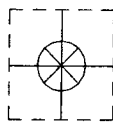


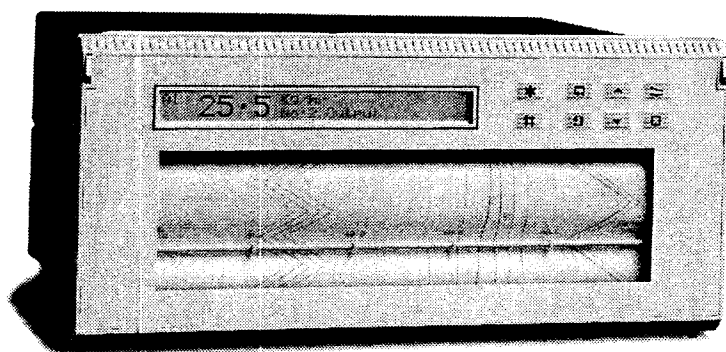
CE



# User's Guide



<http://www.omega.com>  
e-mail: [info@omega.com](mailto:info@omega.com)



## RD12000 User Guide

# GETTING STARTED

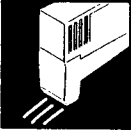



This 250mm strip chart recorder provides accurate and reliable recording of up to 24 channels. It also provides a range of advanced processing capabilities such as flow totalization, maths blocks, logic equations, configurable displays and full message printing.

With the option to fit PC memory card data storage, RS485 MODBUS communication and up to 18 alarm relays, the recorder becomes a very powerful signal processing tool.

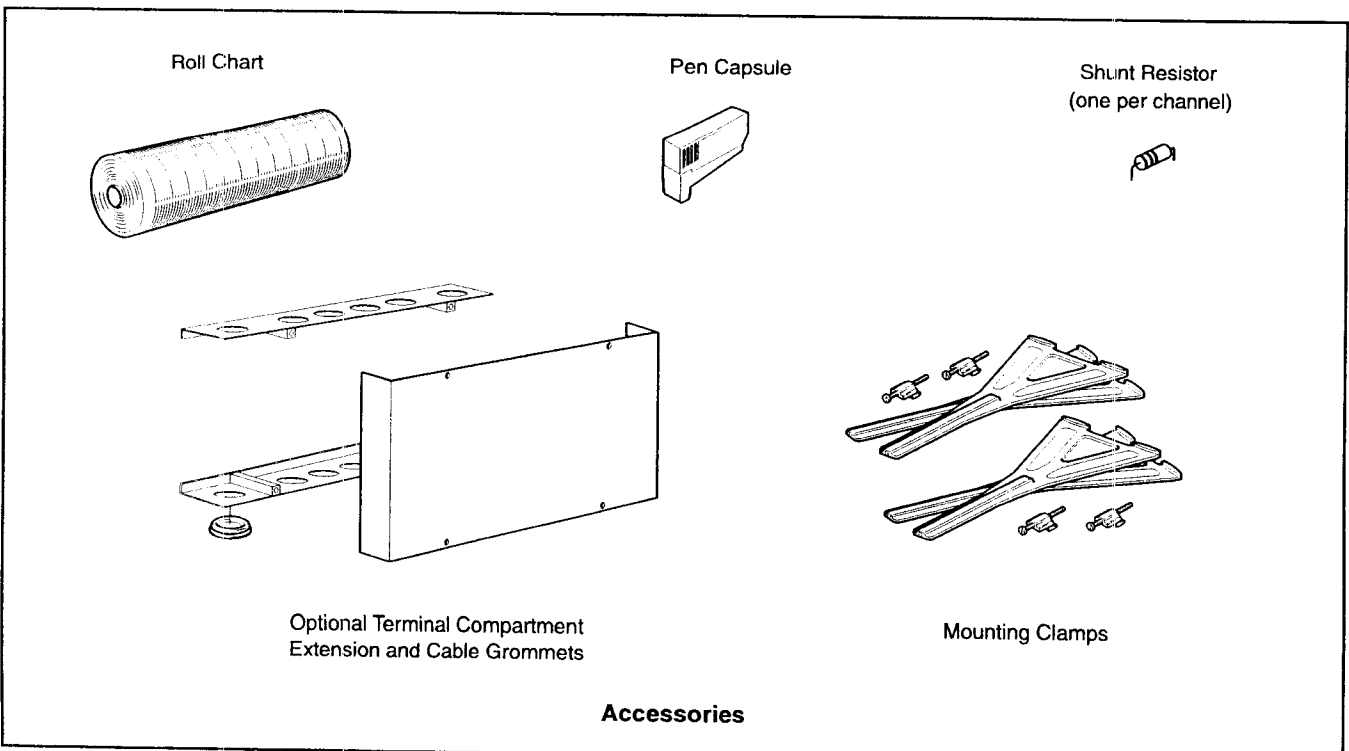
To assist the operator in analyzing any process problem the recorder has a unique Cue and Review system, allowing the user to examine historical data anywhere on the chart at the push of a button.

The recorder can be supplied for panel mounting or for portable use. The front facia, rated IP65, is resistant to hosedown and dusty environments.

The manual is divided into 4 Sections containing all the information required to install, configure and operate the recorder.

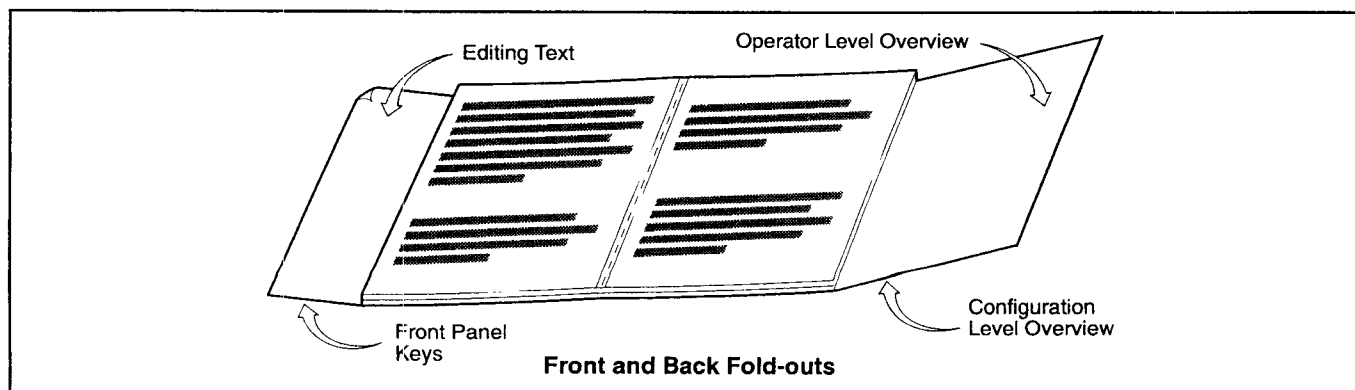
	Page		Page
	<b>CHARTS AND PENS</b>		<b>CONFIGURATION</b>
	3		24
	<ul style="list-style-type: none"><li>• Loading a Chart</li><li>• Fitting the Pen Capsule</li></ul>		<ul style="list-style-type: none"><li>• Security Access</li><li>• Input Configuration</li><li>• Alarm Configuration</li><li>• Chart Set Up</li><li>• Security Code Set Up</li><li>• Totalizer Set Up</li><li>• Maths Blocks</li><li>• Memory Card</li></ul>
	3 6		24 25 33 39 54 61 69 85
	<b>OPERATION</b>		<b>INSTALLATION</b>
	7		94
	<ul style="list-style-type: none"><li>• Viewing Data</li><li>• Selecting the Chart Speed</li><li>• Operator Messages</li><li>• Security</li></ul>		<ul style="list-style-type: none"><li>• Mounting</li><li>• Electrical Connections</li></ul>
	9 11 12 17		95 97

**Symbol Identification and Contents of Sections**

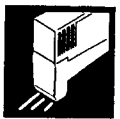


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# 1 CHARTS AND PENS



## 1.1 Loading a Chart

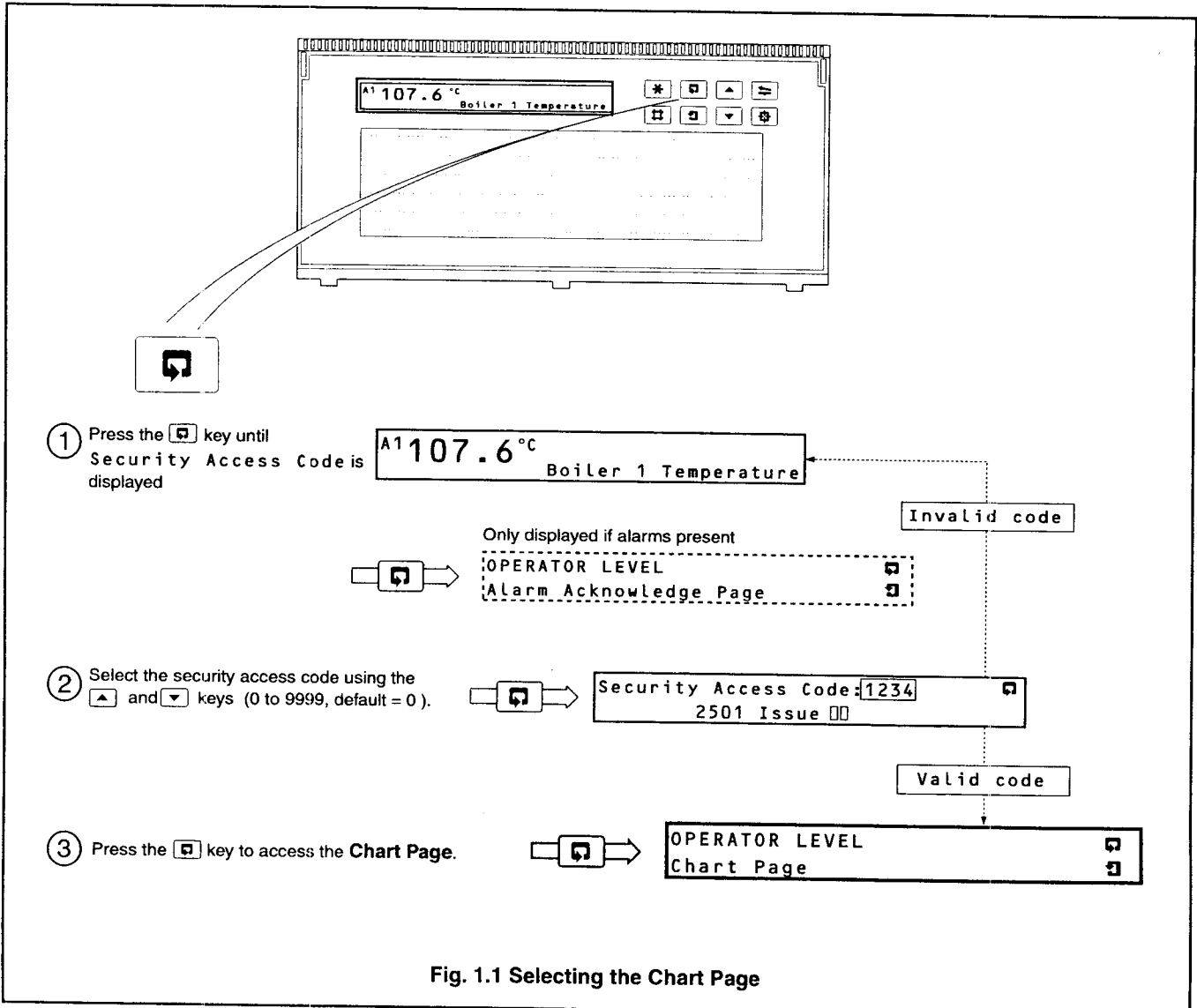


### Caution.

- Channel values and text messages are not recorded during chart reloading and therefore cannot be printed when the chart reload is complete.
- All alarms and relays operate normally during chart reload.
- Do not operate the instrument without the chart cassette fitted.

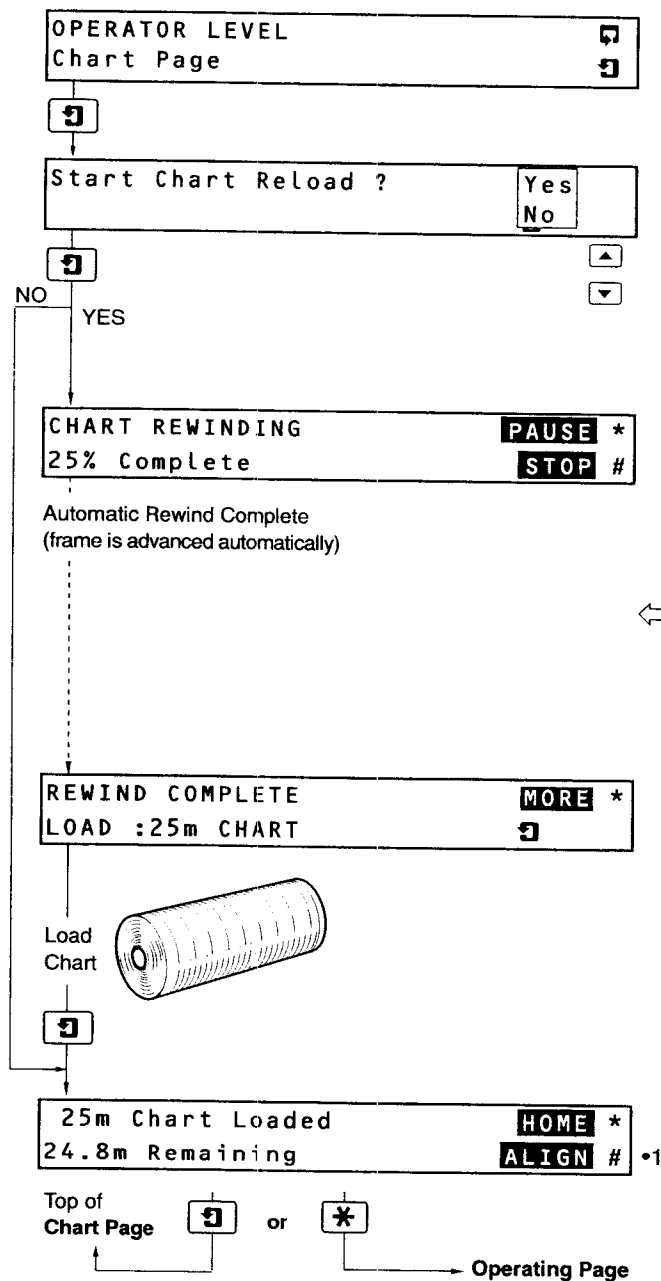
Chart loading is a four-step procedure:

- Select the **Chart Page** ..... This page – see Fig. 1.1
- Start automatic rewind of the old chart ..... Page 4
- Load the new chart ..... Page 5 – see Fig. 1.2
- Advance the chart to an appropriate time line ..... Page 4





## ...1.1 Loading a Chart – Fig. 1.2



Select the **Chart Page** – see Fig. 1.1, previous page.

### Start Chart Reload

To load a chart, select 'YES' using the key.

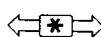
Press the key to start automatic rewind.

If the motor continues to drive when the chart paper is rewound, press the (STOP) key.



**Caution.** Do not press the key whilst the chart is winding. This action cancels automatic rewind and only manual rewind is available.

To pause the rewind press the key.



REWINDING PAUSED

To abort the rewind and continue recording, press the key while 'REWINDING PAUSED' is displayed.

### Load a New Chart

Remove the old chart and load new chart paper – see Fig. 1.2.

If necessary, press the key until any remaining chart is rewound.

Refit the chart cassette then press the key to take up any slack in the chart and resume recording.

### Completion

HOME: Press the key to go directly to the **Operating Page**.

or

ALIGN: Press the key to start time alignment.

### Time Alignment

The chart can be advanced to ensure that the time is printed on major time lines (1 hour graduations). Recording stops and the print head moves from side to side on the chart to enable precise adjustment onto a time line.

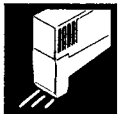


Time Alignment

Press the key to advance the chart to a time line.

Press the key to resume recording.

•1 The 'ALIGN' facility is displayed only if Time Alignment is enabled – see Section 3.4.1/ Chart Control Page/ Time Alignment.



## ...1.1 Loading a Chart – Fig. 1.2

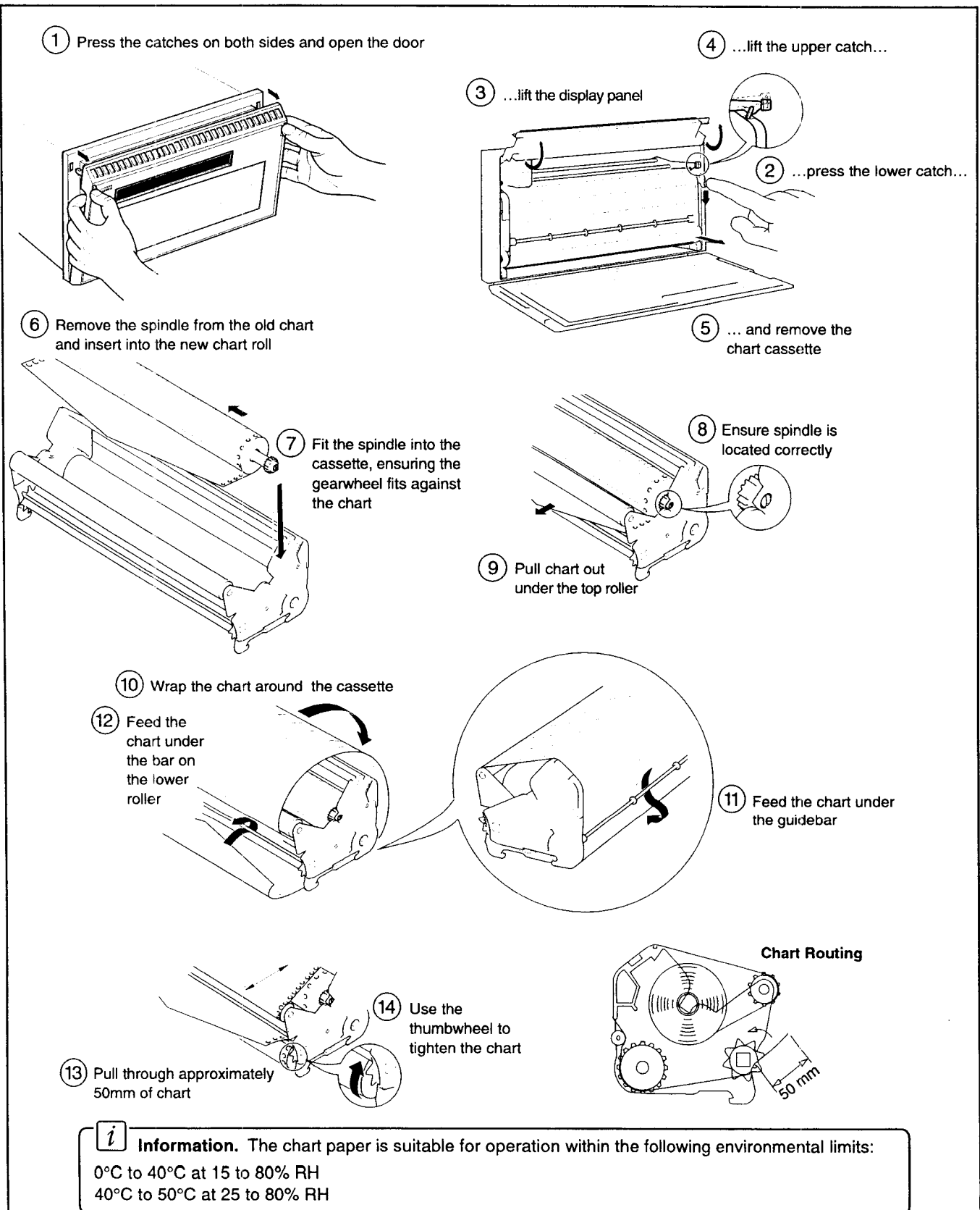


Fig. 1.2 Loading a Roll Chart



## 1.2 Fitting the Pen Capsule – Fig. 1.3

- a) Switch on the power supply.
- b) Fit a new capsule as shown in Fig. 1.3.



### Information.

- After fitting a new capsule the ink flow takes a short time to achieve full color density.
- More ink is used if the input signal being recorded changes rapidly. To prolong the life of the pen capsule do not select an input range which is oversensitive. If the input signal is noisy, use the digital filter to reduce the effect of the noise – see Section 3.2.1/ Input Set Up Page/ Filter Time.
- Two types of pen capsule are available, standard and high temperature. The high temperature capsule is designed for use by recorders operating at ambient temperatures consistently above 30°C (86°F).

①

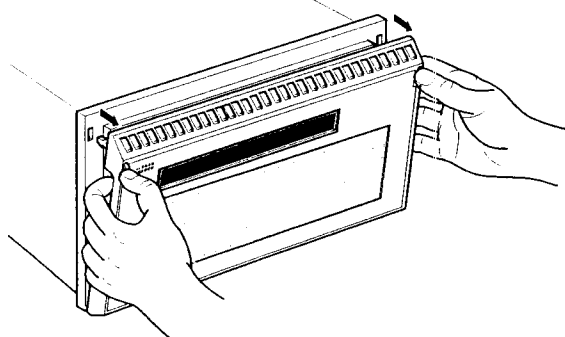
Activate the pen lift  
(raise the pens)



PEN LIFT  
ACTIVATED

②

Open the door

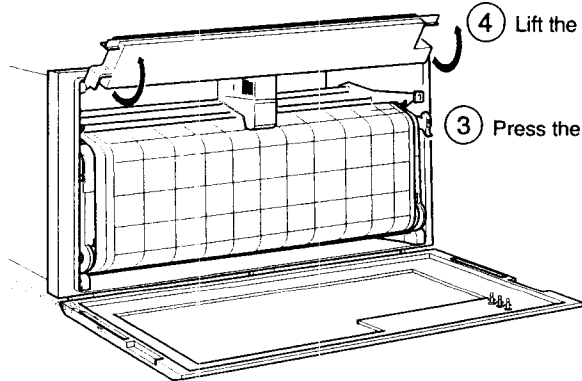


④

Lift the display panel

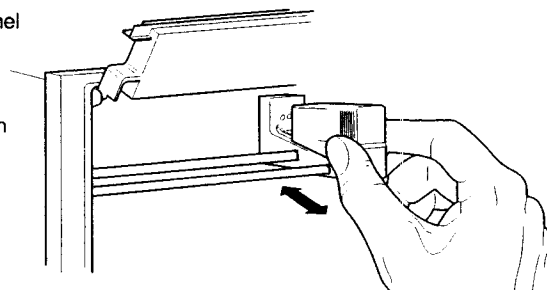
③

Press the lower catch



⑤

Remove/replace the pen capsule



⑥

Close the display panel

⑦

Close the door

⑧

De-activate the pen lift  
(lower the pens)



