making any electrical connections, see **Warnings** on page 63.

Notes.

1. Fuse rating – 500mA (20 X 5mm) Type T.

2. Ensure that the Earth (Ground) lead is longer than the Line and Neutral leads.

Fig. 5.9 Power Supply Selection and AC Connections

6 Fault Diagnosis

Symptom	Possible Cause	Action
Recorder does not power up	a) Internal fuse (if fitted) is blown b) Internal power switch (if fitted) is OFF c) Power supply connections are incorrect	a) Check wiring, rectify fault and replace fuse b) Turn power switch ON c) Check connections
Chart does not appear to move	a) Very slow chart duration selected – see Section 3.4, page 20 b) **Stop Chart Source** selected – see Section 3.4, page 20	a) Select required chart duration in **Common Configuration** – see Section 3.4, page 20 b) Set **Stop Chart Source** to **None** – see Section 3.4, page 20
Pens in recording position but do not drop onto paper	**Stop Chart Source** selected – see Section 3.4, page 20	Set **Stop Chart Source** to **None** – see Section 3.4, page 20
Red pen does not move beyond 94% position on chart	When real-time event pen is fitted the red pen cannot go beyond 94% to prevent pens clashing	Use chart range that prevents the need to go beyond 94% of maximum on chart
Pen lift key on front panel does not work	Pen lift key is disabled	Set **Pen Lift Enable** to **YES** – see Section 3.4, page 20
Pens do not remain lifted when pen lift key is used	Auto pen drop feature is enabled	Set **Auto Pen Drop** to **NO** – see Section 3.4, page 20
Analog inputs are slow to respond	A large filter time has been set	Set Pen X Filter to a value that gives the required response – see Section 3.5, page 24
Time or date incorrect	Not set for correct local time	Set correct time and date – see Section 3.12, page 50
Totalizers cannot be reset by the Operator	Totalizer reset function is not enabled	Set **Totalizer Reset** to **YES** – see Section 3.4, page 20
External relays connected to relays in instrument fail to de-energize	Arc suppression capacitors are provided across the relay contacts and capacitor leakage current may be sufficient to prevent an external relay from de-energizing	Remove the arc suppression components: ■ R13 and R14 on mainboard ■ R1 and R7 on standard I/O and analog relay module ■ IC3 to IC10 on 4 relay module

Table 6.1 Fault Diagnosis

7 Spares and Accessories

Item	Part No.

Pen Capsules (pack of 3)

Black.. C1900/0119
Blue C1900/0120
Red... C1900/0121
Green.. C1900/0122
Violet* C1900/0123

Pen Arm Assemblies

ER/C Type Chart (J or R in Code Number) – Standard Pen C1900/0076
ER/C Type Chart (J or R in Code Number) – Event Pen... C1900/0078
PX105 and PXR105 Type Chart (K or S in Code Number) – Standard Pen C1900/0075
PX105 and PXR105 Type Chart (K or S in Code Number) – Event Pen C1900/0077

Fuses

100 to 240V B11069 (500mA)

*True time line event option only.

(Kit contains 2 sets of items shown)

Pen Capsule
1 to 4
(depending on
no. of channels)

Charts
(Pack of 3)

Pipe-mounting Kit
C1900/1713

Keys
(Door lock versions only)

**Wall-mounting Brackets, Bolts
and Washers (4 of each)**

Case-to-Panel Gasket
C1900/0149
(see **Note** below)

A – Standard Accessories

B – Optional Accessories

Note. If panel-mounting to NEMA 4X hosedown standard is required, a continuous bead of suitable silicon sealant *must* be applied between the case flange and the panel. *Do not* use the optional gasket.