PEN LIFT  
DE-ACTIVATED



**Information.** Some resistance may be felt as the spring clip locates in the capsule.

Fig. 1.3 Fitting the Pen Capsule

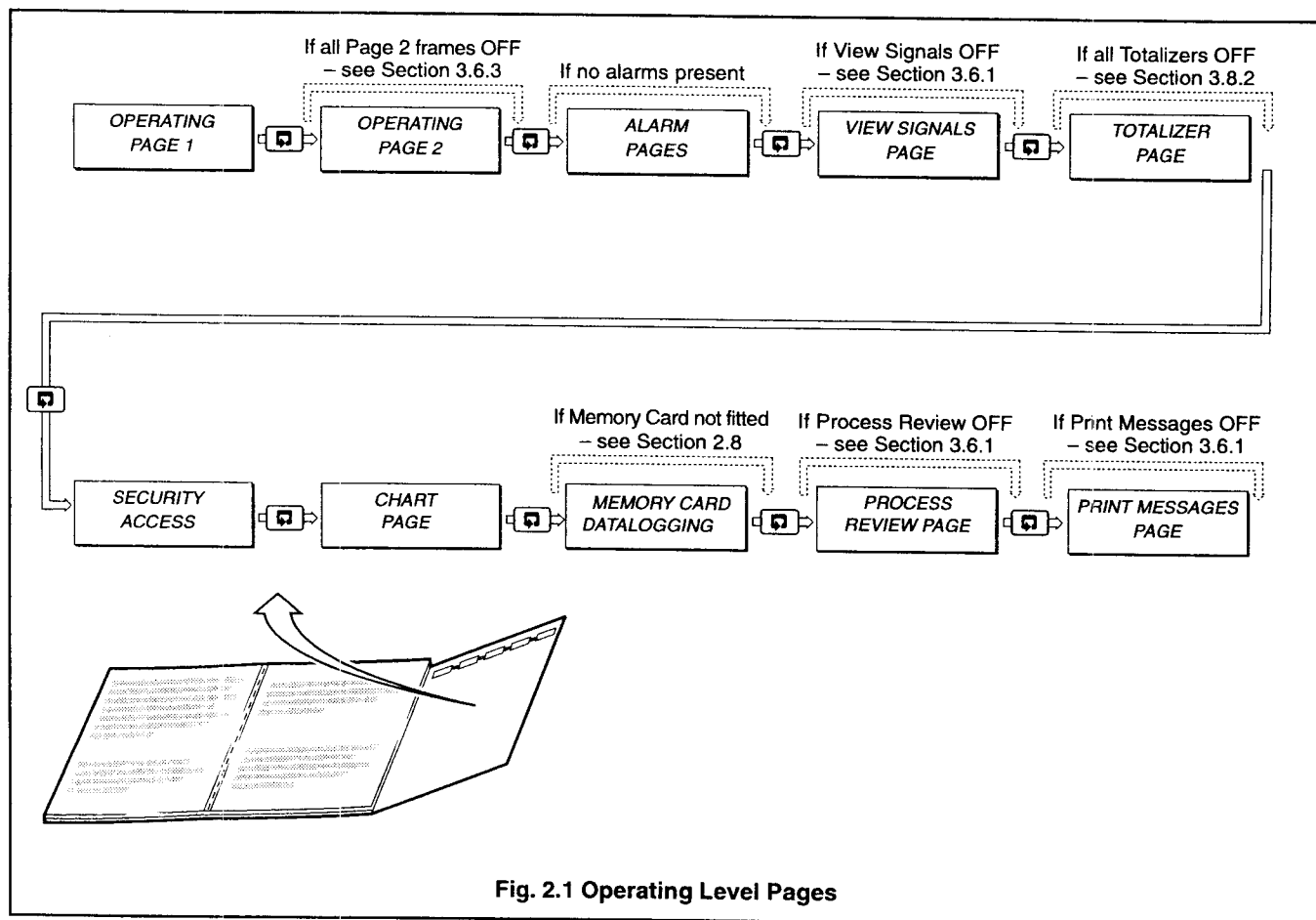
## 2 OPERATION



### 2.1 Introduction – Figs. 2.1 to 2.3

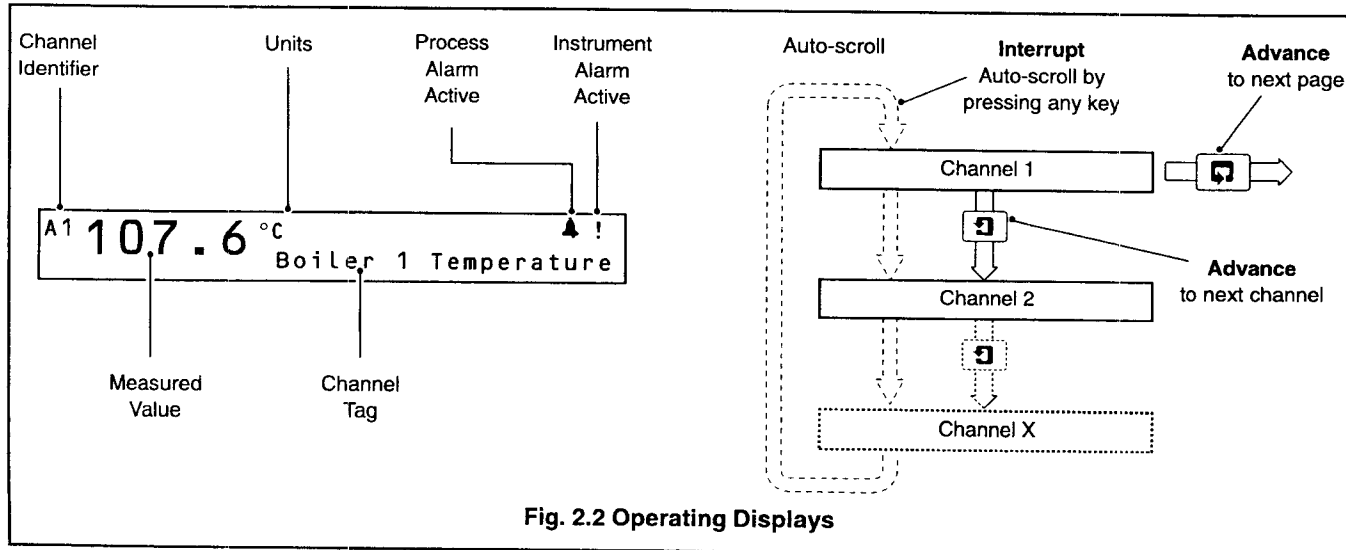
#### 2.1.1 Operator Level Pages – Fig. 2.1

An overview of the Operator Level pages is contained on the back fold-out.



#### 2.1.2 Operating Displays – Fig. 2.2

In the normal, day-to-day mode of the instrument, channel information is displayed sequentially (autoscroll active).

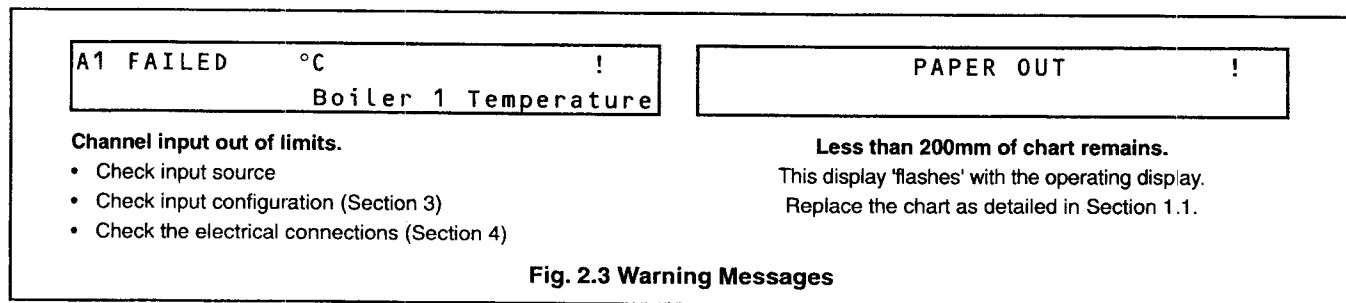






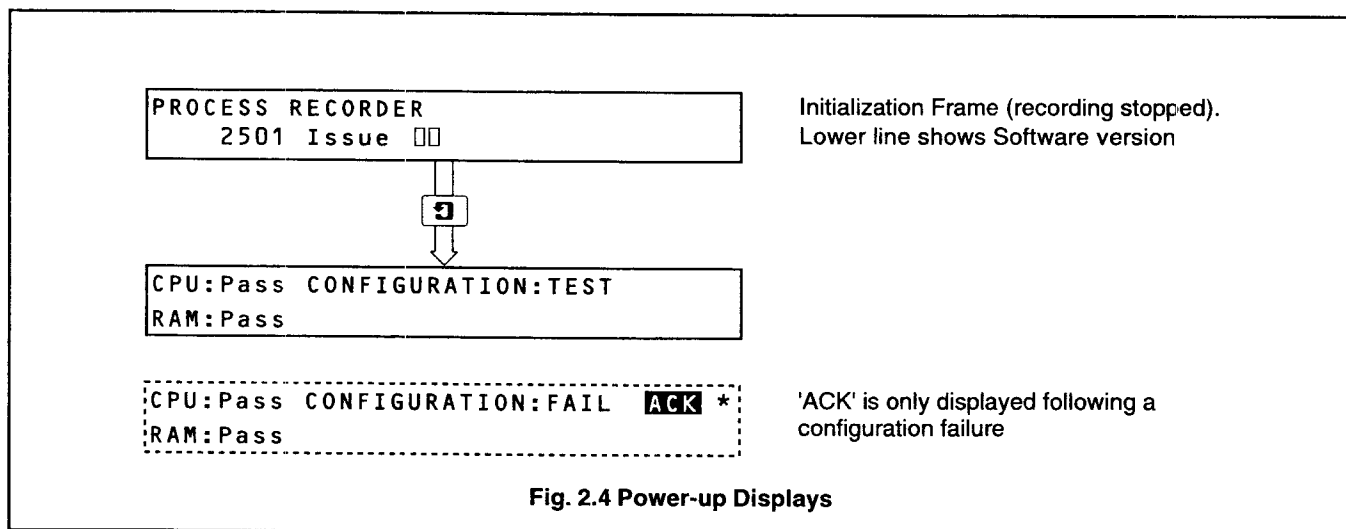
### 2.1.3 Warning Messages – Fig. 2.3

Warning messages provide instrument status and input warnings.



### 2.2 Instrument Start-up – Fig 2.4

On power-up the instrument carries out an automatic test of the CPU, RAM and Configuration. On completion a 'PASS' or 'FAIL' message is displayed. If a 'FAIL' message occurs press the **ACK \*** key to acknowledge the error and proceed as Table 2.1



Message	Action
CPU:Fail	Contact the local service organisation
RAM:Fail	
CONFIG:Fail	Power down and up. Press ACK * to clear the error. If message still displayed check the instrument configuration If message still displayed contact the local service organisation

Table 2.1 Start-up Error Messages



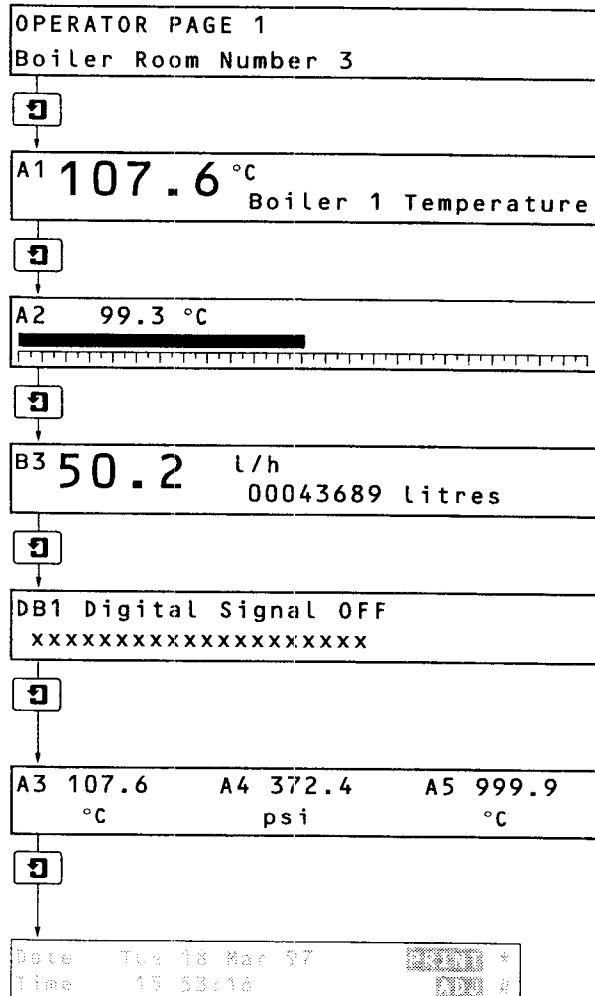
## 2.3 Operator Pages 1 and 2



**Information.** Operating pages 1 and 2 can be configured to display data from up to 12 analog inputs (A1 to D6, M1 to M8), the default setting is: Page 1 – A1 to A6, B1 to B6. Page 2 – C1 to C6, D1 to D6.

### 2.3.1 Viewing the Measured Values

Operator Pages 1 and 2 can be configured to display information in up to 5 different ways – see Section 3.6.3. In the normal, day-to-day mode of the instrument information for each channel is displayed sequentially (autoscroll). Press any key to interrupt the autoscroll sequence.



#### Operating Page Tag

This frame can be disabled.

– see Section 3.6.3/ Operating Pages 1 and 2/ Operating Page Title.

#### Standard Display

Channel ID, measured value, units and channel tag.

#### Bargraph Display

Channel ID, measured value, units, and bargraph indicator. The scale has major and minor divisions at 5% and 2.5% intervals respectively.

#### Totalizer Display

Channel ID assigned to total, measured value, units, total value and total value units.

#### Digital Signal Display

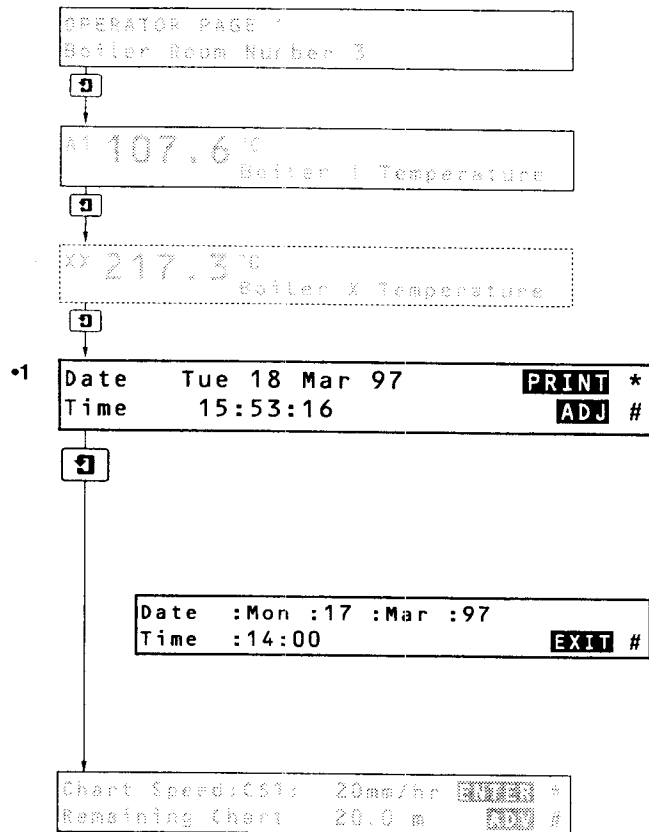
Digital signal ID, signal state and 20 character message. The message is assigned from the message block, one message per signal state – see Section 3.7.1/ Message Blocks Page/ Selecting a Message Block.

#### Multiple Display

Up to 3 channels can be displayed, showing the channel ID, value and engineering units.



### 2.3.2 Viewing the Date and Time



Press any key to interrupt the autoscroll sequence.

Press the **F1** key to select the **Date/Time** frame.

#### Date/Time

The current date and time are displayed.

Press the **\*** key to print the date and time on the chart.

Press the **#** key to access the adjustment frame.

#### Adjusting the Date and Time

Use the **▲** and **▼** keys to adjust each parameter.

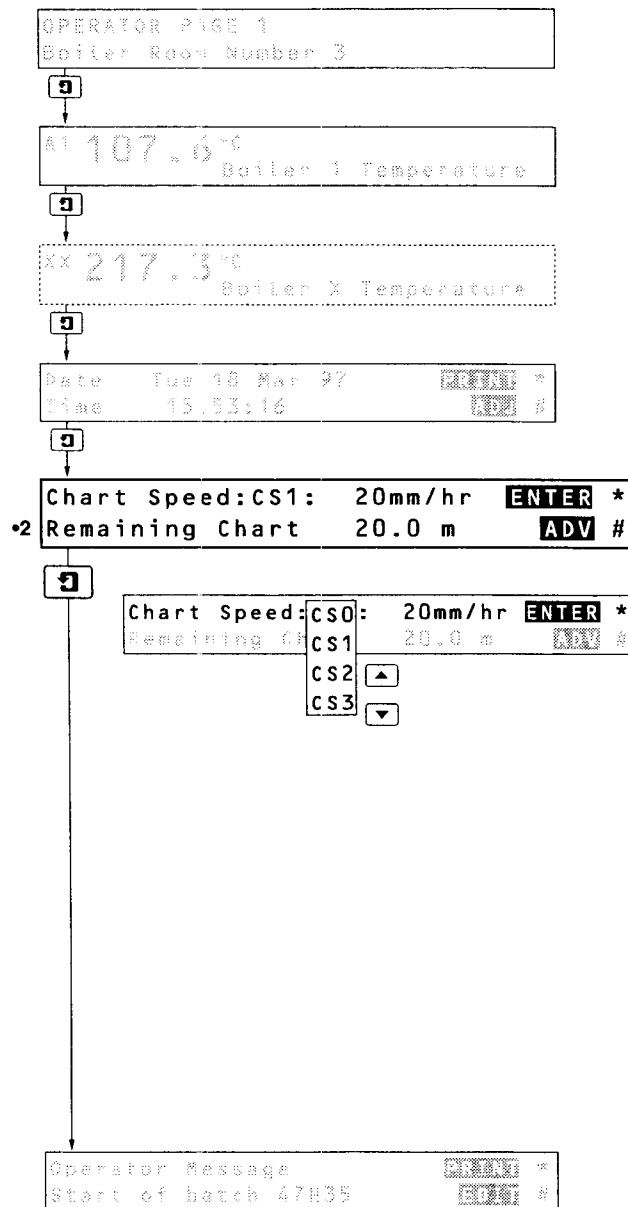
Press the **→** key to advance to the next parameter.

Press the **#** key to exit the adjustment frame.

- 1 The print facility is available only if enabled – see Section 3.6.1/ Operator Contents Page/ Operator Printing Enable.



### 2.3.3 Selecting the Chart Speed



Press the **F2** key to select the **Chart Speed** frame.

#### Chart Speed and Remaining Chart

The chart speed and length of chart remaining are displayed.

Use the **▲** and **▼** keys to select the preset chart speed. The chart speeds are set up in the Configuration level – see Section 3.4.1/ Chart Control Page/ Setting the Chart Speed.

Press the **\* (ENTER)** key to enter the selection.



**Note.** If CS0 is selected, 'Chart Stopped' is printed with the date and time. If another chart speed is selected and is set to 0mm/h (see Section 3.4.1/ Chart Control Page/ Setting the Chart Speed), 0mm/h is printed with the date and time.

#### Chart Advance

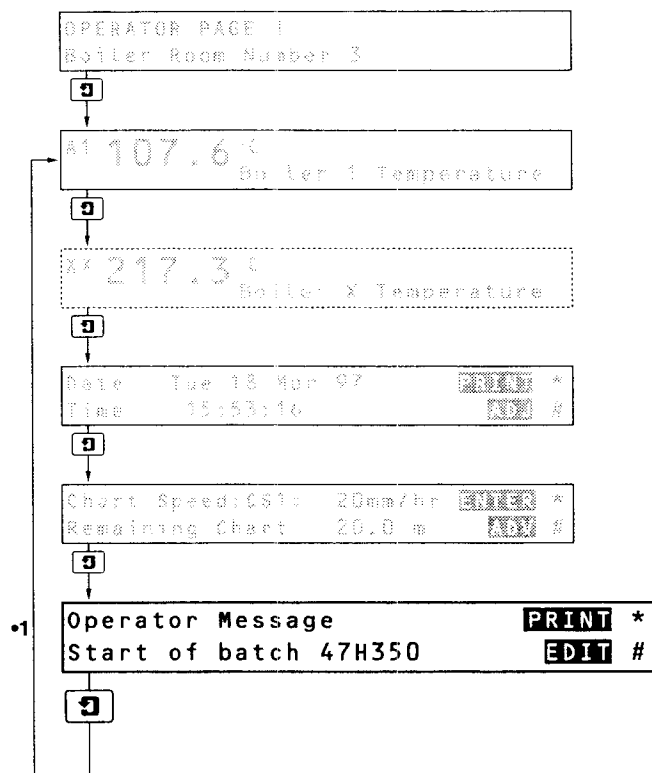
If required, the chart can be wound forward to create separation space. e.g between batches.

Press and hold the **ADV** key to advance the chart.

- 1 The 'Select Chart Speed' and 'Chart Advance' facilities are available only if enabled – see Section 3.4.1/ Chart Control Page/ Chart Speed Select or / Paper Advance.



### 2.3.4 Operator Messages



Press the **[F1]** key to access the Operator Message frame.

#### Operator Message

The Operator Message is displayed.

Press the **[F2]** key to print the displayed message on the chart.

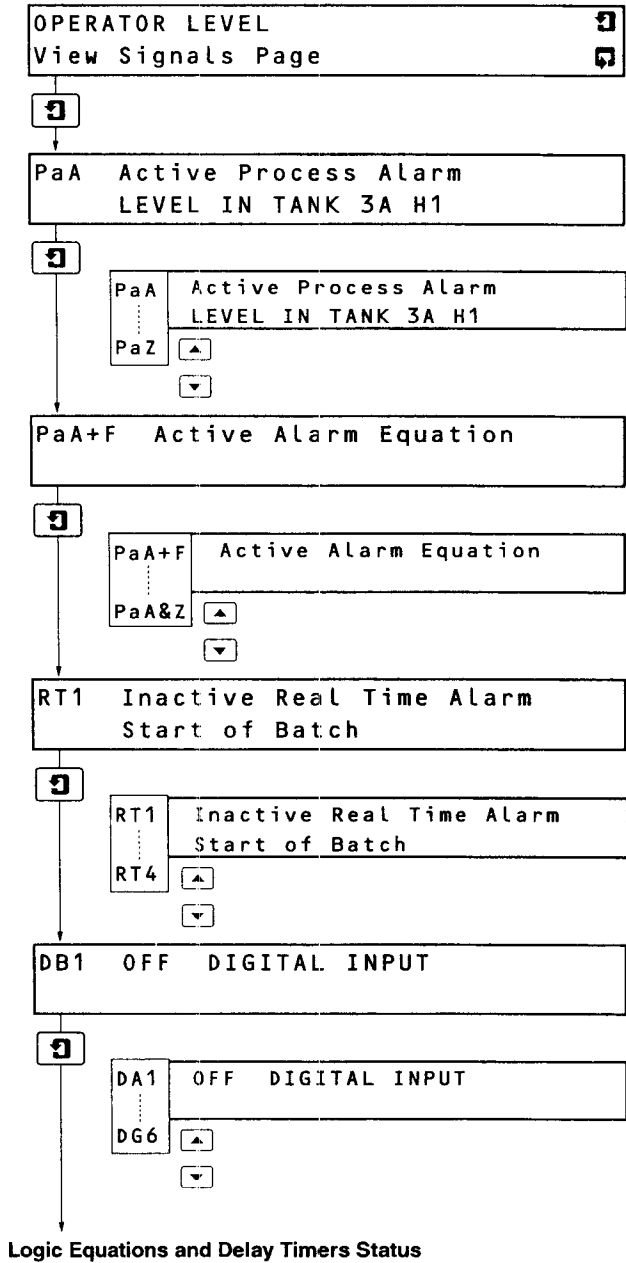
Press the **[F3]** key to edit the message – see front Fold-out.

- 1 The print facility is available only if enabled – see Section 3.6.1/ Operator Contents Page/ Operator Printing Enable.



2.4 View Signals Page

This page can be disabled – see Section 3.6.1/ Operator Contents Page/View Signals Page.



Press the key to access the **View Signals Page**.

**Process Alarm Status**  
Displays the status of any process alarm PaA to PaZ and a 20 character alarm message.

Select the process alarm to be displayed.

Press the key to advance to the next frame.

**Alarm Equation Status**  
Displays the status of any alarm equation.

Select the alarm equation to be displayed.

Press the key to advance to the next frame.

**Real Time Alarm Status**  
Displays the status of any real time alarm.

Select the real time alarm to be displayed.

Press the key to advance to the next frame.

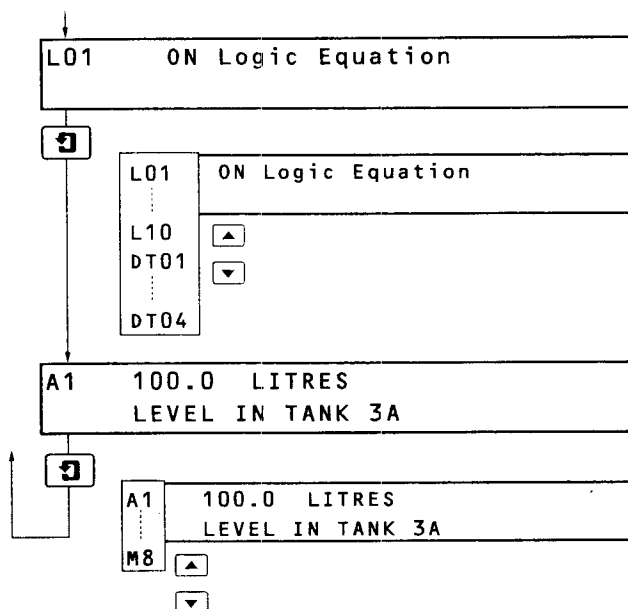
**Digital Input Status**  
Displays the status of the digital inputs.