Fig. 7.1 Accessories

8 Specification

Construction

Size	15.23 in. (h) x 15.04 in. (w) x 5.57 in. (d) (386.8 x 382.0 x 135mm)
Weight	18lb (8.2kg)
Case material	Glassfiber-filled reinforced polyester
Window material	Polycarbonate or glass
Door latch	High-compression with optional lock

Environmental

Operational temperature range	0° to 55°C (32° to 130°F)
Operational humidity range	5 to 95%RH (non-condensing) 5 to 80%RH (chart only)
Case sealing	NEMA 3 (IP54) NEMA 4X (IP66) (optional)

Installation

Mounting options	Panel, wall or pipe
Terminal type	Screw
Wire size (max)	14 AWG (I/O), 12 AWG (power)

Operation and Configuration

Programming method	Via front panel keys
Security	Password-protected menus

Safety

General safety	EN61010
Installation category	II
Pollution degree	2
Dielectric	500V DC (channel/channel) 2kV DC (channel/ground)
Memory protection	Nonvolatile FRAM
Approvals	CE CSA General Safety (option) UL General Safety (option)

Power Supply

Voltage	100 to 240V AC ±10% (90V min. to 264V AC max.), 50/60Hz
Consumption	<30 VA (typical for full spec. unit)
Line interruption	Up to 60ms

Process Inputs and Outputs

General

Noise Rejection	Common mode >120dB at 50/60Hz Normal (series) mode >60dB at 50/60Hz
CJC rejection ratio	<0.05°C/°C (0.1°F/°F)
Sensor break protection	Upscale or downscale drive
Out of range detection	0 to 100% of engineering span
Temperature stability	<0.02% of reading/°C (0.04% of reading/°F) or 1µV/°C
Long-term drift	<0.01% of reading or 10µV annually
Input impedance	>10MW (mV and V inputs) 39W (mA input)

Analog Inputs

Signal types	mV, V, mA, W
Thermocouple types	B, E, J, K, N, R, S, T
Resistance thermometer	Pt 100
Other linearizations	$x^{1/2}$, $x^{3/2}$, $x^{5/2}$, linear
Sample interval	250ms per channel
Dielectric	500V DC channel/channel
Digital filter	0 to 60s (programmable)
Engineering range	–999 to 9999

Type	Range Low	Range High	Minimum Span	Accuracy
mV	0	150	5	±0.1% reading or 10µV
V	0	5	0.1	±0.1% reading or 20mV
mA	0	50	1	±0.2% reading or 0.2µA
Ohms (low)	0	750	20	±0.2% reading or 0.1W
Ohms (high)	0	10k	400	±0.5% reading or 10Ω

Table 8.1 Analog Input Performance

Type	°C		°F		Accuracy (excluding CJC)
	Range Low	Range High	Range Low	Range High	
B	–18	1800	0	3270	±2.0°C (above 200°C) (3.6°F [above 434°F])
E	–100	900	–140	1650	±0.5°C (0.9°F)
J	–100	900	–140	1650	±0.5°C (0.9°F)
K	–100	1300	–140	2350	±0.5°C (0.9°F)
N	–200	1300	–325	2350	±0.5°C (0.9°F)
R	–18	1700	0	3000	±1.0°C (above 300°) (1.8°F [above 572°F])
S	–18	1700	0	3000	±1.0°C (above 200°C) (1.8°F [above 434°F])
T	–250	300	–400	550	±0.5°C (0.9°F)
PT100	–200	600	–325	1100	±0.5°C (0.9°F)

Table 8.2 Thermocouple Performance

2-Wire Transmitter Power Supplies

Number	1 per channel
Voltage	24V DC nominal
Drive	Up to 25mA
Isolation	500V DC channel-to-channel

Analog Outputs

Type	4 to 20mA
Accuracy	±0.1%
Maximum load	750W
Dielectric	500V DC

Relay Outputs

Type	SPDT
Rating (with non-inductive load)	5A at 115/230V AC

Digital Inputs

Type	TTL or volt-free
Minimum pulse	250ms
Dielectric	500V DC between modules, no isolation within module

Digital Outputs

Type	5V TTL
Rating	5mA per output
Dielectric	500V DC between modules, no isolation within module

Serial Communications

Connections	RS485, 4-wire
Protocol	Modbus RTU

Data Logging

Memory card type	Compact Flash Type 1
Card size	Max. 1GB
Recording Duration	See table below

(4 Channels)	128MB	256MB	512MB	1GB
1 s	1.1 months	2.3 months	4.5 months	8.8 months
5 s	5.6 months	11.3 months	1.9 years	3.6 years
10 s	11.3 months	1.9 years	3.7 years	7.2 years
30 s	2.8 years	5.6 years	11.1 years	21.7 years
60 s	5.6 years	11.1 years	22.2 years	43.4 years
5 min.	27.8 years	55.5 years	111.0 years	216.8 years
10 min.	55.5 years	111.0 years	222.1 years	433.7 years
30 min.	166.5 years	333.1 years	666.2 years	1301.1 years
1 hour	333.1 years	666.2 years	1332.3 years	2602.2 years
6 hour	1998.5 years	3996.9 years	7993.9 years	15613.1 years

Table 8.3 Recording Duration

Recording System
Pens

Number	1, 2, 3, or 4 (red, green, blue, black)
Response	7 seconds (full scale)
Resolution	0.1% steps
Pen lift	Motor-driven, with optional autodrop

Event Pens

Standard	3-position event recording on any channel
Real time	3-position event recording on the same time line as Pen 1

Chart

Chart size	10 in. or 105mm
Chart speed	1 to 167 hours or 7 to 32 days per revolution
Rotation accuracy	<0.5% of rotation time

Graphical Display Panels
Displays

Number	1 (1 or 2 pens) or 2 (3 or 4 pens)
Type	High contrast 128 x 64 STN dot matrix LCD (graphics) module
Status indicators	Indicate channel number on display
Alarm indicators	Indicate channel with active alarms

Panel keys

Function	Programming access, increment/decrement, pen lift and menu key

Alarms and Logic
Alarms

Number	4 per channel
Type	High/low process, fast/slow rate of change, time delay
Adjustments	Hysteresis, time delay
Alarm indicators	Indicate channel with active alarms

Logic Equations

Number	4
Function	OR, AND
Inputs	Alarm states, digital inputs, totalizers, logic
Outputs	Relays, digital outputs, chart stop, alarm acknowledge

Advanced Software Functions
Totalizers

Number	Up to 4
Size	999,999,999 max.
Output	External counter driver, 'wrap' pulse signal
Totalizer log	Max. 21 entries per totalizer

Math

Number of equations	4
Type	+, −, x, ÷, low & high select, maximum, minimum, average, mass flow, RH

Timers

Number	2
Type	Real-time clock driven event, adjustable duration
Output	Relay, digital output, logic equation

EMC
Emissions and Immunity

Meets requirements of:

EN50081-2

EN50082-2

EN61326 for an industrial environment

CE Mark

Module Type	I/O Per Module							Max. No. Per Instrument
	Analog I/P	Analog O/P	Trans. PSU	Relays	Digital I/P	Digital O/P	Comms.	
Standard I/O	1	1	1	1	2			4
4 relays				4				2
8 digital I/P					8			3
8 digital O/P						8		3
RS485 comms.							1	1

Table 8.4 Option Module Types

Appendix A – Signal Sources

Source	Description
None	No source required
Pen 1 to Pen 4	Process variable assigned to Pen 1 Process variable assigned to Pen 2 Process variable assigned to Pen 3 Process variable assigned to Pen 4
Math Block 1 to Math Block 4	Result of Math Block 1 Result of Math Block 2 Result of Math Block 3 } Available only if Math software option enabled by installation of appropriate software key Result of Math Block 4
Constant 1 to Constant 8	} Available only if Math software option enabled by installation of appropriate software key
Input 1 to Input 6	} Analog inputs 1 to 6
Alarm A1 to Alarm D1	Alarm A Alarm B Alarm C } Channel 1 Alarms (if applicable) Alarm D
Alarm A2 to Alarm D2	Alarm A Alarm B Alarm C } Channel 2 Alarms (if applicable) Alarm D
Alarm A3 to Alarm D3	Alarm A Alarm B Alarm C } Channel 3 Alarms (if applicable) Alarm D
Alarm A4 to Alarm D4	Alarm A Alarm B Alarm C } Channel 4 Alarms (if applicable) Alarm D
Dig Input Main 1 to Dig Input Mod6 8	Digital input module 1 input 1 Digital input module 6 input 8 Available only if digital input module fitted
Tot 1 Count Tot 1 Wrap to Tot 4 Count Tot 4 Wrap	Totalizer 1 external counter drive Wrap around on totalizer 1 } Available only if Totalizer software option enabled by installation of appropriate software key Totalizer 4 external counter drive Wrap around on totalizer 4
Equation 1 to Equation 8	Programmable logic equation 1 Programmable logic equation 8
Timer 1 Timer 2	Real time event 1 } Available only if Timers software option enabled by installation of appropriate software key Real time event 2