Select the digital input to be displayed.

Press the key to advance to the **Logic Equations and Delay Timers Status** frame.



### ...2.4 View Signals Page



#### Logic Equations and Delay Timers Status

Displays the status of the Logic Equations and the Delay Timers.

Select the Logic Equation or Delay Timer to be displayed.

Press the key to advance to the next frame.

#### Analog Input/Maths Result Values

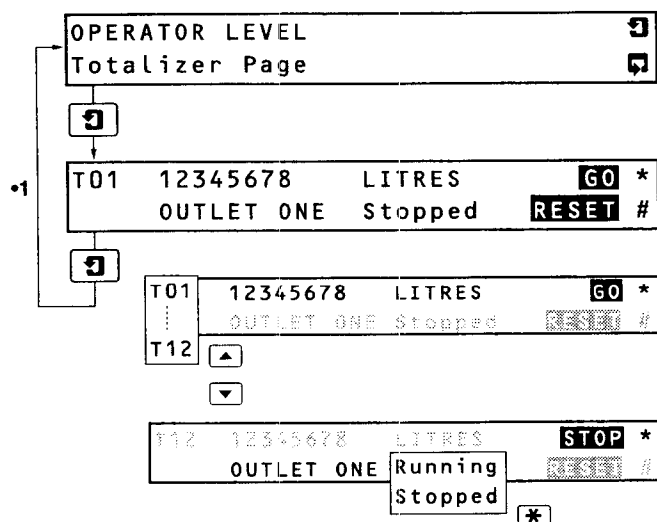
Displays the current value, engineering units and channel tag for the analog inputs and maths results.

Select the analog input/maths result to be displayed.

Press the key to return to the top of the View Signals Page.

## 2.5 Totalizer Page

This page is NOT available if all the Totalizers are switched OFF – see Section 3.8.2/ Totalizer Set Up Page/ Totalizer Type.



Press the key to access the Totalizer Page.

#### Totalizer Value

Displays the current value, units and tag for each totalizer.

Select the totalizer to be displayed.

Press the key to reset the batch total.

Press the key to advance to the next parameter.

Press the key to select 'Stopped' or 'Running'.

Press the key to return to the top of the Totalizer Page.

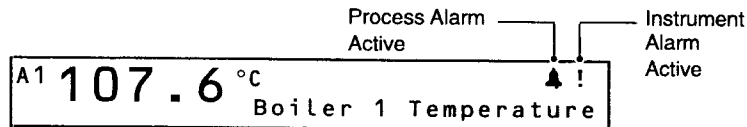
•1 If 'RESET' is disabled the key has no effect and 'RESET' is not displayed. If 'STOP/GO' is disabled the key has no effect and 'STOP' or 'GO' is not displayed – see Section 3.8.2/ Totalizer Set Up Page/ Front Panel Reset or/ Front Panel Stop/Go.



## 2.6 Viewing and Acknowledging Alarms

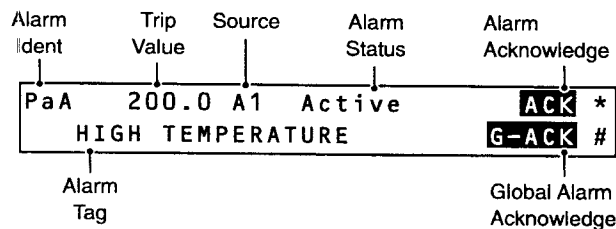
Individual alarms are viewed in the **Alarm Acknowledge Page**. This page is displayed only when active or unacknowledged alarms are present.

There are 3 types of alarm – Process, Real Time and Instrument.



### 2.6.1 Process Alarm

Process alarms can be assigned to any analog input and are activated when a pre-defined trip level is exceeded – see Section 3.3.1. Up to 24 alarms can be configured (PaA to PaZ excluding I and O).



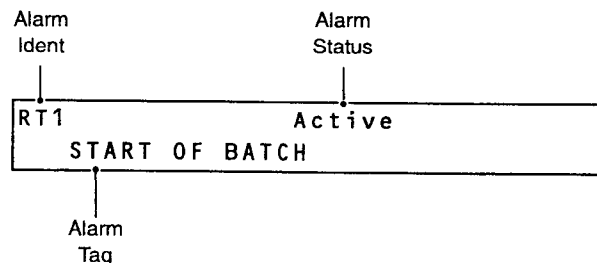
There are five types of alarm state:

Display State	Alarm Acknowledged	Alarm Condition Present	Notes
Active	No	Yes	–
Latched	No	No	Only if the acknowledge type is set to 'Latched'.*
Unack	No	No	Only if the acknowledge type is set to 'Normal'.*
Acknlg	Yes	Yes	–
Clear	Yes	No	Only if the alarm is displayed at the time it becomes inactive.

\* See Section 3.3.3/ Alarm Acknowledge Page/ Acknowledge Type

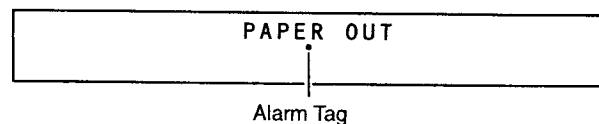
### 2.6.2 Real-time Alarm

Four real-time alarms can be configured to activate at a pre-defined time – see Section 3.3.2./ Real Time Alarms Page. These alarms can be configured to activate on an hourly or daily basis.



### 2.6.3 Instrument Alarm

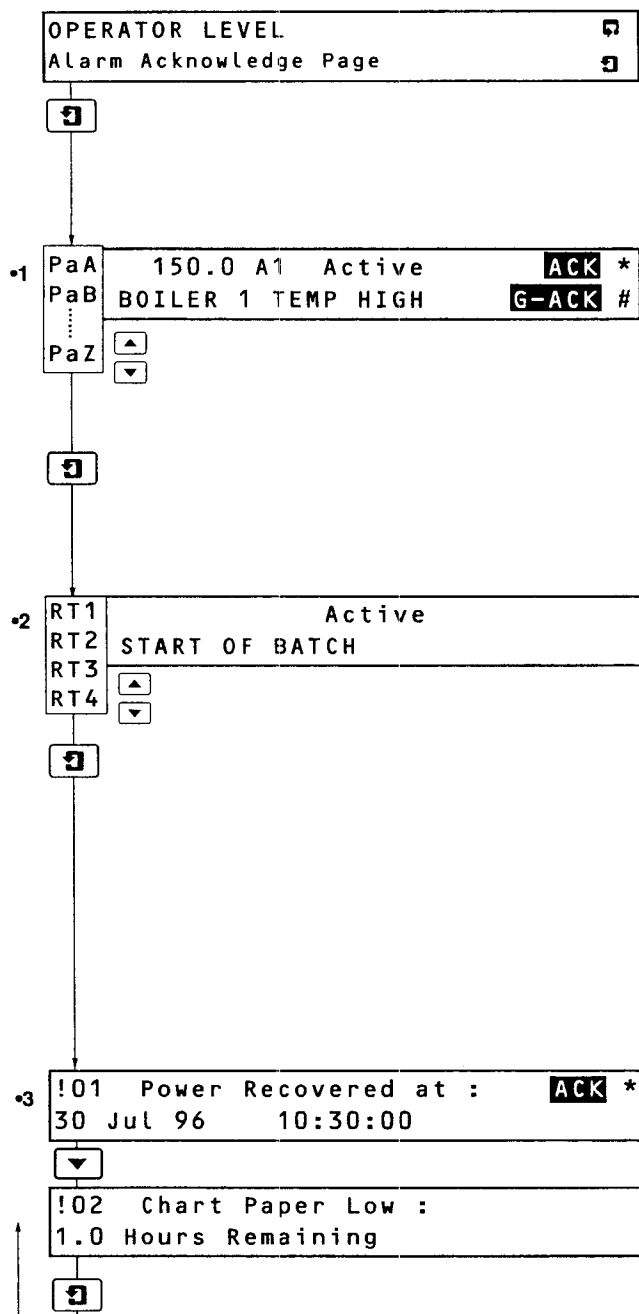
Instrument alarms are generated to indicate a failure (or impending failure) within the instrument system, e.g. Paper out, Paper low.







## 2.6.4 Alarm Acknowledgement



Press the key to access the **Alarm Acknowledge Page**.

### Process Alarms

Press the key to display the first active or latched process alarm.

Press the key to acknowledge the displayed alarm or press to acknowledge all active or latched process alarms. The alarm status changes to 'Acknlg' or 'Clear'.

Press or to display successive active or latched process alarms, if any.

### Real-time Alarms

Press the key to display the first active real-time alarm.



**Note.** Real-time alarms cannot be acknowledged.

Press or to display successive active or latched real-time alarms, if any.

### Instrument Alarms

Press the key to display the first or successive active instrument alarm.

### Power Up following Power Failure

Press the key to acknowledge the alarm.

### Chart Paper Low

Less than 5 hours chart running time remaining.  
Replace the chart – see Section 1.1.

If there are no alarms the display returns to the top of the **Alarm Acknowledge Page**.

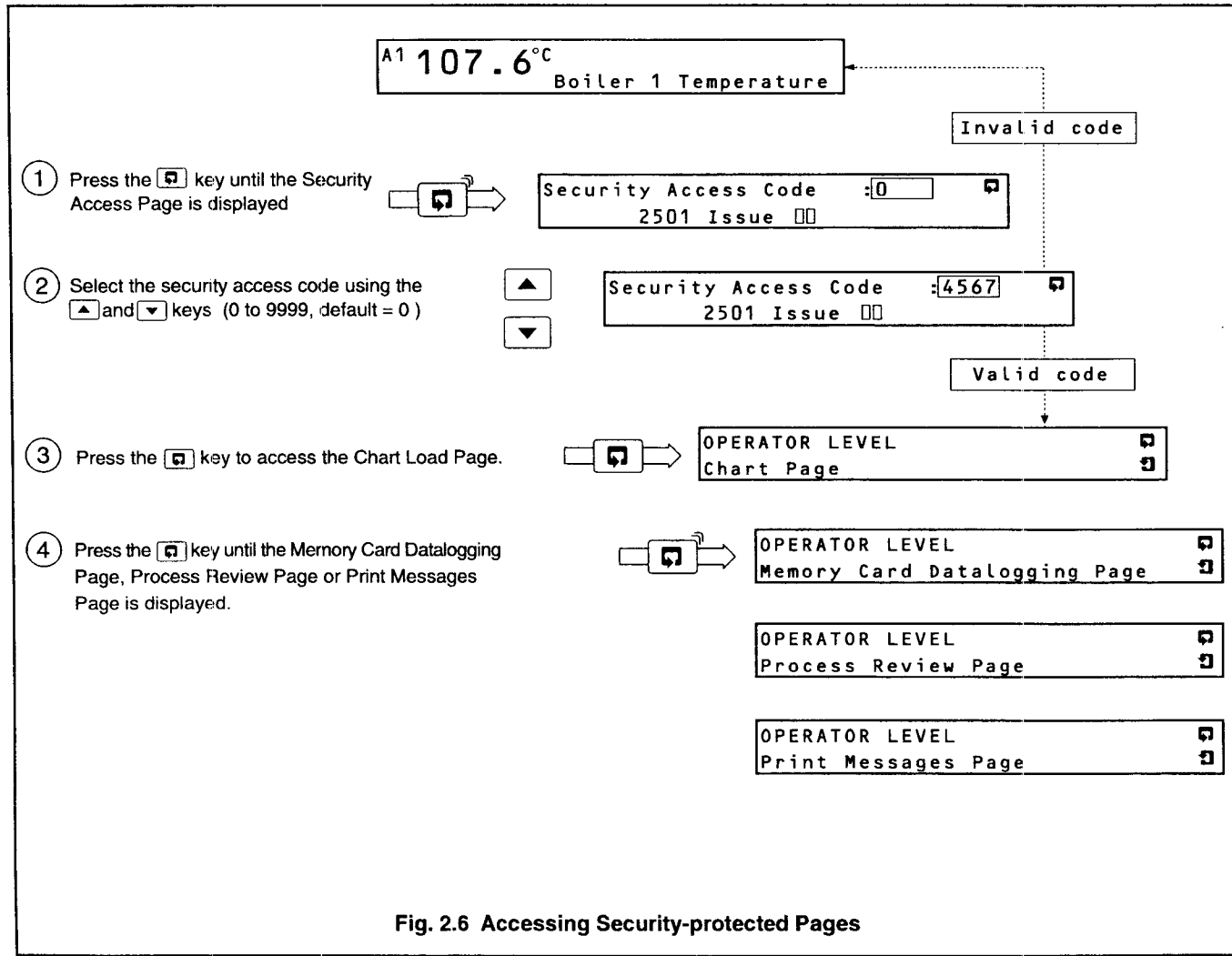
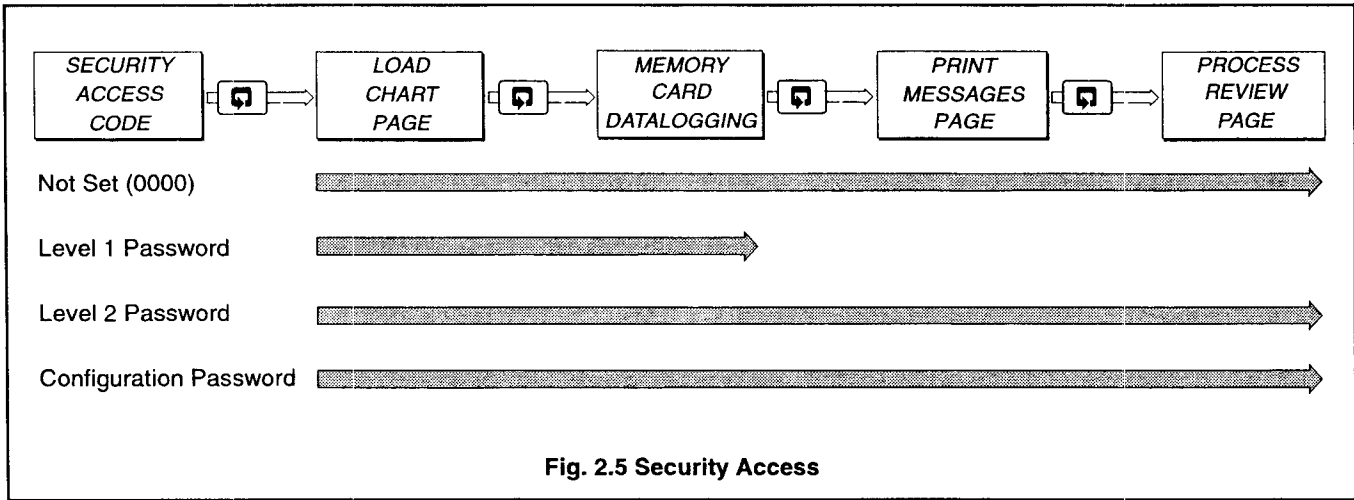
- 1 If there are no active process alarms the display shows the first active real-time or instrument alarm.
- 2 If there are no active real-time alarms, the display either shows any active instrument alarms or reverts to the **Alarm Acknowledge Page**.
- 3 Not displayed if the 'Power Failure Indication' parameter is selected 'OFF' – see Section 3.3.4/ Power Failure Indication.



2.7 Security Access

Entry into the **Memory Card Datalogging Page**, **Process Review Page** and **Print Messages Page** is protected by Security Access Codes – see Fig. 2.5.

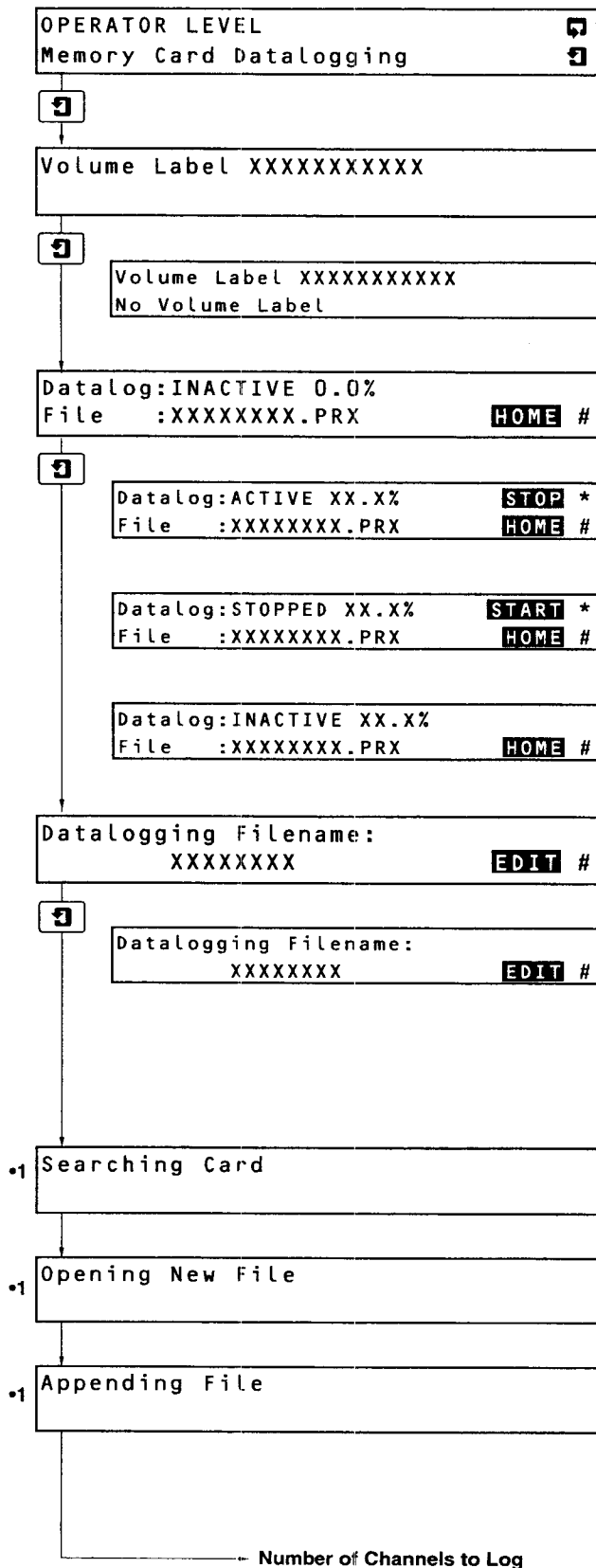
The Security Access Codes are set in the Configuration level – see Section 3.6.2/ Security Page.





## 2.8 Memory Card Datalogging Page

This page is only displayed if a Memory Driver Board is fitted.



Enter the Security Access Code and advance to the **Memory Card Datalogging Page** – See Fig. 2.6.

Press the **F1** key to access the page.

### Volume Label

The card name is displayed.

If the card has no name 'NO VOLUME LABEL' is displayed.

To edit the card name see Section 3.10.2/ Memory Card Formatting/ Volume Label.

Press the **F1** key to advance to the next frame.

### Datalogging Status 1

The current datalogging status, % card space remaining and file name are displayed.

**Datalog Active** – To stop datalogging and advance to the channel set up parameters press the **F2** key.

**Datalog Stopped** – Datalogging was previously active and has been stopped. Press the **F2** key to restart datalogging.

**Datalog Inactive** – Datalogging has not been started.

Press the **F1** key to advance to the next frame.

### Datalogging Filename

Enter the datalog file name.

Press the **F2** key to edit the file name – see front fold out. A name of up to 8 characters can be set.

Press the **F1** key to advance to the next frame.

The card database is searched automatically to verify the file name.

Press the **F2** key and edit the name.

### Processing Displays

If there is an error when searching the card for the filename an error message is displayed – see Table 3.10/ Section 3.10.3

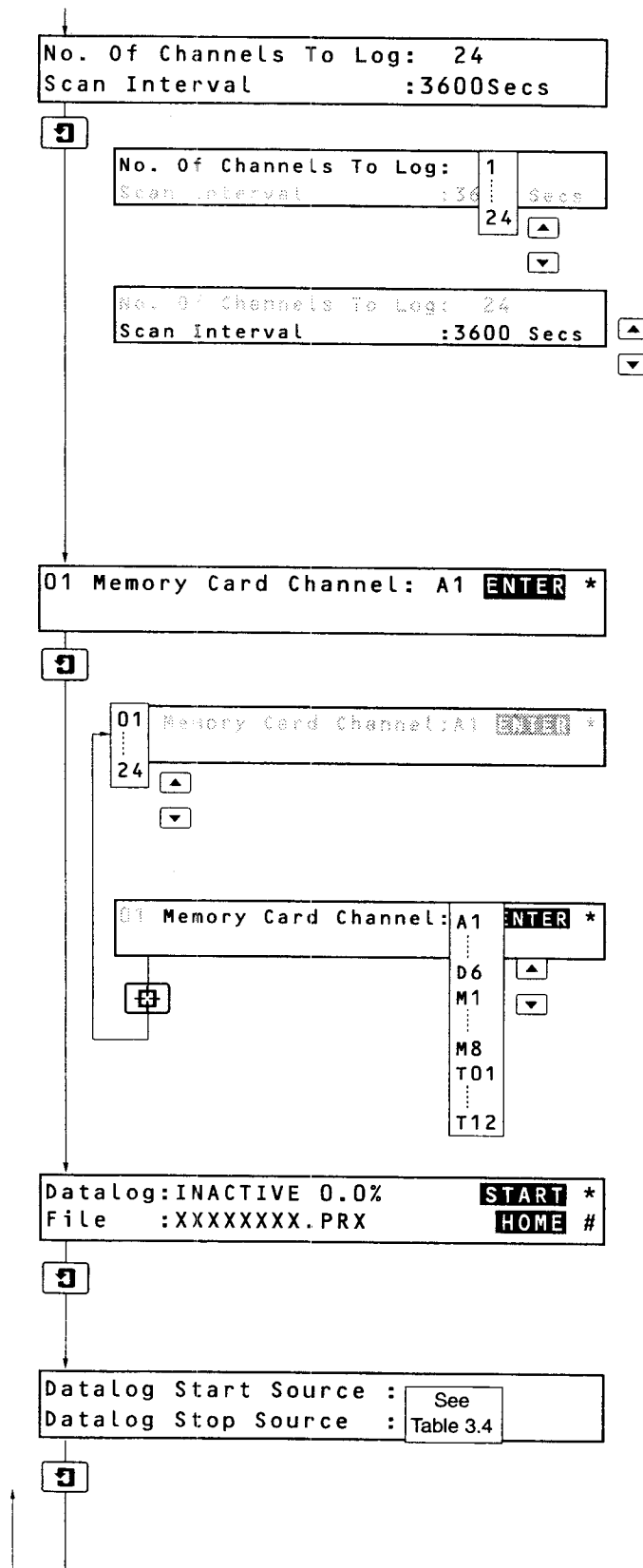
**Opening New File** – Displayed whilst a new file is created.

**Appending File** – Displayed whilst an existing file is amended. Data is added after the last entry in the existing file.

•1 Not displayed if datalogging status is 'ACTIVE'.



## ...2.8 Memory Card Datalogging Page

**Number of Channels to Log**

Select the number of channels to be logged on the card.

Press the key to advance to the next parameter.

**Scan Interval**

Set the logging interval required (3 to 3600 secs if 12 channels or less selected above, 6 to 3600 secs if more than 12 channels selected) in 1 second increments.

If an unacceptable combination of channels/scan time is selected 'CHANGE VALUES' is displayed.

Press the key to advance to the next frame.

**Memory Card Channel**

Select the memory card channel to be set.

Press the key to enter the selected channel ID tag onto the card.

Press the key to advance to the next parameter.

**Channel Source**

Select the source to be assigned to the channel.

Analog inputs – A1 to D6.  
Maths blocks – M1 to M8.  
Totalizer – T01 to T12.

Press the key to set up the next channel.

Press the key to advance to the next frame.

**Datalogging Status 2**

The current datalogging status, remaining card hours and file name are displayed – see Datalogging Status 1.

Press the (HOME) key to return to the Operating Page.  
Press the key to advance to the next frame.

**Datalog Digital Sources**

Select the digital source to start datalogging – see Section 3.3.3/ Table 3.4.

Press the key to advance to the next parameter.

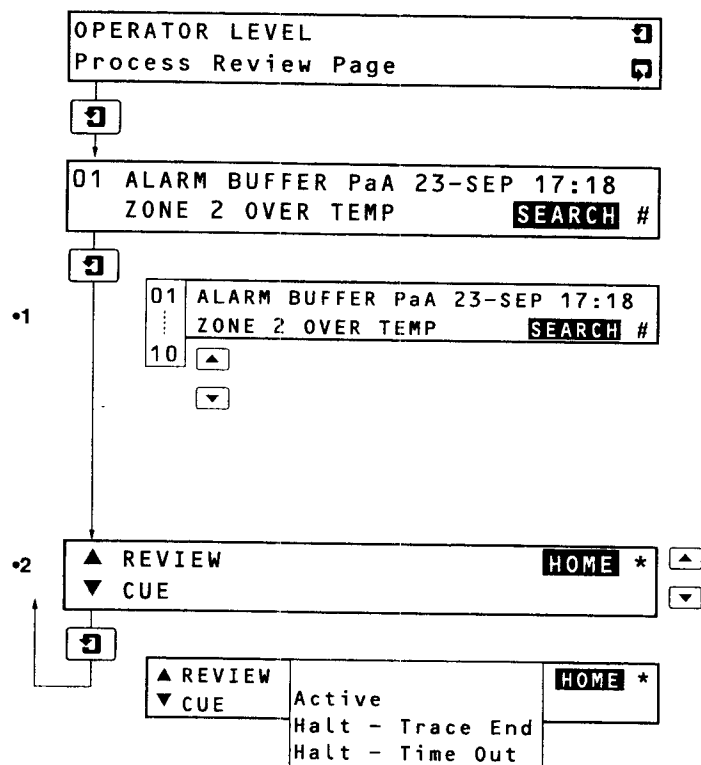
Select the digital source to stop datalogging – see Section 3.3.3/ Table 3.4.

Press the key to return to the Datalogging menu.



## 2.9 Process Review Page

This page can be disabled – see Section 3.6.1/ Operator Contents Page/ Process Review and Print Messages.



Enter the Security Access Code and advance to the **Process Review Page** – see Fig. 2.6.

Press the key to access the page.

### Alarm Buffer

The 10 latest process and real-time alarms are buffered.

Select the buffered alarm to be viewed.  
The alarm identifier, time of occurrence and alarm message are displayed.

Press the key to stop recording and rewind the chart to the place the alarm occurred.

Press the key to advance to the next frame.

### Cue/Review

Historical data can be viewed using the Cue/Review facility.

Press the and keys to stop recording and cue/review the chart.

**Note.** No more than 3 complete rewinds should be performed on a chart to avoid damage to the chart paper.

- ' – Cue/Review not active.
- 'Active' – Cue/Review active.
- 'Halt – Trace End' – The chart is wound further than the last recorded information.
- 'Halt – Time Out' – Use of the Cue/Review facility is not recommended for long periods. The facility automatically times out after approximately 5 minutes of continuous operation.

Press the key to return to the top of the **Process Review Page**.

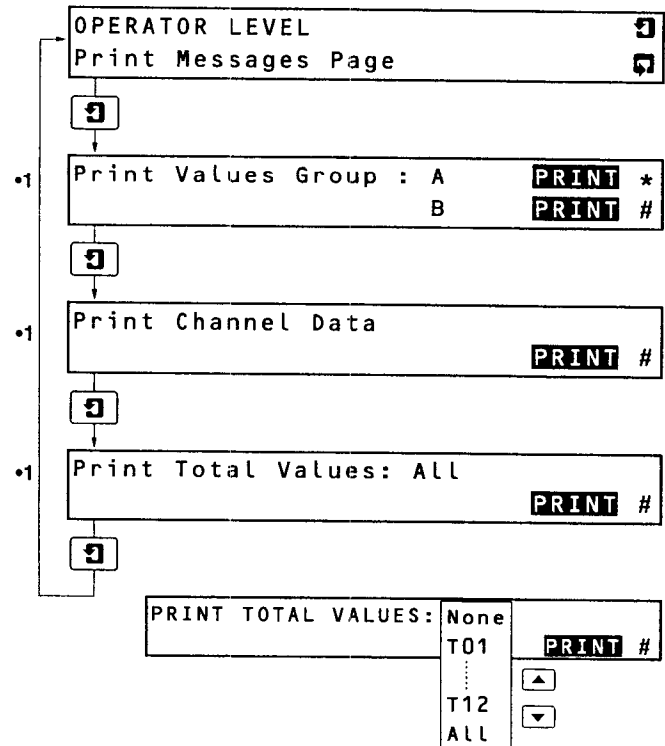
Press the (HOME) key to return to the top of **Operating Page 1**.

- 1 If a new chart is loaded, the alarms that occurred when the previous chart was in use are buffered and can be viewed as normal. However since the chart has been replaced, the 'SEARCH' facility is not available.
- 2 When Cue/Review is terminated, the chart is wound forward approximately 10mm and the current date and time is printed. Channel data is not buffered during Cue/Review and cannot be printed when recording is resumed.



## 2.10 Print Messages Page

This page can be disabled – see Section 3.6.1/ Operator Contents Page/ Process Review and Print Messages.



Enter the Security Access Code and advance to the **Print Messages Page** – see Fig. 2.6.

Press the key to access the page.

### Printing Values Groups<sup>\*2</sup>

Press the key to print values group A  
Press the key to print values group B  
Press the key to advance to the next frame.

### Printing Channel Data

Press the key to print the channel data values.

Press the key to advance to the next frame.

### Printing Total Values

Select the totalizer value to be printed, T01 to T12 or ALL.

Press the key to print the values on the chart.

Press the key to return to the Operator Level menu.

\*1 'PRINT' changes to 'WAIT' whilst the print request is acknowledged. The display reverts to 'PRINT' when printing of the selected parameter is commenced.

\*2 See section 3.7.2 for assignment of channels to groups.

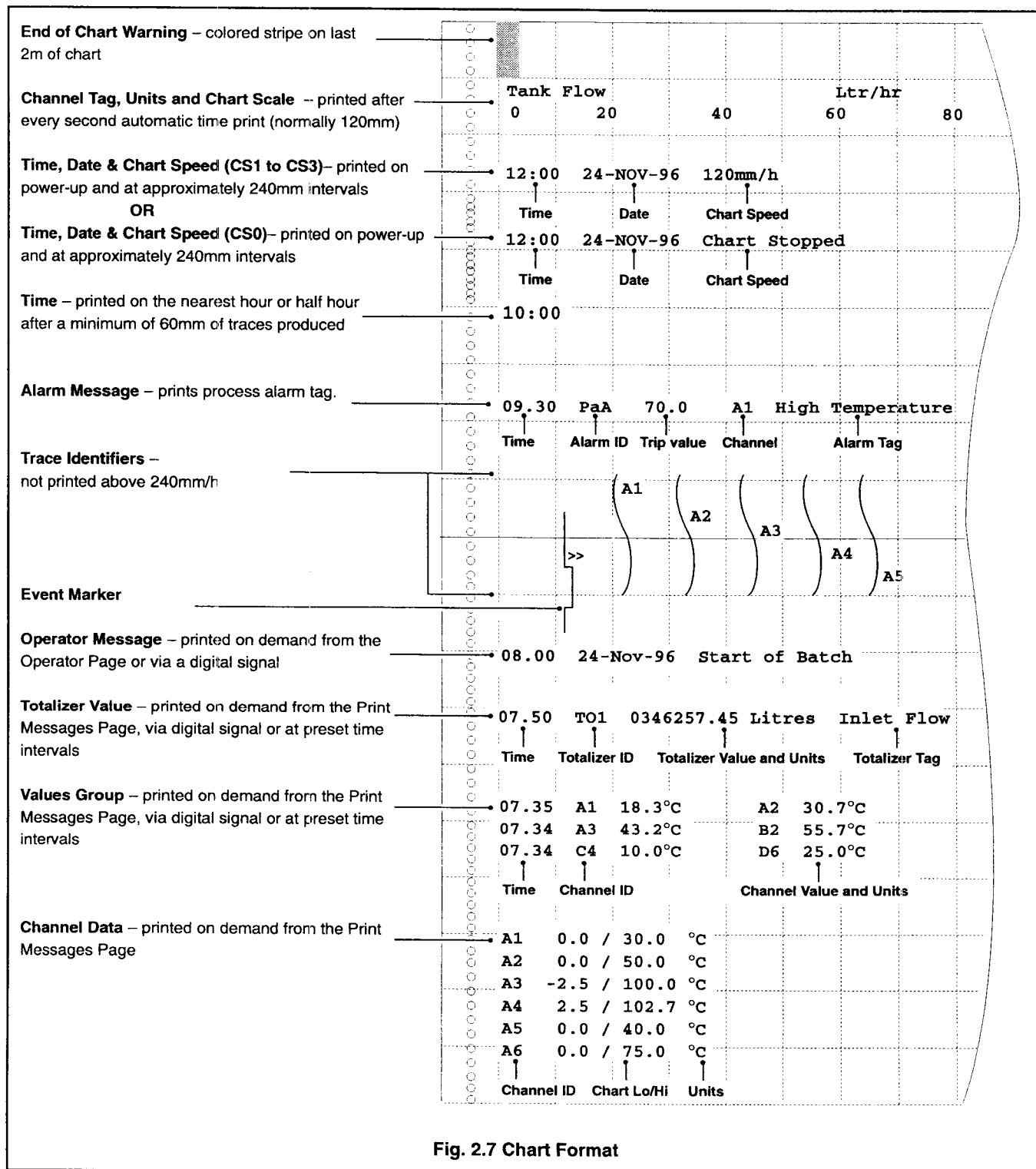


### 2.11 Chart Format – Fig. 2.7

In addition to displaying up to 24 traces, text messages can be printed on the chart at regular intervals such as date/time and scale, or as events occur such as process alarms.




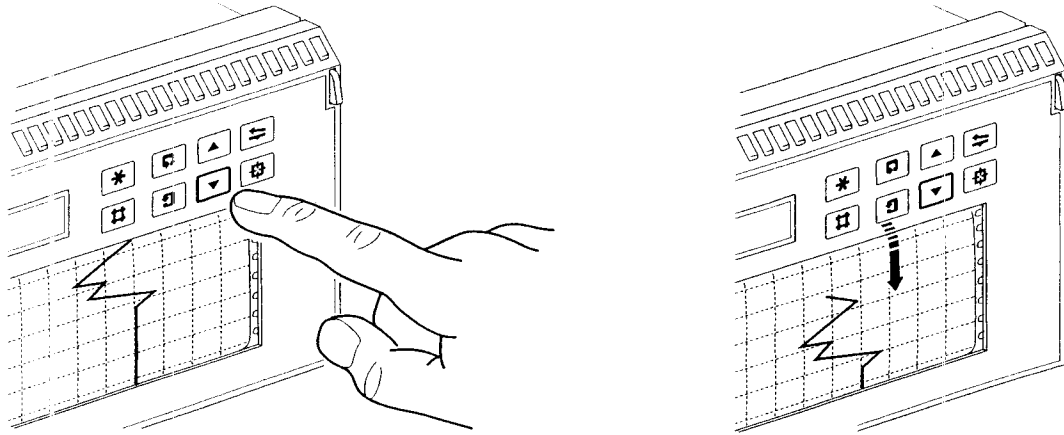
**Note.** When less than 2m (78.7 in.) of unused chart remains a colored stripe is visible along the left-hand edge of the chart. When the instrument has calculated that less than 200mm (7.87 in.) of unused chart remains, tracing of input channel values is suspended until a new chart has been fitted. The remaining chart is used for printing of alarm messages.





### 2.11.1 Using 'Easy View' – Fig. 2.8

'Easy View' allows the operator to view the most recently printed area of the chart. When the  key is pressed, the chart is wound forward for a short distance and returns automatically to its original position a few seconds later. Channel values and text messages are buffered during 'Easy View' and are printed out when recording is resumed.



**Note.**

- The 'Easy View' facility can be disabled – see Section 3.4.1/ Chart Control Page/ Easy View.
- 'Easy View' operates only at chart speeds of 120mm/h or less.
- 'Easy View' operates only in the **Operator Pages**.

**Fig. 2.8 Using 'Easy View'**





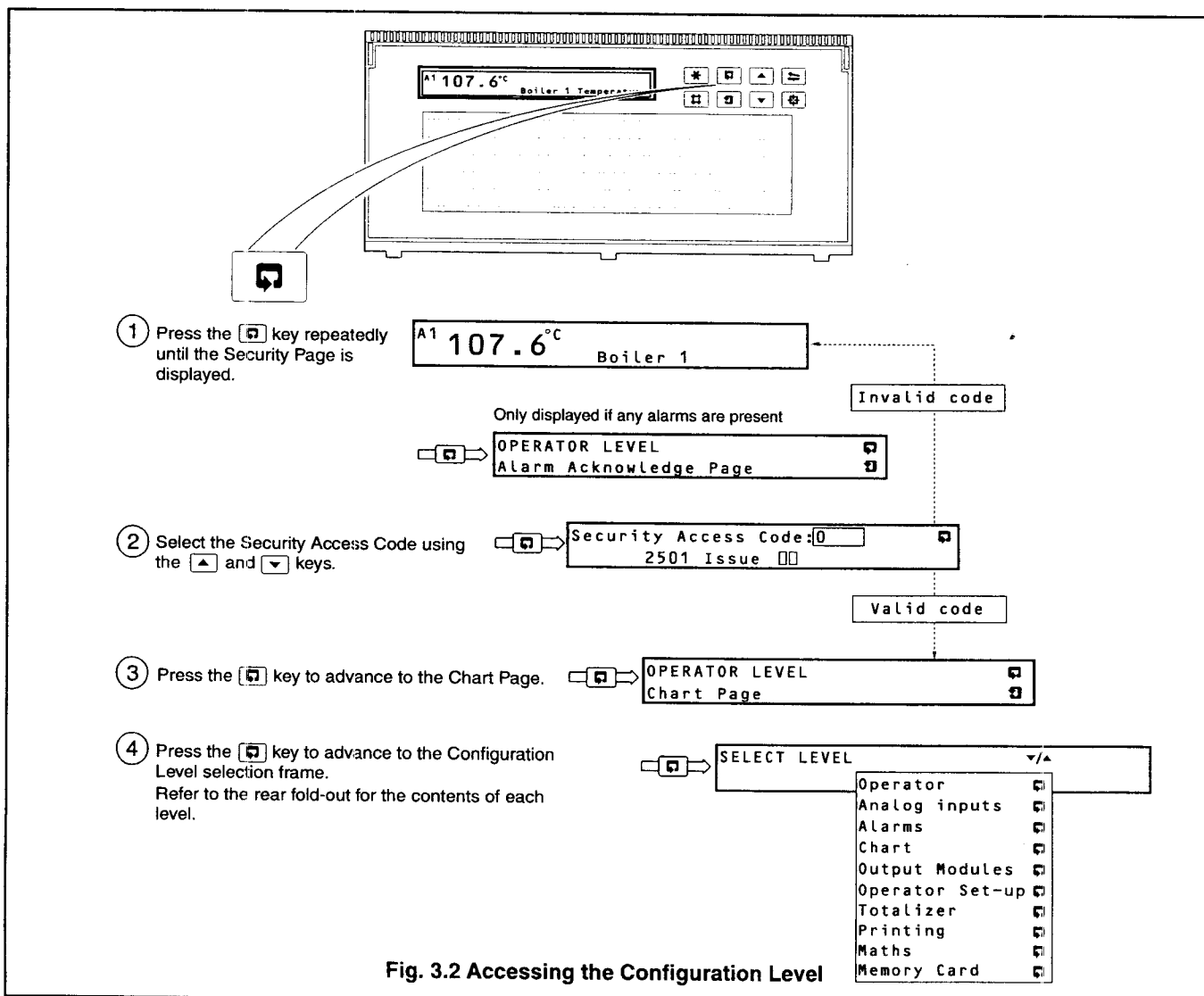
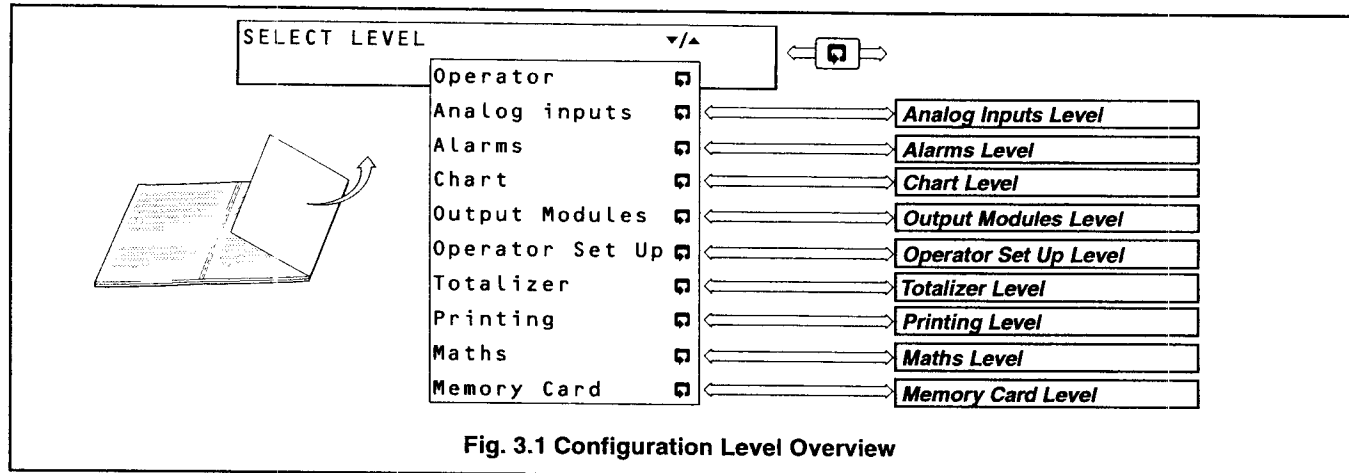
## 3 CONFIGURATION

### 3.1 Introduction – Fig. 3.1

This Section contains information on the Configuration Level programming of the recorder. An overview of the configuration level pages is contained on the back fold-out. Configuration via a computer can be achieved using the PC configurator package.

#### 3.1.1 Entering Changes

Tags and messages are entered at set parameters within the Configuration Level pages – see front fold-out. Changes to parameter values are saved automatically by advancing to the next frame.





## 3.2 Analog Inputs

### 3.2.1 Input Set Up Page

To set up the analog inputs carry out the appropriate procedures detailed in Table 3.1.

Where two or more channels use the same set up data, the Channel Copy facility can be used to configure multiple channels simultaneously – see Section 3.2.2/ Input Copy Page.

Input Type	Make Input Connections	Fit Shunt Resistor	Set Links	Select Input Type	Set Linearizer	Set Electrical Range	Set Display Range
<i>Page Reference</i>	<i>97/98/100</i>	<i>98</i>	<i>99</i>	<i>26</i>	<i>26</i>	<i>26</i>	<i>27</i>
RTD	✓	X	Standard	✓	✓	—	✓
T/C	✓	X	Standard	✓	✓	—	✓
Ω	✓	X	Standard	✓	✓*	✓	✓
V	✓	X	Voltage	✓	✓*	✓	✓
mA	✓	✓	Standard	✓	✓*	✓	✓
mV	✓	X	Standard	✓	✓*	✓	✓
OFF	—	—	—	✓	—	—	—

✓\* = Optional procedure

**Table 3.1 Input Set Up Requirements**



#### ...3.2.1 Input Set Up Page

● Input Set Up    ◀ Input Copy  
:Line Filter    ▶ Input Adjust



A1 Input Type :mA        :Linear  
Elec Lo/Hi : 4.0        :20.0    DP #



A1 Input Type :mA        :Linear  
A2 Elec Lo/Hi : 4.0        :20.0    DP #  
A3    ▲  
...  
D6    ▼

A1 Input Type :RTD        :Linear  
Elec Lo/Hi : T/C        :20.0    DP #  
:Ω        ▲  
:V        ▼  
:mA  
:mV  
:Off

A1 Input Type :mA        :Custom 2  
Elec Lo/Hi : 4.0        :Custom 1  
:Power 5/2    ▲  
:Power 3/2    ▼  
:SqRoot  
:Pt100  
:Type N  
:Type B  
:Type E  
:Type L  
:Type J  
:Type T  
:Type S  
:Type R  
:Type K  
:Linear

°C or °F

•1 A1 Input Type :mA        :Linear  
Elec Lo/Hi : 4.0        :20.0    DP #

Input Type	mV	V	mA	Ω
Min. Value	-2000	-20	-100	0
Max. Value	2000	20	100	8000
Min. Span	2.5	0.25	0.25	10

Table 3.2 – Limits of Electrical Ranges

Engineering (Display) Range

•1 Not displayed if input type RTD or T/C are selected.

Press the key to select 'Input Set Up' from the Analog Inputs menu.

Press the key to access the page.

#### Input Set Up

##### Channel Selection

Select the channel to be set.

Press the key to advance to the next parameter.

##### Input Type

Select the Input Type required.

('Off' is not applicable to channel A1)



**Note.** For thermocouple applications using an external fixed cold junction, select 'mV' input type.

Press the key to advance to the next parameter.

##### Linearizer Type

Select the Linearizer Type required.

Press the key to advance to the next parameter.

#### Electrical Input Range Low and High -- Table 3.2

Press the key to set the number of decimal places, (low and high values are set simultaneously).

Set the minimum (Lo) value of the electrical input signal within limits – see Table 3.2.

Press the key to advance to the next parameter.

Set the maximum (Hi) value of the electrical input signal within limits – see Table 3.2.

Press the key to set the next channel.

Press the key to advance to the next frame.



## ...3.2.1 Input Set Up Page

A1 Eng Lo/Hi : 50.0 : 250.0 DP \*  
Eng Units bar EDIT #

3

A1 Eng Lo/Hi : 50.0 : 250.0 DP \*  
A2 Eng Units bar EDIT #  
A3 ▲  
D6 ▼

A1 Eng Lo/Hi : 50.0 : 250.0 DP \*  
Eng Units bar EDIT #

THC /RTD Type	°C			°F		
	Min.	Max.	Min. Span	Min.	Max.	Min. Span
Type B	-18	1800	710	0	3272	1278
Type E	-100	900	45	-148	1652	81
Type J	-100	900	50	-148	1652	90
Type K	-100	1300	65	-148	2372	117
Type L	-100	900	50	-148	1652	90
Type N	-200	1300	90	-328	2372	162
Type R & S	-18	1700	320	0	3092	576
Type T	-250	300	60	-418	572	108
Pt100	-200	600	25	-328	1112	45
Power 5/2	-999 to +9999					
Power 3/2						
SqRoot						
Linear						

Table 3.3 – Limits of Engineering Ranges

A1 Eng Lo/Hi : 50.0 : 250.0 DP \*  
Eng Units bar EDIT #

Channel Tag

## Engineering (Display) Range

## Channel Selection

Select the channel to be set.

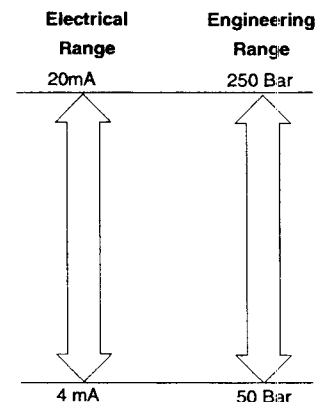
Press the key to advance to the next parameter.

## Engineering Display Value Low and High – Table 3.3

Press the key to set the number of decimal places.  
(Low and high values are set simultaneously).

Enter the display values which represents the minimum and maximum process input signal, within the limits specified in Table 3.3.

**Example** – for an input range of 4.0 to 20.0 mA, representing a pressure range of 50 to 250 bar, set the 'Eng Lo' value to 50.0 and the 'Eng Hi' value to 250.0.



Press the key to advance to the next parameter.

## Engineering Units

Press the key to enter the engineering units of the displayed value e.g. °C, l/h, bar.