Table A.1 Signal Sources

Appendix B – Units

Number	Unit	Description
1	deg C	Degrees Celsius
2	deg F	Degrees Fahrenheit
3	Kelvin	Degrees Kelvin
4	%RH	% Relative Humidity
5	%	%
6	ppm	parts per million
7	ppb	parts per billion
8	pH	potential Hydrogen
9	l/d	liters per day
10	l/h	liters per hour
11	l/m	liters per minute
12	l/s	liters per second
13	Ml/d	megaliters per day
14	Ml/h	megaliters per hour
15	Ml/m	megaliters per minute
16	Ml/s	megaliters per second
17	gal/d (Imp)	imperial gallons per day
18	gal/h (Imp)	imperial gallons per hour
19	gal/m (Imp)	imperial gallons per minute
20	gal/s (Imp)	imperial gallons per second
21	Mgal/d (Imp)	imperial mega gallons per day
22	gal/d (US)	US gallons per day
23	gal/h (US)	US gallons per hour
24	gal/m (US)	US gallons per minute
25	gal/s (US)	US gallons per second
26	Mgal/d (US)	US mega gallons
27	m3/d	cubic meters per day
28	m3/h	cubic meters per hour
29	m3/m	cubic meters per minute
30	m3/s	cubic meters per second
31	ft3/d	cubic feet per day
32	ft3/h	cubic feet per hour
33	ft3/m	cubic feet per minute
34	ft3/s	cubic feet per second
35	SCFM	standard cubic feet per minute
36	kg/d	kilograms per day
37	kg/h	kilograms per hour
38	kg/m	kilograms per minute
39	kg/s	kilograms per second
40	T/d	metric tonnes per day
41	T/h	metric tonnes per hour
42	T/m	metric tonnes per minute

Table B.1 Units

Number	Unit	Description
43	T/s	metric tonnes per second
44	lb/d	pounds per day
45	lb/h	pounds per hour
46	lb/m	pounds per minute
47	lb/s	pounds per second
48	ton/d	imperial tons per day
49	ton/h	imperial tons per hour
50	ton/m	imperial tons per minute
51	ton/s	imperial tons per second
52	ug/kg	micrograms per kilogram
53	mg/kg	milligrams per kilogram
54	l	liters
55	ml	milliliters
56	kl	kiloliters
57	Ml	megaliters
58	m	meters
59	gal	imperial gallons
60	g x 10	imperial gallons x 10
61	g x100	imperial gallons x 100
62	kgal	imperial kilo gallons
63	Mgal	imperial mega gallons
64	gal	us gallons
65	g x 10	us gallons x 10
66	g x100	us gallons x 100
67	kgal	us kilo gallons
68	Mgal	us mega gallons
69	m3	cubic meters
70	km3	kilo cubic meters
71	Mm3	mega cubic meters
72	CUMEC	cubic meter of water per second
73	kg	kilograms
74	T	tons
75	kT	kilotons
76	lb	pounds
77	ton	imperial tons
78	mbar	millibar
79	bar	bar
80	m WG	meters water gauge
81	Hz	hertz
82	kHz	kilohertz
83	% sat	% saturation
84	%O2	% oxygen

Table B.1 Units (Continued)

Number	Unit	Description
85	%N2	% nitrogen
86	%HCl	% hydrochloric acid
87	NTU	nephelometric turbidity units
88	FTU	formazine turbidity units
89	%OBS	% obscuration
90	btu	british thermal units
91	ft3	cubic feet
92	kft3	kilo cubic feet
93	Mft3	mega cubic feet
94	g/l	grams per liter
95	g/h	grams per hour
96	g/d	grams per day
97	ml/m	milliliters per minute
98	ml/h	milliliters per hour
99	%dO2	% dissolved oxygen
100	uV	microvolts
101	mV	millivolts
102	MV	megavolts
103	A	amps
104	mho	conductance
105	S	Siemens
106	uS/cm	microSiemens per centimeter
107	mS/cm	milliSiemens per centimeter
108	uS/m	microSiemens per meter
109	mS/m	milliSiemens per meter
110	Feet	imperial feet
111	AcreFt	volume of water, 1ft deep, covering an area of 1 acre
112	Inches	imperial inches
113	Custom	user defined units