Units of up to six characters can be set – see front fold-out.

Press the key to set the next channel.

Press the key to advance to the next frame



#### ...3.2.1 Input Set Up Page

A1 Channel Tag  
System Pressure EDIT #



A1 Channel Tag  
A2 System Pressure EDIT #  
A3 ▲  
...  
D6 ▼

A1 Channel Tag  
System Pressure EDIT #

A1 Broken Sensor Drive :UPSCALE  
Level : 10%



A1 Broken Sensor Drive :UPSCALE  
A2 Level : 10%  
A3 ▲  
...  
D6 ▼

A1 Broken Sensor Drive :UPSCALE  
Level : NONE ▲  
                                  DOWNSCALE ▼

A1 Broken Sensor Drive :UPSCALE  
Level : 10%

Filter Time

#### Channel Tag

#### Channel Selection

Select the channel to be set up.

Press EDIT # to enter a description of the quantity being measured, e.g. system pressure.

Up to twenty characters can be used – see front fold-out.

Press the ▶ key to advance to the next frame.

#### Broken Sensor Drive

In the event of a fault being detected on the input, the recorder can be set to drive upscale, downscale or in the direction of failure.

Select the channel to be set up.

Press the ▲ key to advance to the next parameter.

Select the direction required:

- UPSCALE – Channel value driven beyond Full Scale.
- NONE – Driven in direction of failure.
- DOWNSCALE – Channel value driven below zero.

Press the ▲ key to advance to the next parameter.

#### Fault Detection Level

A fault tolerance level can be set to allow for deviations above or below the input span.

- ▲ Set the value required, between 0 and 100% of the display range in 1% increments (default setting = 10%).
- ▼

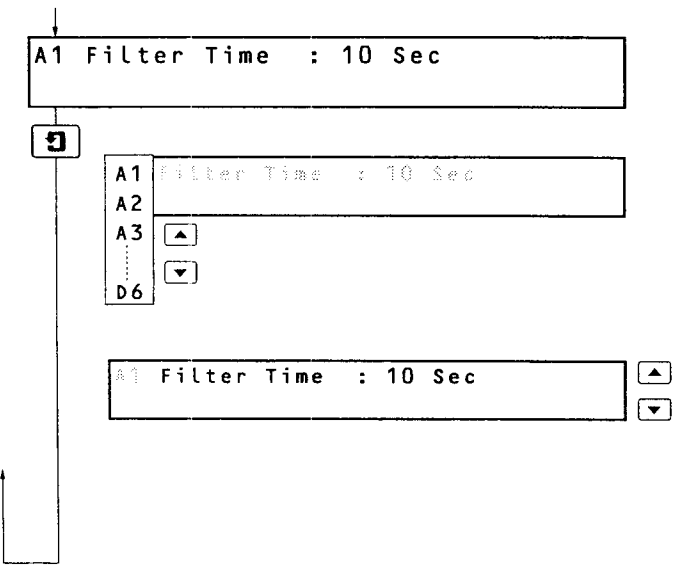
**Example** – setting the fault detection level to 10% on an input range of 50 to 250 bar, causes a fault to be detected below 30 and above 270 bar. The resulting 'Analog Input Failure' signal can then be allocated to an alarm – see Section 3.3.3/ Alarm Acknowledge Page/ Table 3.4.

Press the ▶ key to set the next channel.

Press the ▶ key to advance to the next frame.




...3.2.1 Input Set Up Page



Filter Time


Channel Selection


Select the channel to be set up.

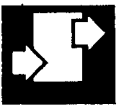
Press the  key to advance to the next parameter.

Filter Time

The input filter averages the process variable input values over the time period set.  
Enter the time required, (5 to 60 seconds) or 'OFF'.

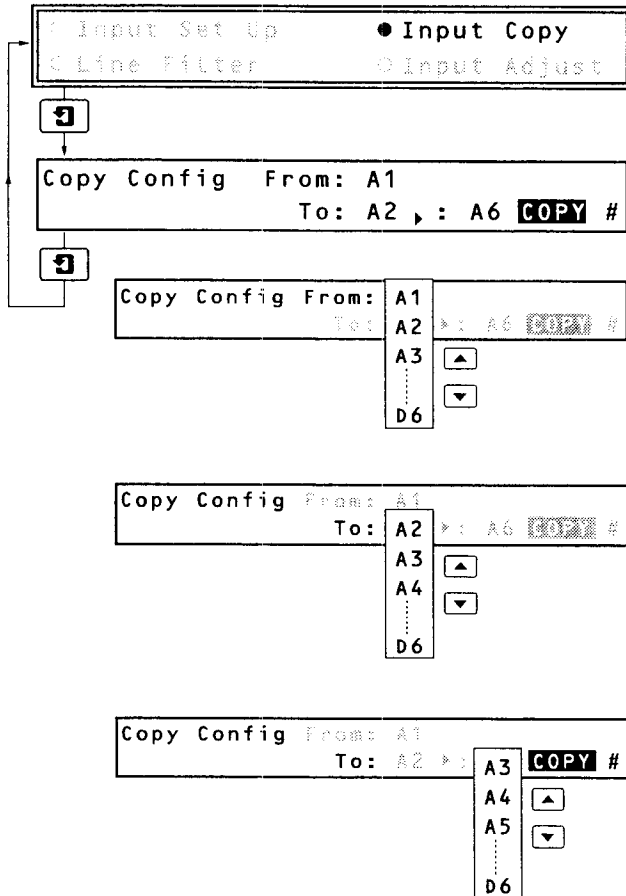
Press the  key to set the next channel.

Press the  key to return to the Analog Inputs menu.



#### 3.2.2 Input Copy Page

The Input Copy facility allows the configuration data and channel tag for any channel to be copied to any other analog input channel.



Press the key to select the 'Input Copy' from the Analog Inputs menu.

Press the key to access the page.

#### Copying the Configuration

##### Copy Source Channel

Select the channel configuration to be copied.

Press the key to advance to the next parameter.

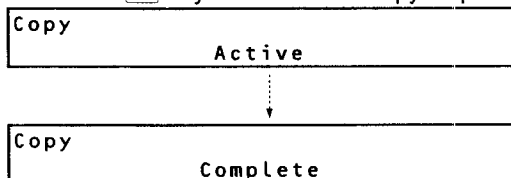
##### Copy Destination Channel

Select the channel to which the configuration is to be copied (or the lowest channel number in a range).

Press the key to advance to the next parameter.

Select the highest channel number to which the configuration is to be copied.

Press the key to activate the copy sequence.

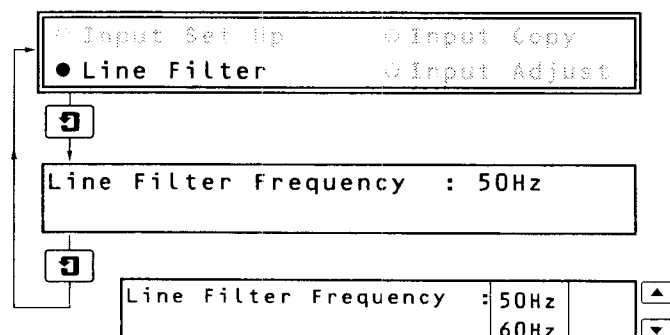


The 'Active' frame is displayed for a short time whilst the copy sequence is carried out.

Press the key to return to Analog Inputs menu.

#### 3.2.3 Line Filter Page

The Line Filter is used to reject mains frequency pick-up on the input lines.



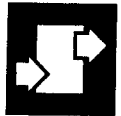
Press the key to select the 'Line Filter' from the Analog Inputs menu.

Press the key to access the page.

##### Line Filter Frequency

Select the rejection frequency required, 50 or 60 Hz.

Press the key to return to Analog Inputs menu.



### 3.2.4 Input Adjust Page



#### Information.

- Enables fine tuning and calibration of the input.
- System offset errors – removed using Offset Adjustment.
- System scale errors – removed using Span Adjustment.
- Offset/Span Adjustment – used to carrying out a spot calibration.
- Reset – removes any previously programmed offset or scale adjustment settings.
- Analog inputs do not require re-calibrating when the input type or range is changed.

#### Calibration

- Switch off the power supply to the instrument.
- Remove the analog input to be adjusted and connect an accurate signal source, suitable for simulation over the entire input range.

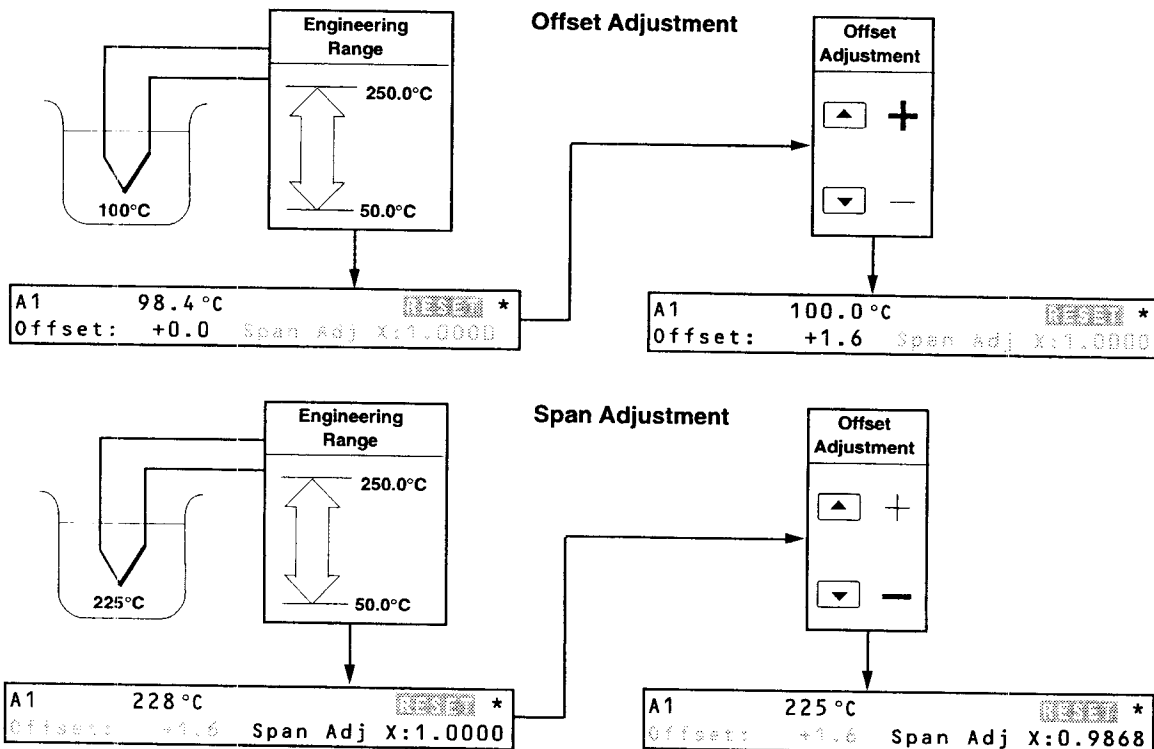


**Note.** For thermocouple inputs, connect the millivolt source using appropriate compensating cable – see Section 4.5, Table 4.1. For 2-lead resistance thermometers, connect the resistance box at the sensor end of the leads or the resistance must be added to the calibration values.

- Switch on the power supply to the instrument.
- Select the spot calibration point. As a general rule use:  
 Offset Adjustment for a spot calibration at < 50% of engineering range span.  
 Span Adjustment for a spot calibration at > 50% of engineering range span.

#### Fine Tuning

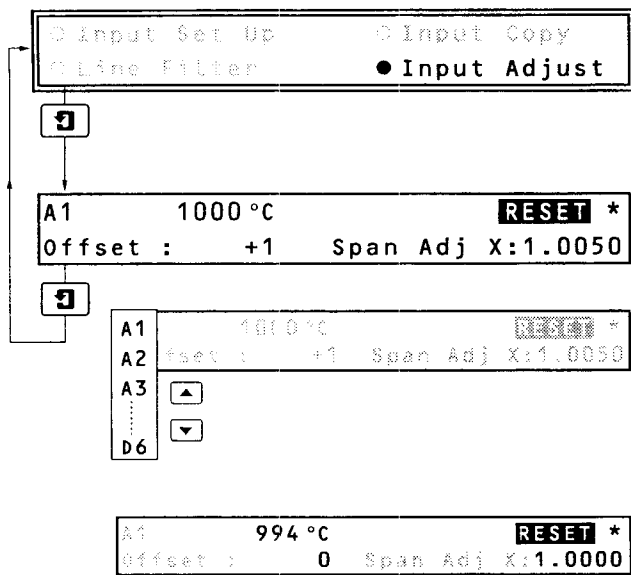
Use the Offset and Span adjustments to tune the instrument until the required value is displayed.







#### ...3.2.4 Input Adjust Page



Press the **F1** key to select 'Input Adjust' from the Analog Inputs menu.

Press the **F2** key to access the page.

#### Calibration

##### Channel Selection

Select the channel to be adjusted (A1 to D6 depending on the number of inputs fitted).

On entry the default is 'A1'.

##### Adjusting the Input Signal

Press the **F3** key to reset the input offset and input span readings to their nominal values.

##### Electrical and resistance thermometer input

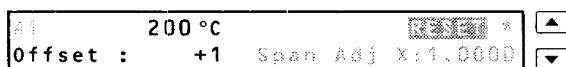
Apply an input signal corresponding to the spot calibration required.

For RTD inputs, use resistance values obtained from standard tables.

##### Thermocouple input

- Measure the ambient temperature at the output terminals of the input signal source.
- Using thermocouple tables, look up the millivolt equivalent of this temperature (1), and of the spot calibration temperature (2).
- Subtract (1) from (2) and set the input signal source to this value.

Press the **F4** key to advance to the next parameter.



##### Offset Adjustment

Apply the input value corresponding to the spot calibration point and adjust the display to read the spot calibration point.

**Example** – If the display range is 0°C to 1000°C and a spot calibration is required at 200°C, set the input source equivalent to 200°C and adjust the display to read 200°C.

Press the **F4** key to advance to the next parameter.



##### Span Adjustment

Apply the input value corresponding to the spot calibration point and adjust the display to read the spot calibration point.

**Example** – If the display range is 0°C to 1000°C and a spot calibration is required at 800°C, set the input source equivalent to 800°C and adjust the display to read 800°C.

Press the **F5** key to return to the Analog Inputs menu.

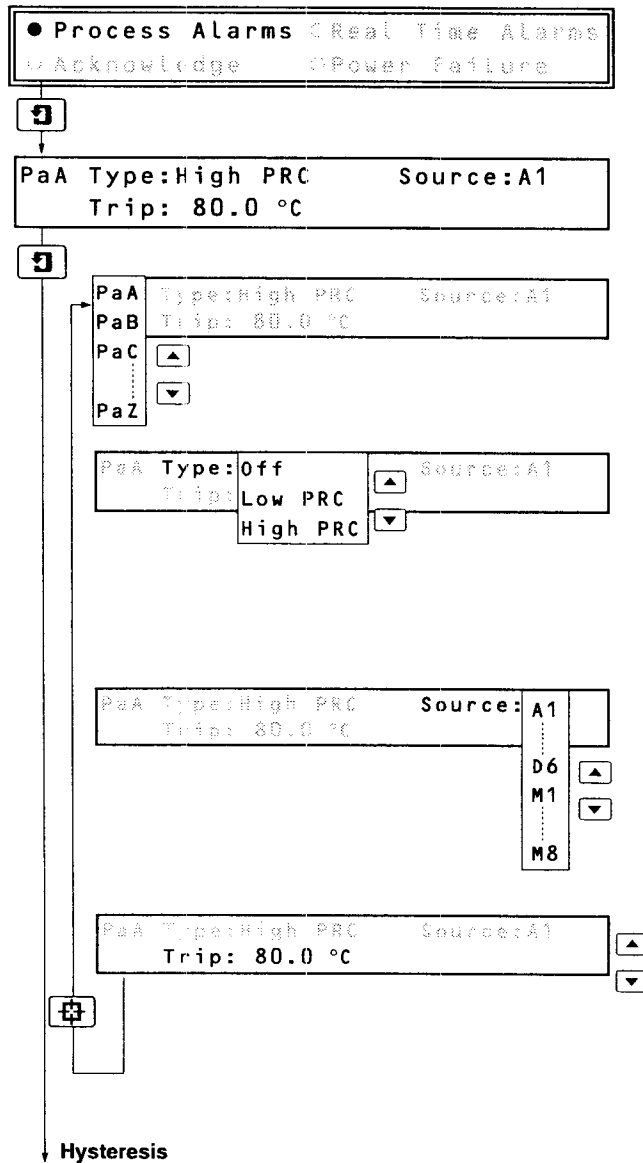



### 3.3 Alarm Configuration


#### 3.3.1 Process Alarms Page

##### Information.

- 24 Process alarms – identified PaA to PaZ (excluding I and O).
- High/low process alarms.
- Alarms assignable to any analog input.
- Adjustable level and time hysteresis values – to prevent oscillation of alarm state.
- 20-Character alarm tags can be printed on the chart as the alarm becomes active.



Press the  key to select 'Process Alarms' from the Alarms menu.

Press the  key to access the page.

#### Process Alarms Set Up

##### Select Alarm

Select the process alarm to configure. Up to 24 alarms (PaA to PaZ, excluding I and O) can be configured.

Press the  key to advance to the next parameter

##### Alarm Type

- Off – Sets alarm to OFF.
- Low PRC – Low Process, activated when input signal falls below trip level.
- High PRC – High Process, activated when input signal rises above trip level.

Press the  key to advance to the next parameter.

##### Alarm Source


Select the alarm source from analog inputs A1 to D6 and maths blocks M1 to M8 (depending on the options fitted).


Press the  key to advance to the next parameter.

##### Trip Level

Set the trip level.

The engineering units are set in the Input Set Up Page – see Section 3.2.1/ Input Set Up Page/ Engineering Units.

Press the  key to set up the next alarm.

Press the  key to advance to the Hysteresis frame.



#### ...3.3.1 Process Alarms Page

PaA Hysteresis : 20.0 °C  
Time Hysteresis : 10 Sec

1

PaA Hysteresis : 20.0 °C  
Time Hysteresis : 10 Sec  
PaB  
PaZ

▲  
▼

PaA Hysteresis : 20.0 °C  
Time Hysteresis : 10 Sec

▲  
▼

PaA Hysteresis : 20.0 °C  
Time Hysteresis : 10 Sec

▲  
▼

1

PaA Process Alarm Tag  
Alarm A On

EDIT #

1


PaA Process Alarm Tag  
PaB  
PaZ

▲  
▼

#### Hysteresis Set Up

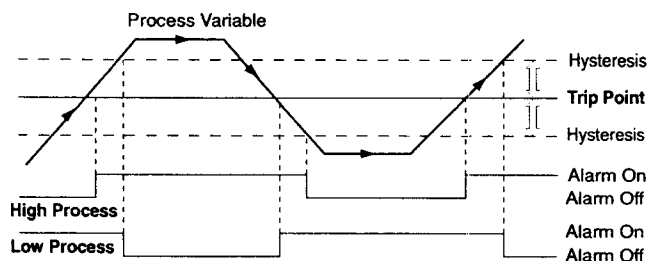
##### Select Alarm Hysteresis

Select the alarm to configure.

Press the  key to advance to the next parameter.

##### Hysteresis

Set the hysteresis value in engineering units. The alarm is activated at the trip level but is only de-activated after the signal has moved into the safe region by an amount equal to the hysteresis value.



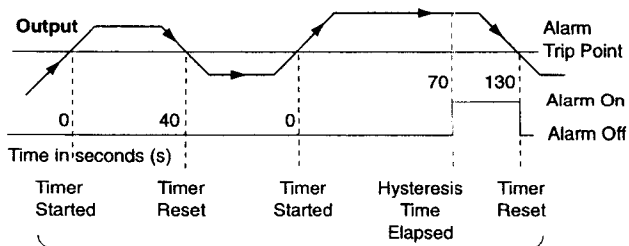
Use the  key to advance to the next parameter.

##### Time Hysteresis

Set the hysteresis value between 0 and 9999 seconds.


The alarm is activated when the input signal has been in an alarm condition continuously for a time greater than the 'Time Hysteresis' value.

The alarm is de-activated as soon as the input signal moves into the safe region – the time hysteresis value has no effect during alarm de-activation.



##### Time Hysteresis Status

Time hysteresis set to 70s, with a high process alarm


Press the  key to set up the next alarm.


Press the  key to advance to the next frame.

#### Process Alarm Tag

Select the alarm to configure.

Set an alarm description of up to 20 characters – see front fold-out.

Press the  key to set up the next alarm.

Press the  key to return to the Alarms menu.

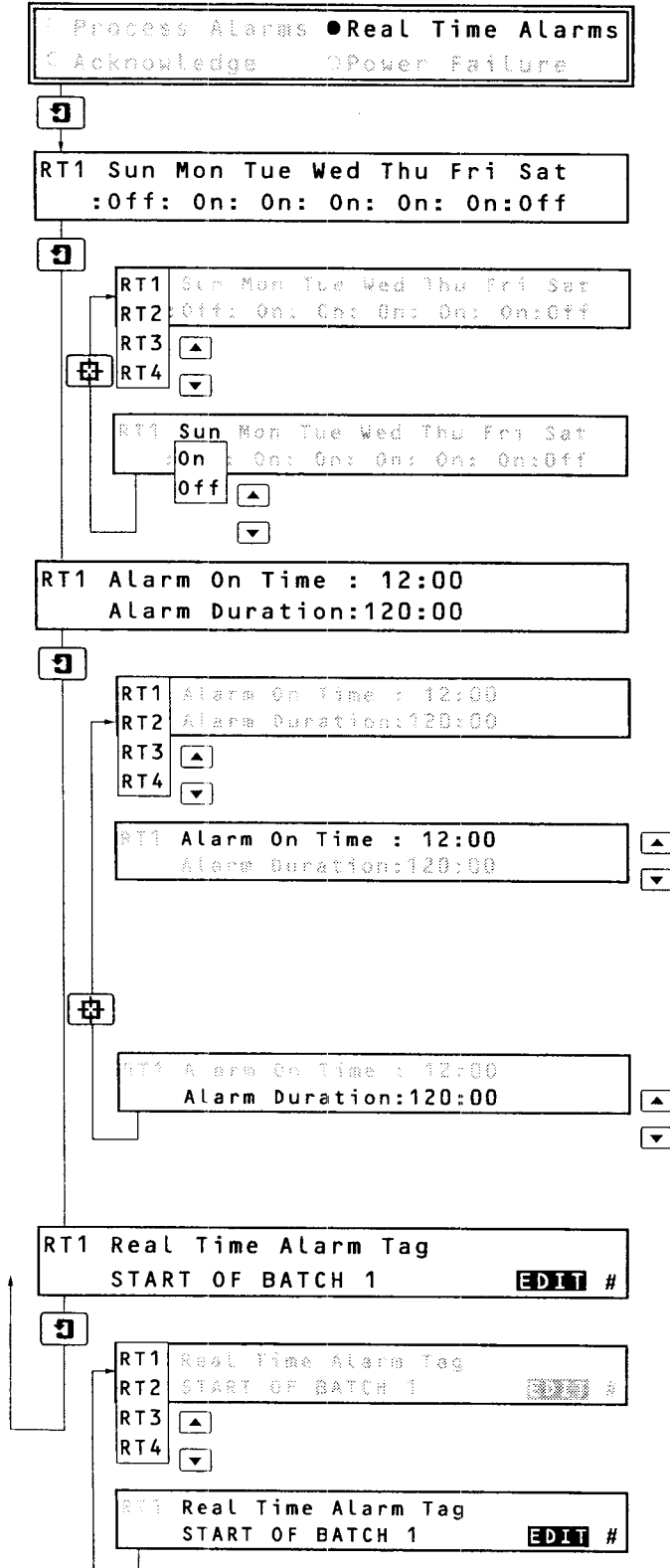


### 3.3.2 Real Time Alarms Page



#### Information.

- Four programmable real-time alarms.
- Programmable start times and durations.



Press the key to select 'Real Time Alarms' from the Alarms menu.

Press the key to access the page.

#### Real-time Alarms

##### Alarm To Configure

Up to four alarms (RT1 to RT4) can be configured, each being assigned 'On' days, 'On' time and duration. Press the key to advance to the next parameter.

##### Alarm On Days

Select which days the alarm is required to be active. Press the key to move between days. Press the key to set up the next alarm. Press the key to advance to the next frame.

##### Alarm On Time and Duration

The last alarm to be configured is displayed.

##### Select Alarm

Select alarm to configure.

Press the key to advance to the next parameter.

##### Alarm On Time

Set the alarm on time between 00:00 and 23:59. Alternatively, hours can be set to \*\* allowing the alarm to be activated at a specific minute each hour.

**Example** – to activate the alarm at 15 minutes past each hour set Alarm On Time to \*\*:15.

Press the key to advance to the next parameter.

##### Alarm Duration

Set the alarm duration between 00:00 and 167:59 (hr:min).

Press the key to set up the next alarm.

Press the key to advance to the next frame.

#### Real-time Alarm Tag

The last alarm to be configured is displayed.

##### Select Alarm

Press the and keys to select Alarm Tag to edit.

##### Real-time Alarm Tag

Press the key to enter an alarm description of up to 20 characters – see front fold-out.

Press the and keys to set up the next alarm or

Press the key to return to the Alarms menu.

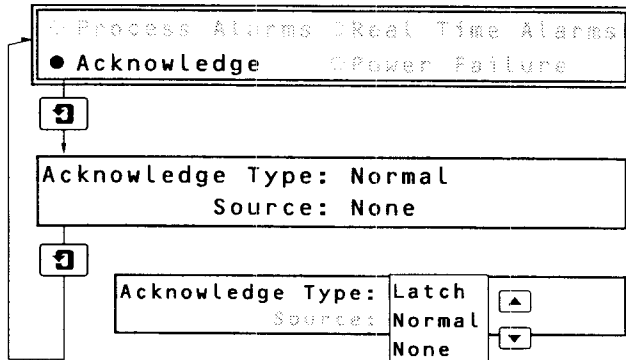


### 3.3.3 Alarm Acknowledge Page



#### Information.

- Three operator acknowledge options for Process alarms.
- Global alarm acknowledgement – from internal or external digital source.



Press the key to select 'Acknowledge' from the Alarms menu.

#### Alarm Acknowledge

##### Acknowledge Type

Select the type of alarm acknowledge facility required:

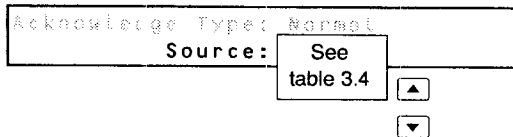
- Latch – Alarm condition is latched and the alarm state remains active until acknowledged in the **Operator Level Alarm Ack Page** and the alarm condition is cleared.
- Normal – Alarm state remains active until the condition is removed.  
Acknowledge facility available.
- None – Alarm state remains active until the condition is removed.  
Acknowledge facility not available.

Press the key to advance to the next parameter.

##### Global Acknowledge Source

Select the source to be used to acknowledge all alarms – see Table 3.4.

Press the key to return to the Alarms menu.



Source	Description	Source	Description	Source	Description
<b>Digital Inputs *</b>		<b>Process Alarm Combinations</b>		<b>Operator and Warning Messages</b>	
"NONE"	—	"PaA+F "	OR of Process Alarms A, B, C, D, E, F	"CS 0 "	Chart speed 0 selected
" DA1 "	DA1	"IPaA+F "	NOR of Process Alarms A, B, C, D, E, F	"CS 1 "	Chart speed 1 selected
"IDA1 "	NOT DA1	"PaG+M "	OR of Process Alarms G, H, J, K, L, M	"CS 2 "	Chart speed 2 selected
" DB1 "	DB1	"IPaG+M "	NOR of Process Alarms G, H, J, K, L, M	"CS 3 "	Chart speed 3 selected
"IDB1 "	NOT DB1	"PaN+T "	OR of Process Alarms N, P, Q, R, S, T	"P Out "	Paper Out
" DC1 "	DC1	"IPaN+T "	NOR of Process Alarms N, P, Q, R, S, T	"P Low "	Paper Low
"IDC1 "	NOT DC1	"PaU+Z "	OR of Process Alarms U, V, W, X, Y, Z	"Pwr F "	Power Failed
" DD1 "	DD1	"PaU+Z "	NOR of Process Alarms U, V, W, X, Y, Z	"Clkbat"	Clock battery low
"IDD1 "	NOT DD1	"PaA+Z "	OR of all Process Alarms	"MODBUS"	MODBUS Digital Input
" DE1 "	DE1	"IPaA+Z "	NOR of all Process Alarms	"PenLft"	Pen lift activated
"IDE1 "	NOT DE1	"PaA&F "	AND of Process Alarms A, B, C, D, E, F	<b>Logic Equation Results</b>	
" DE2 "	DE2	"IPaA&F "	NAND of Process Alarms A, B, C, D, E, F	"EQN 01 "	L01
"IDE2 "	NOT DE2	"PaG&M "	AND of Process Alarms G, H, J, K, L, M	"EQN 02 "	L02
To		"IPaG&M "	NAND of Process Alarms G, H, J, K, L, M	"EQN 03 "	L03
" DG6 "	DG6	"PaN&T "	AND of Process Alarms N, P, Q, R, S, T	"EQN 04 "	L04
"IDG6 "	NOT DG6	"IPaN&T "	NAND of Process Alarms N, P, Q, R, S, T	To	
* See Section 4.4 for input designation		"PaU&Z "	AND of Process Alarms U, V, W, X, Y, Z	"EQN 10 "	L10
		"PaU&Z "	NAND of Process Alarms U, V, W, X, Y, Z	<b>Delay Timer</b>	
		"PaA&Z "	AND of all Process Alarms	"DT 1 "	DT1
		"IPaA&Z "	NAND of all Process Alarms	"DT 2 "	DT2
				"DT 3 "	DT3
				"DT 4 "	DT4
				<b>Totalizer Wrap Pulse</b>	
<b>Process Alarms</b>		<b>Real Time Alarms</b>		"TW 01 "	T01
"PaA "	A	"RT1 "	1	"TW 02 "	T02
"IPaA "	NOT A	"IRT1 "	NOT 1	"TW 03 "	T03
"PaB "	B	"RT2 "	2	"TW 04 "	T04
"IPaB "	NOT B	"IRT2 "	NOT 2	To	
"PaC "	C	"RT3 "	3	"TW 12 "	T12
"IPaC "	NOT C	"IRT3 "	NOT 3	<b>Totalizer Count Pulse</b>	
"PaD "	D	"RT4 "	4	(only assignable to digital output, relay or totalizer)	
"IPaD "	NOT D	"IRT4 "	NOT 4	"TC 01 "	T01
"PaE "	E	<b>Analog Input Failure</b>		"TC 02 "	T02
"IPaE "	NOT E	"AA1 "	A1 Fail	"TC 03 "	T03
"PaF "	F	"AA2 "	A2 Fail	"TC 04 "	T04
"IPaF "	NOT F	"AA3 "	A3 Fail	To	
To		"AA4 "	A4 Fail	"TC 12 "	T12
"PaZ "	Z	"AA5 "	A5 Fail	<b>MODBUS</b>	
"IPaZ "	NOT Z	"AA6 "	A6 Fail	"MDB-01 "	MODBUS Digital I/P 01
		To		To	
		"AD5 "	D5 Fail	"MDB-24 "	MODBUS Digital I/P 24
		"AD6 "	D6 Fail		
		<b>Maths Block Failure</b>			
		"MB 01 "	M1		
		"MB 02 "	M2		
		"MB 03 "	M3		
		To			
		"MB 08 "	M8		

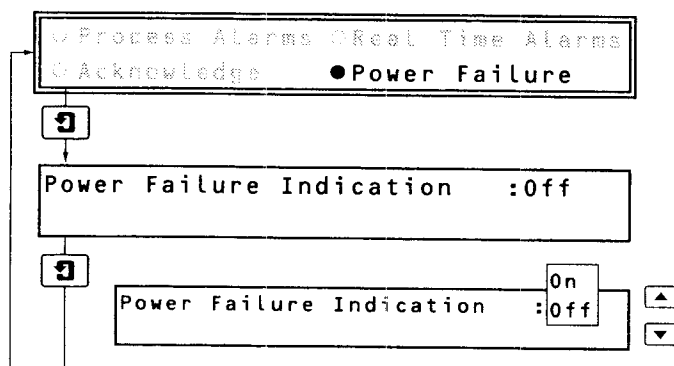
- 1) Process alarms set to OFF are not included in the combination when the equation is calculated.
- 2) Displayed when the output exceeds the engineering span by  $\pm 10\%$ .


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### 3.3.4 Power Failure Page

This page allows the power failure indication to be displayed in the Operator Pages.




Use the  key to select 'Power Failure' from the Alarms menu.

---

#### Power Failure Indication

Select 'On' to enable display of the Power Failure alarm in the **Alarm Acknowledge Page** and an instrument alarm in the **Operating Pages**.

---

Press the  key to return to the Alarms menu.



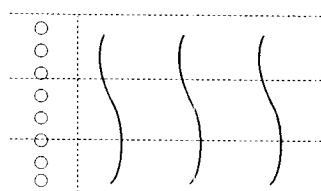
### 3.4 Chart Level

#### 3.4.1 Chart Control Page

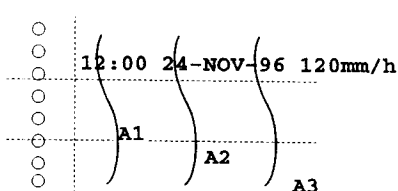


##### Information.

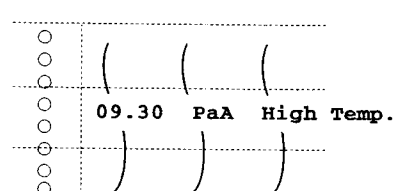
- Set up to three independent chart speeds (plus chart speed 0 – stopped) – selectable from Operating Level or by digital signal.
- Enable/disable printing of text, enable/disable alarm printing.
- Selectable text print speed, fast or slow.
- Auto pen-drop – returns the pen capsule to an operating state after a 5 minute delay to ensure recording is not inadvertently left disabled.
- 'Easy View' feature – allows quick access of latest printed information.



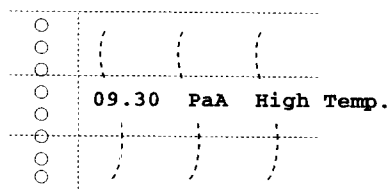
**A – Continuous trace,  
no text**



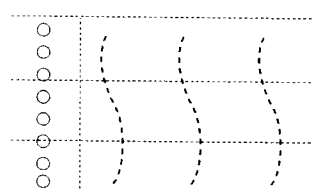
**B – Continuous trace,  
text overwrites trace**



**C – Continuous trace,  
text breaks trace**



**D – Dotted trace,  
text breaks trace**



**E – Dotted trace,  
no text**

**Fig. 3.3 Examples of Text/Trace Printing**

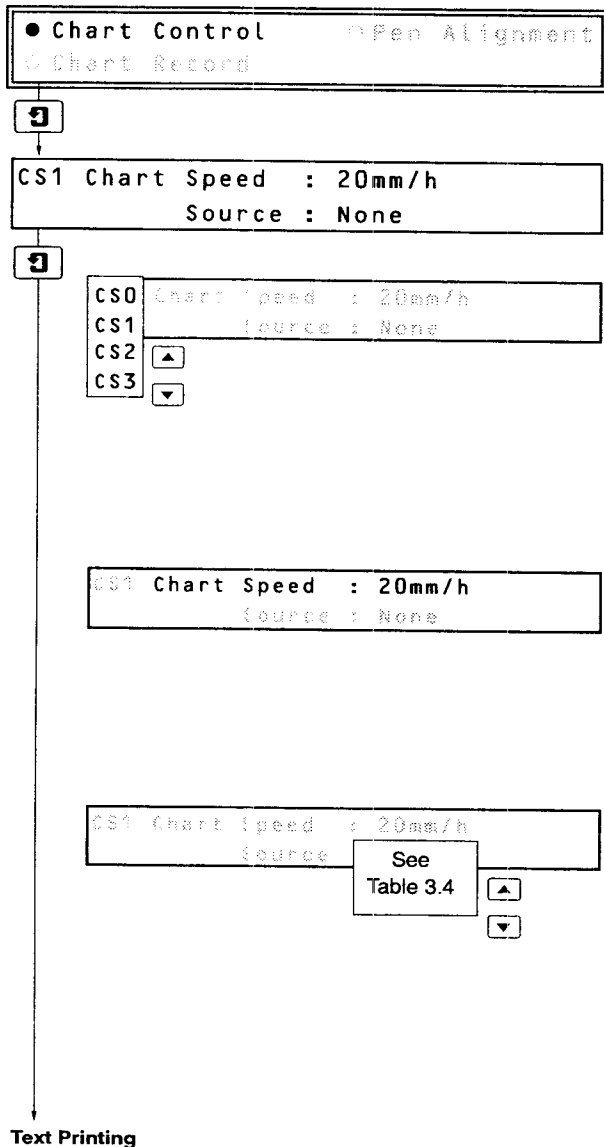
Print Mode	Chart Speed (mm/h)		
	0 to 240	241 to 500	501 to 1500
<b>A – Continuous trace No Text</b>	Auto print: OFF Alarm print: OFF	Auto print: OFF Alarm print: OFF	–
<b>B – Continuous traces Text overwrites trace</b>	Print speed: Slow	–	–
<b>C – Continuous trace Text breaks trace</b>	Print speed: Fast	Print speed: Fast	–
<b>D – Dotted trace Text breaks trace</b>	–	–	Print speed: Fast
<b>E – Dotted trace No Text</b>	–	–	Auto print: OFF Alarm print: OFF

**Table 3.5 Text Printing Options**





#### ...3.4.1 Chart Control Page



Press the key to select 'Chart Control' from the Chart menu.

Press the key to access the page.

#### Chart Control Page

##### Selecting the Chart Speed

Select a chart speed (CS0, CS1, CS2 or CS3).

**Note.** Chart speed CS0 is preset to 0mm/h. If CS0 is selected, 'Chart Stopped' is printed on the chart with the date and time)

Press the key to advance to the next parameter.

##### Setting the Chart Speed

Set a speed between 0 and 1500mm/hr.

**Note.** If the selected chart speed (other than CS0) is set to 0mm/hr, then 0mm/h is printed on the chart with the date and time.

Press the key to advance to the next parameter.

##### Chart Speed Source

Select the source required to initiate a change to the chart speed set above – see Section 3.3.3/ Table 3.4.

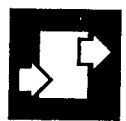
Press the key to advance to the Text Printing frame.

#### Example.

If a chart speed of 120mm/h is required when digital input DA1 is active, and at all other times, the required chart speed is 20mm/h:

- Set chart speed 1 to 20mm/h
- Set chart speed 1 source to 'DA1' (NOT DA1)
- Set chart speed 2 to 120mm/h
- Set chart speed 2 source to 'DA1'

Select chart speed 1 and start recording. When DA1 becomes active the chart speed changes to 120 mm/h. When DA1 becomes inactive the chart speed returns to 20mm/h.



### ...3.4.1 Chart Control Page

Auto Print : ON Alarm Print: OFF  
Print Speed: Slow

**[F]**

Auto Print : ON Alarm Print: OFF  
OFF Print Speed: Slow

▲  
▼

Auto Print : ON Alarm Print: ON  
Print Speed: OFF

▲  
▼

Auto Print : ON Alarm Print: OFF  
Print Speed: S Fast

Slow

Chart Cassette Type

#### Text Printing

##### Auto Print

Select the Auto Print mode required:

- ON – Enables automatic printing of time/date, chart speeds, scales and channel Identifiers.
- OFF – Disables automatic printing.

Press the **[F]** key to advance to the next parameter.

##### Alarm Print

Select ON to enable the printing of alarm messages.

Press the **[F]** key to advance to the next parameter.

##### Alarm and Operator Message Print Speed

With chart speeds  $\leq 240\text{mm/h}$  the selections have the following effect:

- Fast – Interrupts chart traces to print alarms or operator message.
- Slow – Prints alarms or operator message during chart traces.

Print speed options.

Parameter to Print	Chart Speed (mm/h)	
	1 - 240	241 - 1500
Process Alarms	Slow/Fast	Fast
Real Time Alarms	Slow/Fast	
Scales (Test Print)	Fast	
Operator Message	Slow/Fast	

The print speed for messages in autoprnt (i.e. Time, Date, Scales, Chart speed change and Trace Identifiers) is predefined and cannot be selected, ie.

Slow  $\leq 240\text{mm/h}$ .

Fast  $> 240\text{mm/h}$ .

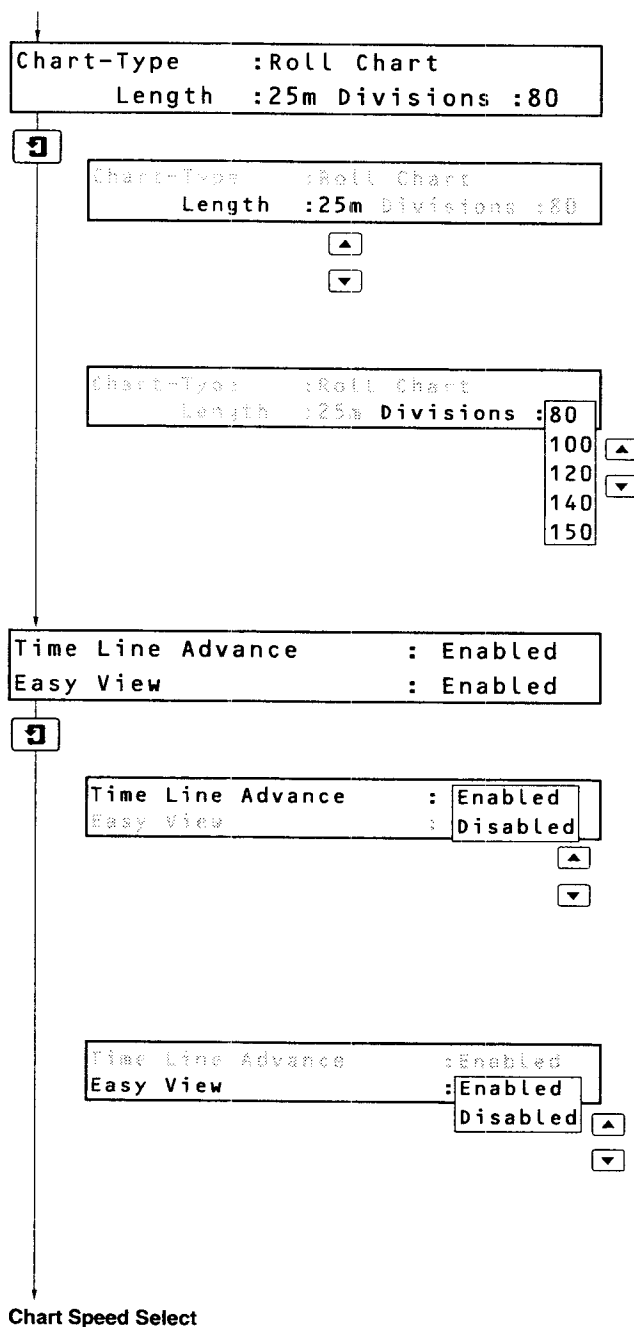
Trace identifiers are not printed at speeds  $> 240\text{mm/h}$ .

Press the **[F]** key to advance to the Chart Cassette Type frame.



### ...3 CONFIGURATION

#### ...3.4.1 Chart Control Page



#### Chart Settings

The Chart type, length and number of divisions is displayed.

#### Chart Length

Enter the required chart length in 1m increments. For roll chart cassettes, the standard length is 25m.

Press the key to advance to the next parameter.

#### Divisions

Select the number of divisions on the chart width.

Press the key to advance to the next frame.

#### Chart Functions

#### Time Alignment

After loading a new chart, the Time Alignment function allows the chart to be advanced to a time line before commencing recording.

Select 'Enabled' to display the Time Alignment function in the **Chart Page** – see Section 1.1/ Time Alignment.

Press the key to advance to the next parameter.

#### 'Easy View'

'Easy View' winds the chart forward a small distance to allow the latest information to be viewed. The chart is then returned automatically to the recording position where any buffered data is printed.

Select 'Enabled' to display the 'Easy View' function in the **Operator Page** – see Section 2.11.1

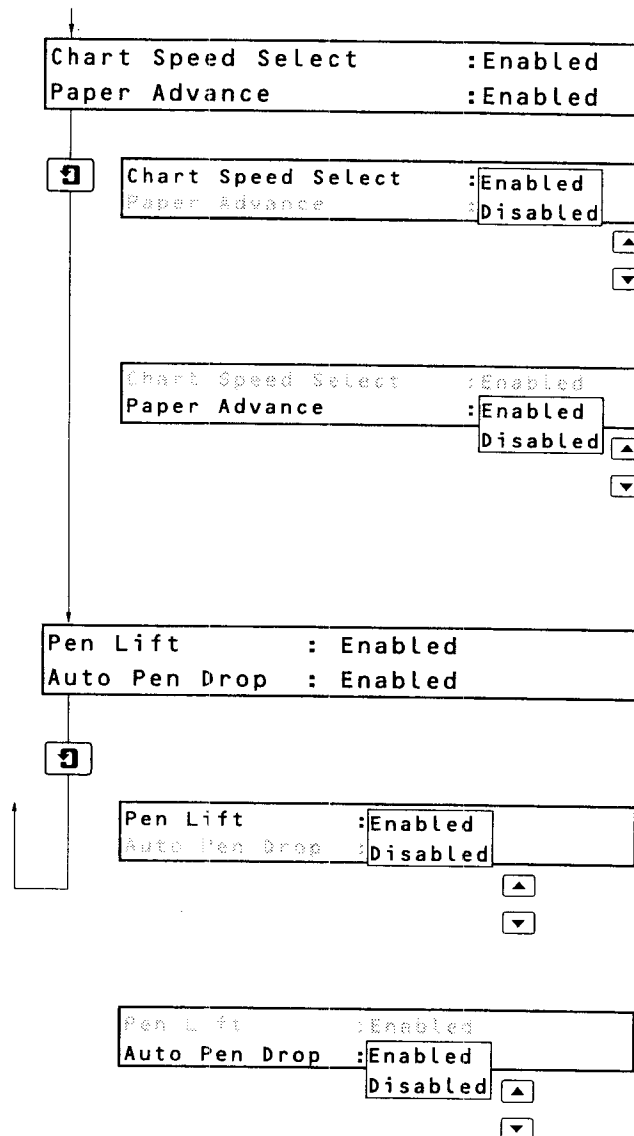


**Note.** 'Easy View' only operates with print speeds of  $\leq 120\text{mm/h}$ .

Press the key to advance to the Chart Speed Select frame.




### ...3.4.1 Chart Control Page



#### Chart Settings


##### Chart Speed Select

Select 'Enabled' to allow the chart speed to be selected in the operator pages.

Press the  key to advance to the next parameter.


##### Paper Advance

Select 'Enabled' to allow the chart to be wound forward manually in the operator pages.

Press the  key to advance to the next frame.

#### Pen Lift/Drop Settings

##### Pen Lift


Select 'Enabled' to allow use of the  key on the front panel (Pen lift).

Press the  key to advance to the next parameter.

##### Auto Pen Drop

The Auto Pen Drop facility returns the pen capsule to an operating state approximately five minutes after the pen lift has been activated.

Select 'Enabled' to activate the Auto Pen Drop facility.

Press the  key to return to the Chart menu.

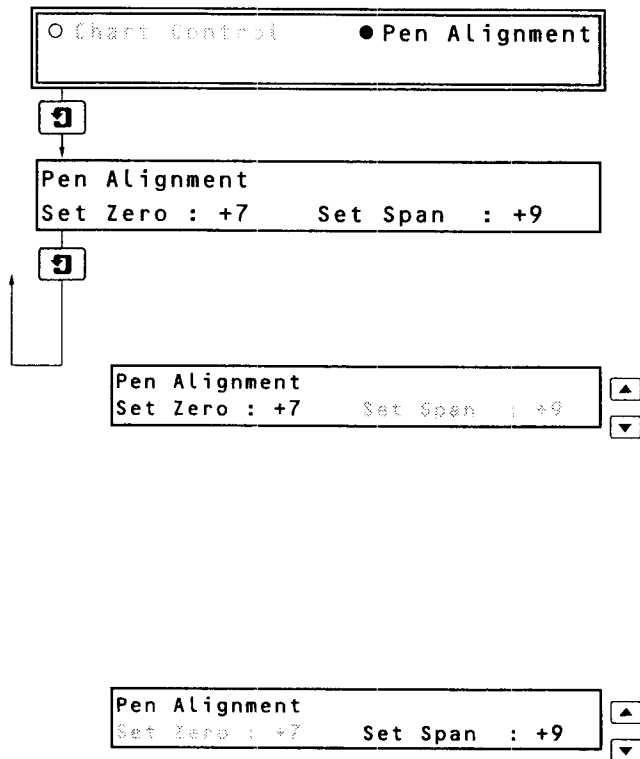


#### 3.4.2 Pen Alignment Page



##### Information.

- Allows accurate adjustment of pen position on the chart.
- Can be used to remove the effect of inconsistencies in chart manufacture.