Table B.1 Units (Continued)

Appendix C – Installation Record

Position 1

Module Type 1 ☑

Link Positions *(Tick Boxes)*

Analog Output *	+	1
	–	2
Analog Input		3
		4
		5
		6
Logic Inputs *	C	7
	L1	8
	L2	9
Relay Output	NO	10
	C	1
	NC	12

Position 2

Module Type *(Tick Box)* 1 ☐ 2 ☐

Link Positions *(Tick Boxes)*

Analog Output *	+	1
	–	2
Analog Input		3
		4
		5
		6
Logic Inputs *	C	7
	L1	8
	L2	9
Relay Output	NO	10
	C	1
	NC	12

* Not applicable on Module Type 2

Position 3

Module Type *(Tick Box)* 1 ☐ 2 ☐

Link Positions *(Tick Boxes)*

Analog Output *	+	1
	–	2
Analog Input		3
		4
		5
		6
Logic Inputs *	C	7
	L1	8
	L2	9
Relay Output	NO	10
	C	1
	NC	12

* Not applicable on Module Type 2

Position 4

Module Type *(Tick Box)* 1 ☐ 2 ☐ 6 ☐ 7 ☐

Link Positions *(Tick Boxes)*

Analog Output *	+	1
	–	2
Analog Input		3
		4
		5
		6
Logic Inputs *	C	7
	L1	8
	L2	9
Relay Output	NO	10
	C	1
	NC	12

* Not available on Module Type 2

4 ☐ 5 ☐

Logic I/Ps (Type 4) or Logic O/Ps (Type 5)

C	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8
8	9
C	10

Link Positions *(Tick Box)*

Type 4   Type 5

3 ☐

Relay Output 1	NC	1
	NO	2
	C	3
Relay Output 2	NC	4
	NO	5
	C	6
Relay Output 3	NC	7
	NO	8
	C	9
Relay Output 4	NC	10
	NO	1
	C	12

Position 5

Module Type *(Tick Box)* 2 ☐   3 ☐   4 ☐   5 ☐

		Terminal	
Analog Output *	1	+	
	2	–	
Analog Input	3		
	4		
	5		
	6		
Logic Inputs *	7	C	
	8	L1	
	9	L2	
Relay Output	10	NO	
	1	C	
	12	NC	

Link Positions *(Tick Boxes)*

	Terminal		
Relay Output 1	1	NC	
	2	NO	
	3	C	
Relay Output 2	4	NC	
	5	NO	
	6	C	
Relay Output 3	7	NC	
	8	NO	
	9	C	
Relay Output 4	10	NC	
	1	NO	
	12	C	

Logic I/Ps (Type 4) or Logic O?ps (Type 5)

	Terminal	
1	C	
2	1	
3	2	
4	3	
5	4	
6	5	
7	6	
8	7	
9	8	
10	C	

Link Positions *(Tick Box)*   Type 4 ☐   Type 5 ☐

* Not available on Module Type 2

Position 6

Module Type *(Tick Box)* 2 ☐   4 ☐   5 ☐

		Terminal	
Analog Output *	1	+	
	2	–	
Analog Input	3		
	4		
	5		
	6		
Logic Inputs *	7	C	
	8	L1	
	9	L2	
Relay Output	10	NO	
	1	C	
	12	NC	

Link Positions *(Tick Boxes)*

Logic I/Ps (Type 4) or Logic O/Ps (Type 5)

	Terminal	
1	C	
2	1	
3	2	
4	3	
5	4	
6	5	
7	6	
8	7	
9	8	
10	C	

Link Positions *(Tick Box)*   Type 4 ☐   Type 5 ☐

* Not available on Module Type 2

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Available only if
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Refer to Modbus
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Available only if
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Available only if enabled
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Common