Press the **[F1]** key to select 'Pen Alignment' from the Chart menu.

Press the **[F1]** key to access the page.

##### Pen Alignment Settings

On accessing the Pen Alignment Page...

Recording Stopped

...is displayed momentarily.

##### Set Pen Zero

When the Pen Alignment Page is selected the chart will advance at 'fast' speed and the magenta pen will mark the chart at its zero position.

Use the **[Up]** and **[Down]** keys to adjust the pen to the zero position. A 'Set Zero' displacement figure between -10 and +10 is displayed.

Press the **[F1]** key to advance to the next parameter.

##### Set Pen Span

The chart continues to advance at 'fast' speed and the pen moves to its full scale position.

Use the **[Up]** and **[Down]** keys to adjust the pen to the full scale position. A 'Set Span' displacement figure between -10 and +10 is displayed.

Press the **[F1]** key to return to the Chart menu...

Recording Restarted

...is displayed momentarily and the time that recording was stopped is printed on the chart.



### 3.4.3 Chart Record Page



#### Information.

- Two pen function options, Trend or Event.  
Trend – chart trace represents analog input or maths result.  
Event – 3-position event marker.
- Ten programmable zones.
- Trace can be set to change color when a digital input or alarm is active.

Chart Control    Open Alignment  
● Chart Record



01 Trace Primary Color:Magenta



01 Trace Primary Color:Magenta

.....

24



01 Trace Primary Color:

None  
Magenta  
Red  
Black  
Green  
Blue  
Brown  
Z-trace



Set next trace

Trace Secondary Color

Press the key to select 'Chart Record' from the Chart menu.

Press the key to access the page.

#### Trace Primary Color

#### Select Trace

Select the trace to be set.

Press the key to advance to the next parameter.

#### Trace Primary Color

Select the primary color of the pen.

Traces 1 to 6 can be allocated any single color, traces 7 to 24 can be allocated any single color or their designated Z-trace color – see Table 3.6.



**Caution.** On multi-channel applications, consideration should be given when allocating trace colors. If one color is used significantly more than others, the ink is used more quickly.

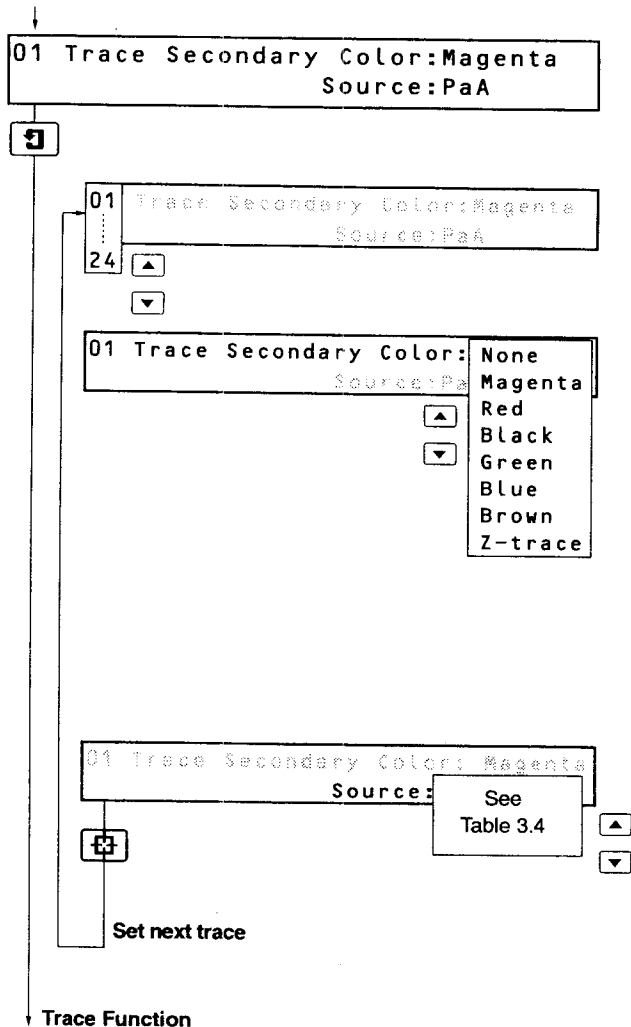
Press the key to set up the next pen or the key to advance to the next frame.

Trace Number	Z-trace color	Trace Number	Z-trace color
01	} Z-trace not available	13	Magenta/Green
02		14	Blue/Red
03		15	Black/Brown
04		16	Magenta/Black
05		17	Black/Blue
06		18	Brown/Green
07	Magenta/Red	19	Green/Red
08	Black/Green	20	Magenta/Blue
09	Blue/Brown	21	Red/Brown
10	Red/Black	22	Red/Black/Green/Magenta
11	Green/Blue	23	Blue/Brown/Magenta/Red
12	Magenta/Brown	24	Black/Green/Blue/Brown

Table 3.6 Z-trace Colours



### ...3.4.3 Chart Record Page



#### Trace Secondary Color

This feature allows the trace color to be changed when a digital input is active or an alarm condition occurs. When the source is active the secondary color is selected.

#### Pen Selection

Select the pen to be set.

Press the  key to advance to the next parameter.

#### Trace Secondary Color

Select the secondary color of the pen.



Traces 1 to 6 can be allocated any single color, traces 7 to 24 can be allocated any single color or their designated Z-trace color – see Table 3.6.



**Caution.** On multi-channel applications, consideration should be given when allocating trace colors. If one color is used significantly more than others, the ink is used more quickly.

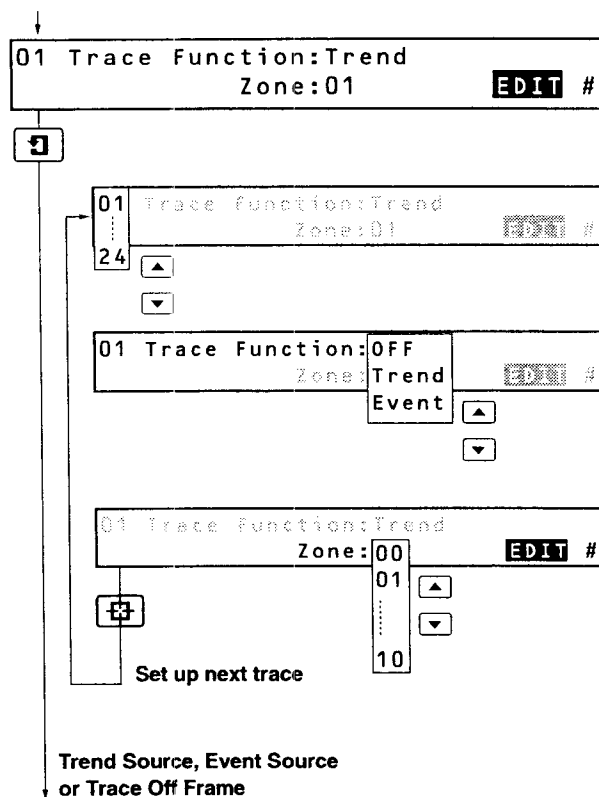
#### Secondary Color Source

Select the source to initiate the color change – see Section 3.3.3/ Table 3.4.

Press the  key to set up the next pen or the  key to advance to the Trace Function frame.



## ...3.4.3 Chart Record Page



## Trace Function

## Trace Selection

Select the trace to be set.

Press the **F1** key to advance to the next parameter.

## Trace Function Selection

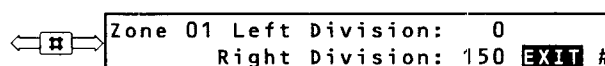
Select the trace function.

Press the **F2** key to advance to the next parameter.

## Zone Set Up – Fig. 3.4

Select the zone to be set.

Zone 0 is preset and uses the full 250mm recording width.



To set zones 1 to 10 press the **F3** key.

The margins are set in chart divisions (steps of 10).

Left margin maximum = No of chart divisions – 10  
ie. 90 on a 100 division chart  
140 on a 150 division chart.

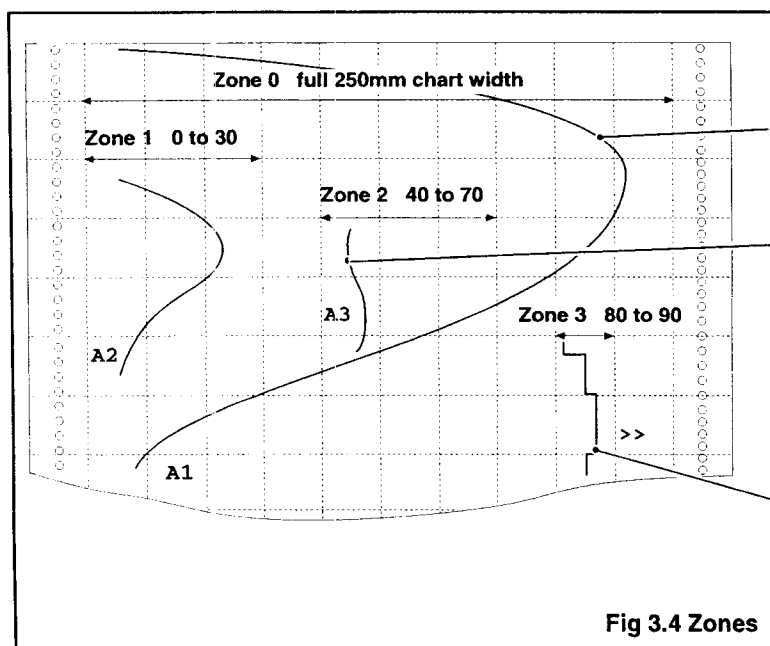
Right margin minimum = 10 + left margin.



**Note.** The number of divisions on the chart is set in Section 3.4.1/ Chart Control Page/ Chart Settings.

Press the **F4** key to return to the Trace Function frame.

Press the **F5** key to advance to the next frame.



## Notes.

Trend traces recorded in zone 0 use the full 250mm recording width, where the left division represents the chart Lo and the right division the chart Hi – see Chart Scale Lo/Hi in the Trend Source frame.

Trend traces recorded in zones 1 to 10 use only the portion of the chart dictated by the margin settings, where the left margin represents the chart Lo and the right margin the chart Hi.

Event traces recorded in zone 0 are positioned at 10.4mm intervals across the chart width according to the trace number, starting 5.2mm from the left edge. If an event source is active the trace deflects approximately 3mm in the relevant direction.

Event traces recorded in zone 1 to 10 are positioned centrally between the left and right margin positions. If an event source is active the trace deflects approximately 3mm in the relevant direction.

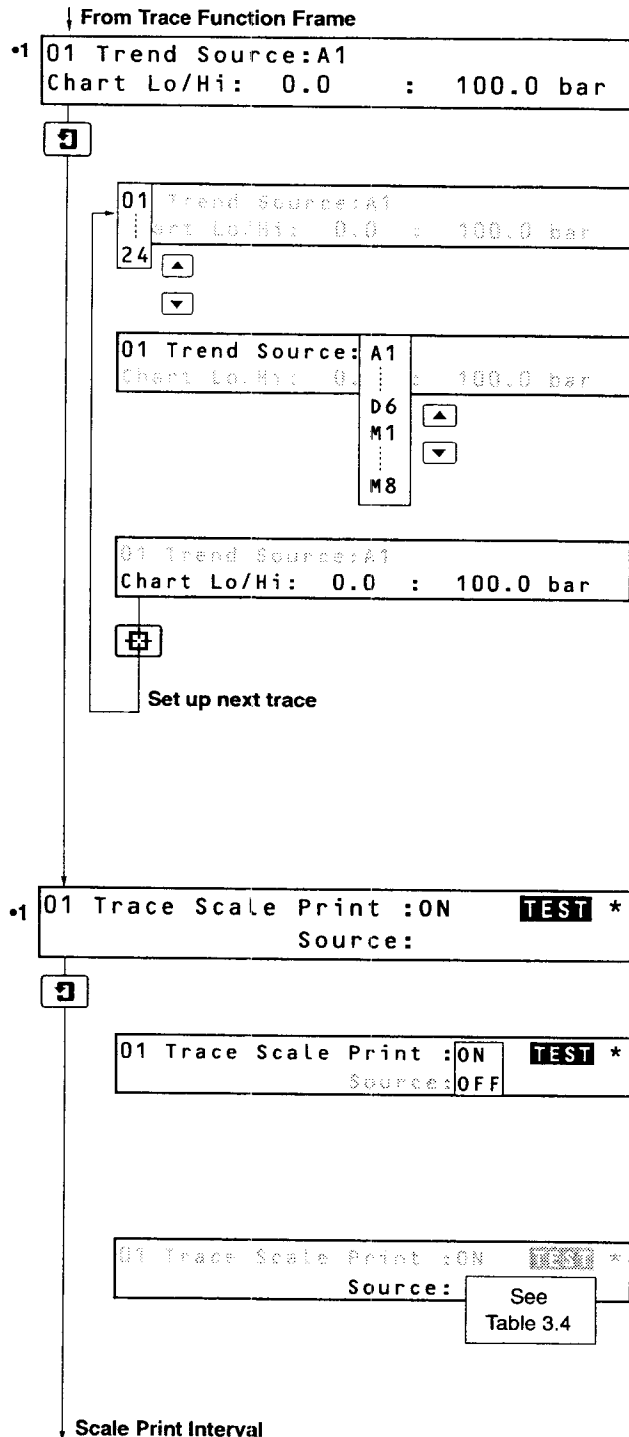
Fig 3.4 Zones





### ...3 CONFIGURATION

#### ...3.4.3 Chart Record Page



##### Trend Source

Displayed if the Trace function 'Trend' is selected in the Trace Function frame.

##### Trace Selection

Select the trace to be set.

Press the  key to advance to the next parameter.

##### Trend Source

Select the channel to be recorded on the selected trace.

Press the  key to advance to the next parameter.

##### Chart Scale Lo/Hi


Set the Lo (minimum) and Hi (maximum) values of the chart scale.

This range can be different from the engineering range of the signal being recorded (within limits -999 to +9999).

The decimal point position is determined by the setting for the analog signal being recorded.


Press the  key to advance to the next frame.

##### Printing the Trace Scale

 **Note.** Scales are not printed in zones less than 10 divisions wide.

##### Trace Scale Print

Select ON to enable automatic printing of the trace scale.

Press the  key to print a test sample of the scale on the chart.

Press the  key to advance to the next parameter.

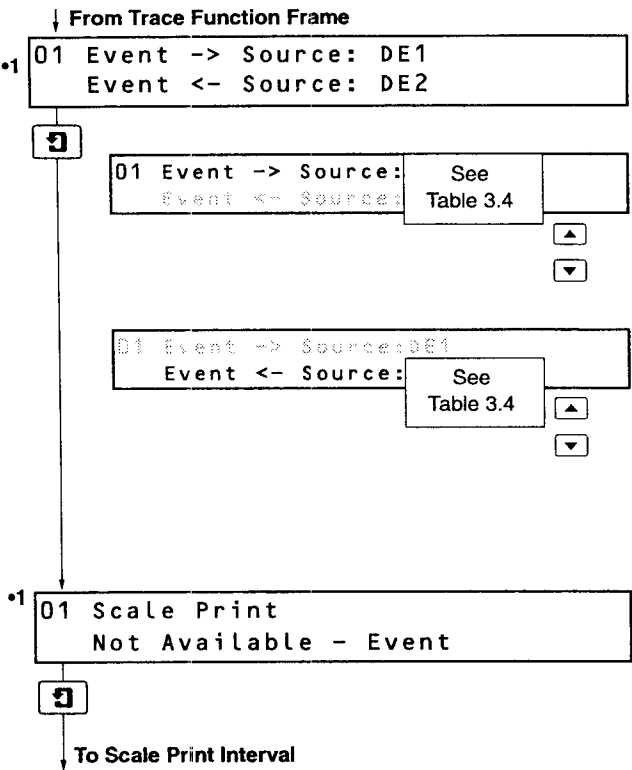
##### Scale Print Source

Select the source to initiate a test scale print – see Section 3.3.3/ Table 3.4.

•1 Not displayed if 'EVENT' or 'OFF' is selected in the Trace Function frame.



...3.4.3 Chart Record Page



**Trace Event Source**

Displayed if the Trace function 'Event' is selected in the Trace Function frame.

**Upscale Event Mark**

Select the source to initiate an upscale event mark – see Section 3.3.3/ Table 3.4.

Press the  key to advance to the next parameter.

**Downscale Event Mark**

Select the source to initiate a downscale event mark – see Section 3.3.3/ Table 3.4.




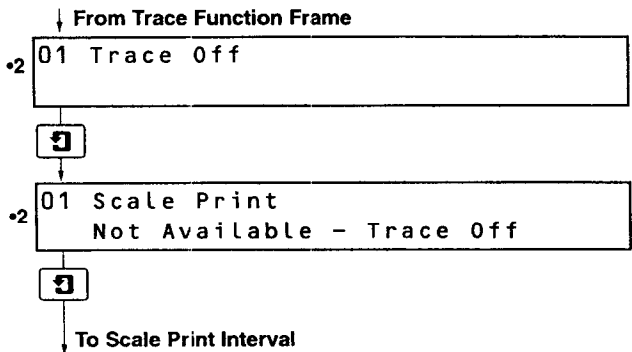
**Note.** If both upscale and downscale event sources are active, the downscale source takes priority.

Press the  key to advance to the next frame.

**Trace Scale**

Displayed to indicate that the Trace Scale frame is not available for event markers.

Press the  key to advance to the Scale Print Interval frame.




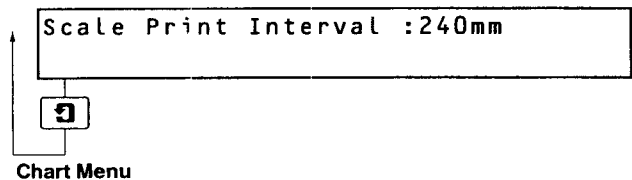
**Trace Off**

Displayed if the Trace function is selected 'OFF' in the Trace Function frame.

**Trace Scale**

Displayed to indicate that the Trace Scale frame is not available if the Trace Function is set to 'OFF'.

Press the  key to advance to the Scale Print Interval frame.



**Scale Print Interval**

The scale is printed on the chart at preset intervals. Set the distance between scale prints in mm. (OFF or 20 to 240 mm to disable automatic scale printing).

Press the  key to return to the Chart menu.

- 1 Not displayed if 'TREND' or 'OFF' is selected in the Trace Function frame.
- 2 Not displayed if 'TREND' or 'EVENT' is selected in the Trace Function frame.



## 3.5 Output Modules



### Information.

- Module types – 3 Relay, 6 Relay, Transmitter PSU or MODBUS serial link.
- Automatic detection of module type fitted.
- Programmable sources and polarity of relay outputs.

### 3.5.1 Relay Output Module Page

● Pos'n E(6Rly)    ○ Pos'n F(Hybd)  
○ Pos'n G(MBus)

● Pos'n E(None)    ○ Pos'n F(Hybd)  
○ Pos'n G(3Rly)  
                          (6Rly)  
                          (Txps)  
                          (MBus)  
                          (Hybd)

E1 Relay O/P-    Source: PaA  
                          Polarity: Positive

E1  
⋮  
E6

E1 Relay O/P-    Source: PaA  
                          Polarity: Positive

▲  
▼

E1 Relay O/P-    Source:  
                          Polarity:

See  
Table 3.4

▲  
▼

E1 Relay O/P-    Source: PaA  
                          Polarity: Positive  
                          Negative

▲  
▼

#### Select Module Position

Press the key to select the module to be configured.

The type of module fitted in each position is displayed automatically:

- None – No module fitted (No configuration required).  
3Rly – 3-relay outputs.  
6Rly – 6-relay outputs.  
Txps – Transmitter PSU (No configuration required).  
MBus – MODBUS serial communications  
        – see *MODBUS Supplement*  
Hybd – Hybrid digital input/output and analog outputs.

Press the key to configure the module in the selected position.

#### Relay Output Module

##### Select Relay Output

Select the relay output to be configured (1 to 3 or 1 to 6, depending on the module fitted).

Press the key to advance to the next parameter.

##### Select Output Source

Select the digital source which activates the relay output – see Section 3.3.3/ Table 3.4.



**Note.** If the relay is used to provide a totalizer count pulse, the maximum pulse frequency is 1.33Hz. Consideration should also be given to the mechanical life of the relay.

Press the key to advance to the next parameter.

##### Select Output Polarity

The relay output can be set to energize for either an active or inactive digital signal:

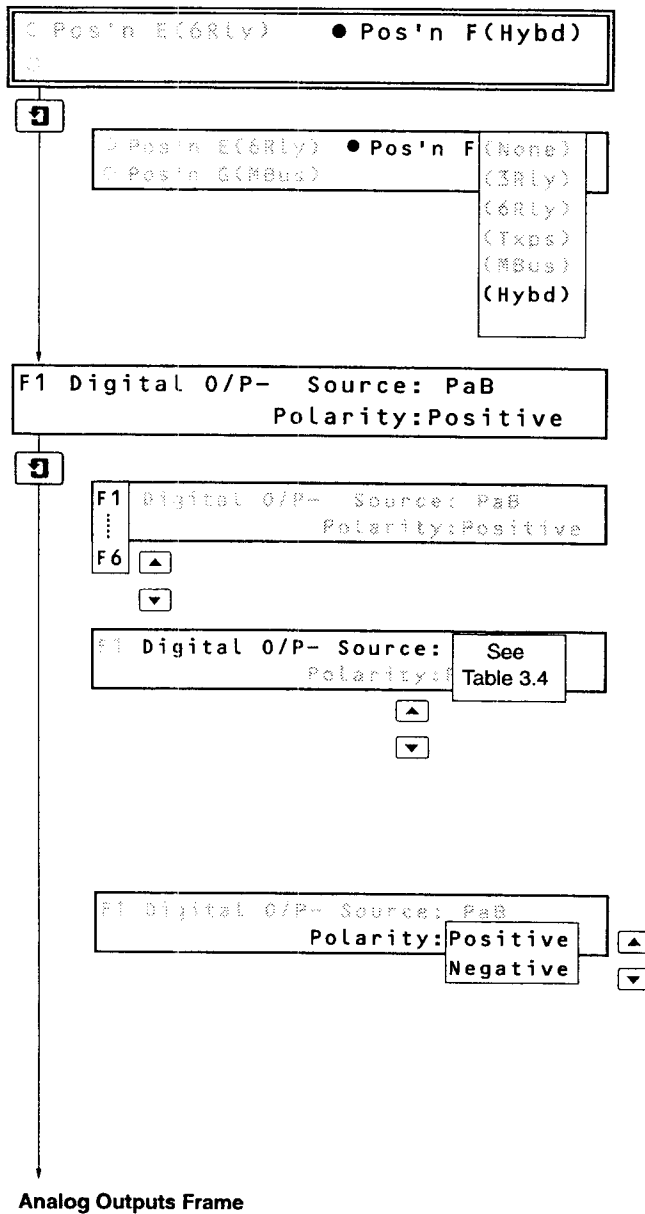
- Positive – If digital source is active, relay is energized.  
Negative – If digital source is inactive, relay is energized.

Press the key to set up the next relay output.

Press the key to return to the Modules menu.



### 3.5.2 Hybrid Output Module Page



#### Hybrid Module

Press the key to select the module position to be configured.

Press the key to access the page.

#### Digital Outputs

##### Select Digital Output

Select the digital output to be configured (F1 to F6).

Press the key to advance to the next parameter.

##### Select Output Source

Select the source which will activate the digital output:  
– see Section 3.3.3/ Table 3.4.