Chart Duration
24 hours

Stop Chart Srce
None

Auto Pen Drop
YES

Pen Lift Enable
YES

Config Password
0000

Line Rejection
50 Hz

Pen Ch Display
Separate

Totals Display
Separate

Other Ch Display
NO

Alarm Adjust
NO

Totalizer Reset
NO

Contrast 1
100

Brightness 1
100

Channels

Select Channel
Pen 1

Pen 1 Tag
Input 1
Edit>

Pen 1 Input Type
High Ohm

Pen 1 Lin. Type
Type K

Pen 1 Units
18 gal/h
(Imp)

Pen 1 Elect. Hi
20.00 mA

Pen 1 Elect. Lo
4.00 mA

Pen 1 Dec. Point
XXXX.X

Pen 1 Eng. Hi
2500.0 gal/h

Pen 1 Eng. Lo
0000.0 gal/h

Pen 1 Chart Hi
2500.0 gal/h

Pen 1 Chart Lo
0000.0 gal/h

Pen 1 Brk Sensor
Downscale

Pen 1 Fault Lev.
10 %

Pen 1 Filter
Off

Alarms

Select Alarm
A1

A1 Type
Off

A1 Trip
0000.0 gal/h

A1 Hysteresis
0000.0 gal/h

A1 Time Hyst
0000 Secs

Totalizers

Select Totalizer

T1 Configuration

Tot 1 Source
Pen 1

Tot 1 Tag
Totalizer 1
Edit>

Tot 1 Count Dir
Up

Tot 1 Units
18 gal/h
(Imp)

Tot 1 Count Rate
00.0000
Manual

Tot 1 Cut Off
5000.0 gal/h

Tot 1 Preset
000005000
gal/h

Tot 1 Predet
000004500
gal/h

Tot 1 Wrap
YES

Tot 1 Reset Srce
Timed

Tot 1 Reset Days
Monday

Tot 1 Reset Hour
00:00

Tot 1 Run Source
None

Anything other than Timed

Tot 1 Log Enable
None

12 hours or 24 hours
selected

Tot 1 Log Start
00:00

OR

Select Totalizer

T1 Secure Total

Secure Total 1
000000000
gal

T1 Secure Reset
NO

Relays

Select Relay

Relay 1.1

Relay 1.1 Source

Alarm A1

Rly 1.1 Polarity
Negative

Digital I/O

Select Dig I/O

Output 6.1

Dout 6.1 Source

Alarm A1

Dout6.1 Polarity
Negative

OR

Select Dig I/O

Input 1.x

Din 1.x Polarity
Negative

Analog Output

Select Output

Analog Output 1

O/P1 Source
Pen 1

O/P1 Range High
2500.0 gal/h

O/P1 Range Low
0000.0 gal/h

O/P1 Elect High
020.0 mA

O/P1 Elect Low
004.0 mA

Logic Equations

Select Equation

Equation 1

Equation 1.1
Alarm A1
Invert>

Equation 1.2
AND

Equation 1.3
NOT   Alarm B1
Invert>

Equation 1.4
OR

Equation 1.5
Alarm C1
Invert>

Equation 1.6
XOR

Equation 1.7
None

Data Logging

Sample Rate
10 Seconds

Filter Type
Instantaneous

File Creation
On Pen Return

Instrument Tag
Boiler 1 Zone 3
Edit>

Pen 1 Short Tag
Pen 1
Edit>

Pen 2 Short Tag
Pen 2
Edit>

Pen 3 Short Tag
Pen 3
Edit>

Pen 4 Short Tag
Pen 4
Edit>

Serial Number
A/4590321/221
Edit>

Clock

System Time
Wednesday
26th May 2004
15:28:59

Set Clock
YES

Set Year
2004

Set Month
May

Set Date
26th

Set Day
Wednesday

Set Hour
15:00

Set Minute
15:28

Update - NO
Wednesday
26th May 2004
15:29:00

Pen Function

Select Pen
Pen 1

Pen 1 Function
Trend

Pen 1 Source
Input 1

Calibration

Select Cal
Pen 1

Pen 1 Input Cal

Reset Pen 1 Cal
NO
-9999.9 gal/h

Pen 1 Offset
0.0
-9999.9 gal/h

Pen 1 Span
1.0000
-9999.9 gal/h

OR

Select Cal
Pen 1

Pen 1 Chart Cal

Set Pen 1 High
0

Set Pen 1 Low
0