**Note.** If the digital output is used to provide a totalizer count pulse, the maximum pulse frequency is 0.667 Hz.

Press the key to advance to the next parameter.

##### Select Output Polarity

The digital output can be set to energize for either an active or inactive digital signal:

- Positive polarity – If digital source is active, the output is energized.
- Negative polarity – If digital source is inactive, the output is energized.

Press the key to advance to the next frame.



#### ...3.5.2 Hybrid Output Module Page

F1 Analog O/P- Source: A1

⏏

F1 Analog O/P- Source: A1

F2

▲

▼

F1 Analog O/P- Source: A1

A1

...

D6

M1

...

M8

▲

▼

F1 Eng Lo/Hi:0 : 1000  
Current Lo/Hi:4.0 : 20.0 mA

⏏

F1 Eng Lo/Hi:0 : 1000  
Current Lo/Hi:4.0 : 20.0 mA

F2 Eng Lo/Hi:0 : 1000  
Current Lo/Hi:4.0 : 20.0 mA

▲

▼

F1 Eng Lo/Hi:0 : 1000  
Current Lo/Hi:4.0 : 20.0 mA

▲

▼

F1 Eng range: 0 / 1000  
Current Range: 4.0 / 20.0 mA

▲

▼

#### Analog Outputs

##### Select Analog Output

Select the Analog Output to be configured (F1 or F2).

Press the  key to advance to the next parameter.

##### Select Analog Output Source

Select the source required to activate the analog output. The source is selected from analog inputs A1 to D6 and maths blocks M1 to M8 (depending on the options fitted). If no analog output is required, select 'None'.

Press the  key to advance to the next frame.


#### Engineering Range Set Up

##### Channel Selection

Select the analog output to be configured (F1 or F2).

Press the  key to advance to the next parameter.

##### Engineering Lo and Hi


 **Note.** The Lo/Hi values set in this frame are independent of those in Section 3.2.1/ Input Set Up Page.

Enter the zero value of the analog output range (within limits -999 to +9999).

(The decimal point position is set according to the analog O/P source).

Press the  key to advance to the next parameter.

Enter the full scale value of the analog output range.


Press the  key to advance to the next parameter.

##### Output Current

Enter the output current value corresponding to zero output range (within limits 0 to 20 mA).

Press the  key to advance to the next parameter.

Enter the output current value corresponding to full scale output range (within limits 0 to 20 mA).

Press the  key to return to the Modules menu.



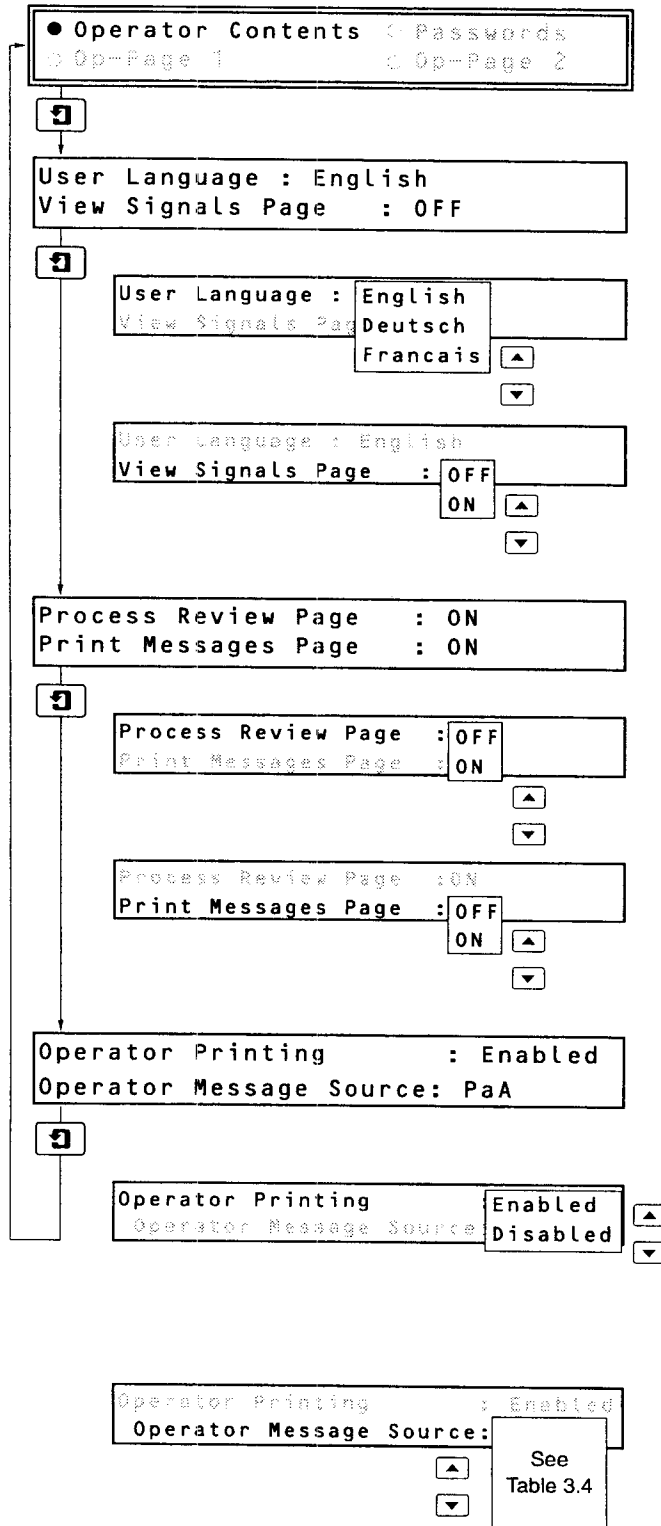
### 3.6 Operator Set Up Level

#### 3.6.1 Operator Contents Page



##### Information.

- English, French or German language options.
- Operator Level Pages which are not required can be turned off.



Press the **F5** key to select 'Operator Contents' from the Operator menu.

Press the **F5** key to access the page.

##### Operator Page

##### User Language

Select the language to be displayed.

Press the **F5** key to advance to the next parameter.

##### View Signals Page

Select 'ON' to enable the **View Signals Page** in the **Operator Level**.

Press the **F5** key to advance to the next frame.

##### Process Review and Print Messages

Select ON to enable the **Process Review Page** in the **Operator Level**.

Press the **F5** key to advance to the next parameter.

Select ON to enable the **Print Messages Page** in the **Operator Level**.

Press the **F5** key to advance to the next frame.

##### Operator Printing Enable/Disable

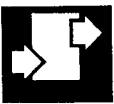
Select 'Enabled' to allow the Operator Message to be set up and printed (the message is set up in the Operator Level), and allow the operator to activate printing of the date and time.

Press the **F5** key to advance to the next parameter.

##### Operator Message Source

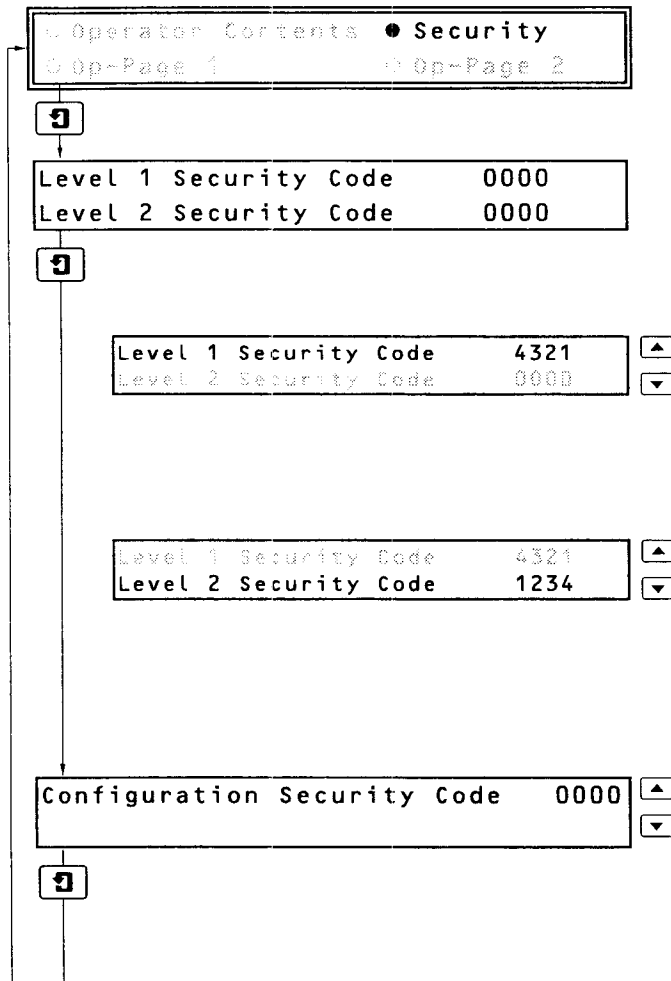
Select the source required to activate printing of the Operator Message – see Section 3.3.3/ Table 3.4.


Press the **F5** key to return to the Operator menu.




### 3.6.2 Security Page

This page is used to set the passwords for access to chart loading, datalogging, process review, message printing and configuration functions.



Press the  key to select 'Security' from the Operator menu.

Press the  key to access the Page.

#### Set Level 1 and Level 2 Security Code

The Level 1 Security Code allows access to the Chart Page and Memory Card Datalogging Page. The Level 2 Security Code allows access to the Process Review Page and the Print Messages Page.

Set the Level 1 Security Code to any number between 0000 and 9999.

(Setting 0000 disables the security and allows unrestricted access to the Load Chart and Datalogging Pages).

Set the Level 2 Security Code to any number between 0000 and 9999.

(Setting 0000 disables the security and allows unrestricted access to the Level 1 Pages, the Print Messages and Process Review Pages).

Press the  key to advance to the next frame.

#### Set Configuration Security Code

The Configuration Security Code allows access to the Load Chart and Datalogging Pages (Level 1), the Print Messages and Process Review Pages (Level 2) and the Configuration Level (Level 3).

Set the Code to any number between 0000 and 9999.

(Setting 0000 disables the security and allows unrestricted access to all levels).

Press the  key to return to the Operator menu.

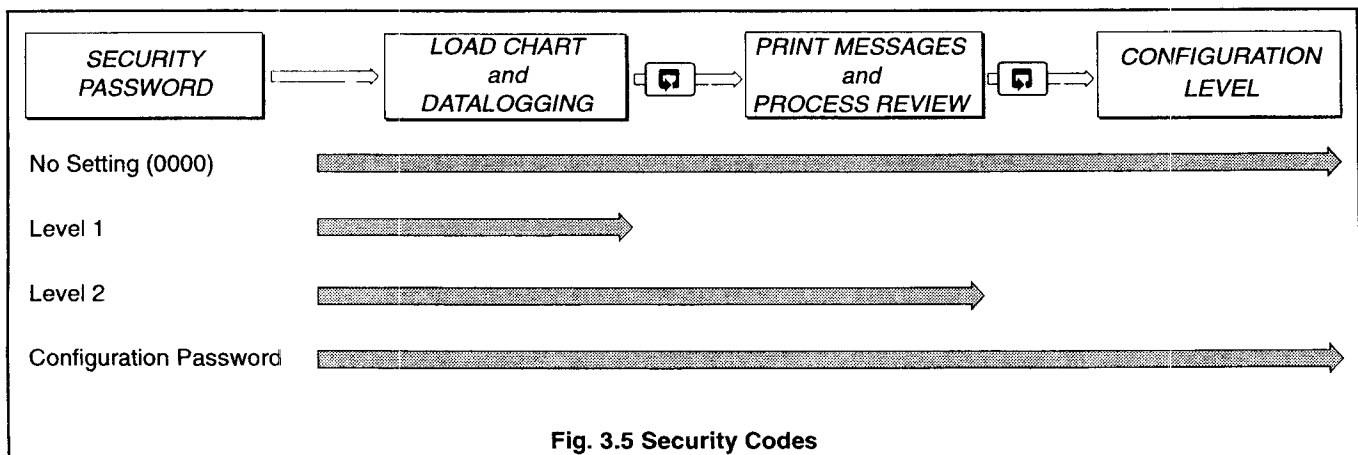


Fig. 3.5 Security Codes

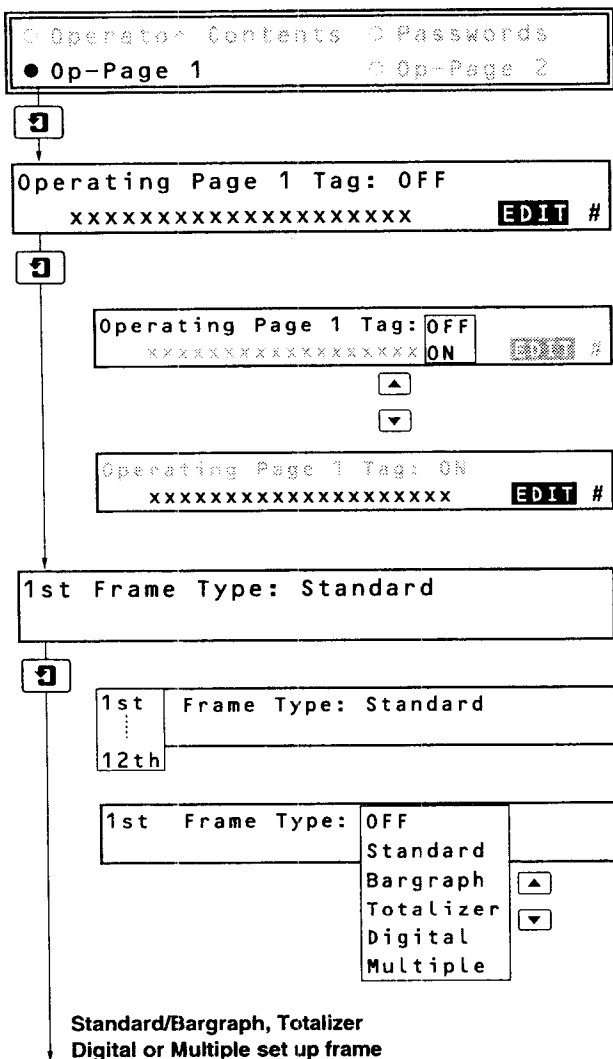


### 3.6.3 Operator Pages 1 and 2



#### Information.

- Two operating pages, each with 12 individually configured frames.
- 5 frame display options
- Operator Page 2 is not displayed if all the frames are set to 'OFF'.



Press the key to select 'Op-Page 1' or 'Op-Page 2' from the Operator menu.

Press the key to access the page.

#### Operating Page Title

A title frame can be displayed at the start of the operating page.

#### Operating Page Tag

Select ON to enable the title frame to be displayed.

Press the key to edit the 20 character message.

Press the key to advance to the next frame.

#### Op Page Frame Set Up

Select the Op-Page Frame to be set up.

Press the key to advance to the next parameter.

#### Frame Type

Select the Frame Type required.

(OFF is not available on the 1st frame of Op-Page 1).

A1	107.6 °C	Boiler 1 Temperature	Standard
A2	99.3 °C		Bargraph
B3	50.2 l/h	00043689 litres	Totalizer
DB1	Digital Signal OFF	xxxxxxxxxxxxxxxxxxxxx	Digital
A3	107.6 °C	A4 372.4 psi	A5 999.9 °C
			Multiple

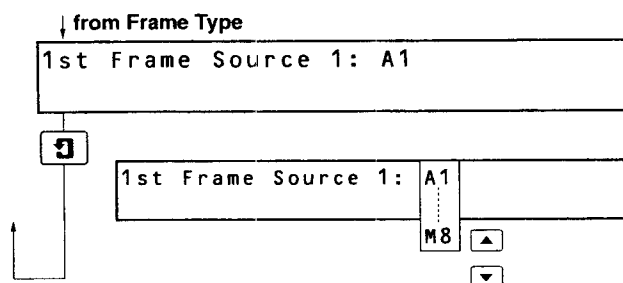
Press the key to set up the next Op-Page Frame.

Press the key to advance to the set up frames.





### ...3.6.3 Operator Pages 1 and 2




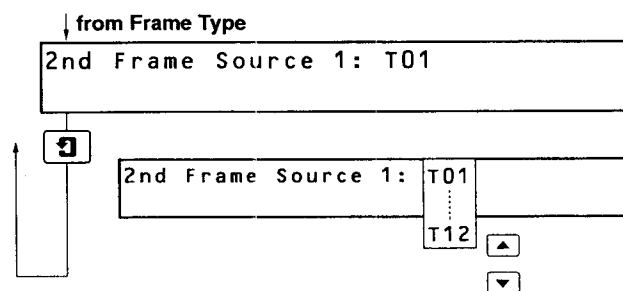
#### Standard/Bargraph Type

Displays the Analog Input information – see Section 2.3.1.

#### Selecting the Input Source

Select the Analog Input to be displayed.

Press the  key to return to the Operator menu.



#### Totalizer Type

Displays a totalizer result – see Section 2.3.1.

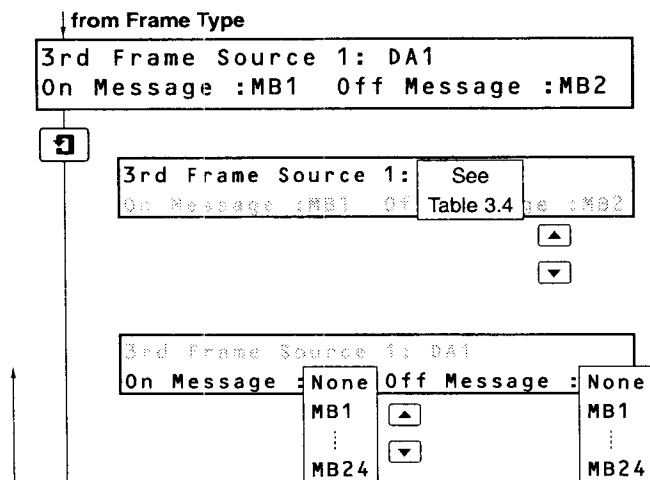
#### Selecting the Input Source

Select the totalizer to be displayed.

Press the  key to return to the Operator menu.



### ...3.6.3 Operator Pages 1 and 2



#### Digital Type


The frame is allocated to a digital source. The messages displayed are selected from the message blocks – see Section 3.7.1/ Message Blocks Page.

Select the Digital source to be displayed – see Section 3.3.3/ Table 3.4.

Press the  key to advance to the next parameter.

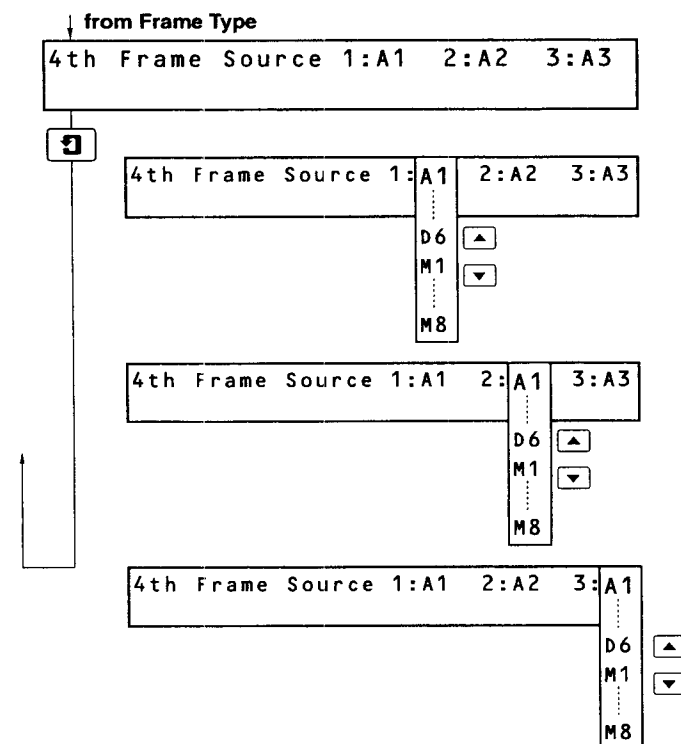
#### ON/OFF Messages

Select the message block to be displayed when the source is active.

Press the  key to advance to the next parameter.

Select the message block to be displayed when the source is inactive.

Press the  key to return to the Operator menu.



#### Multiple Type

Displays 3 Analog input channels and/or Maths results – see Section 2.3.1.

Select the source to be displayed as source 1.  
A1 to D6, M1 to M8.

Press the  key to advance to the next parameter.

Select the source to be displayed as source 2.  
A1 to D6, M1 to M8.

Press the  key to advance to the next parameter.

Select the source to be displayed as source 3.  
A1 to D6, M1 to M8.

Press the  key to return to the Operator menu.

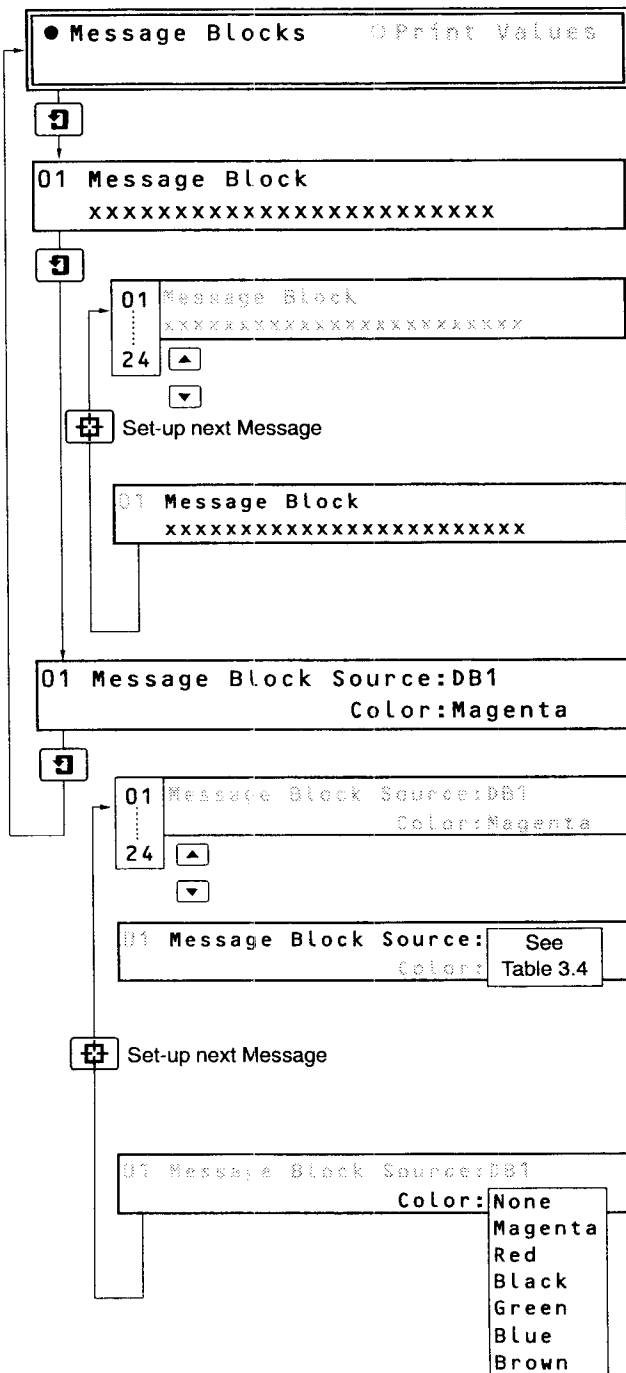



## 3.7 Printing Menu


### 3.7.1 Message Blocks Page

#### Information

- Twenty four, 20-character Operator messages.
- Message printing can be triggered by internal or external digital signals.
- Programmable color of message.
- Time stamping for message.




Press the  key to select 'Message Blocks' from the Printing menu.

Press the  key to access the page.

#### Message Set Up



##### Selecting a Message Block

Select the message to be set.

Press the  key to advance to the next parameter.

##### Message

Enter a message of up to 20 characters – see front fold-out.

Press the  key to set up the next message.  
Press the  key to advance to the next frame.

#### Message Block Set Up

##### Selecting a Message Block

Select the message to be set.

Press the  key to advance to the next parameter.



##### Message Block Source

Select the source to activate printing of the message – see Section 3.3.3/ Table 3.4.

Press the  key to advance to the next parameter.

##### Color

Select the color required for the printing of the message.

Press the  key to set up the next message.  
Press the  key to return to the printing menu.



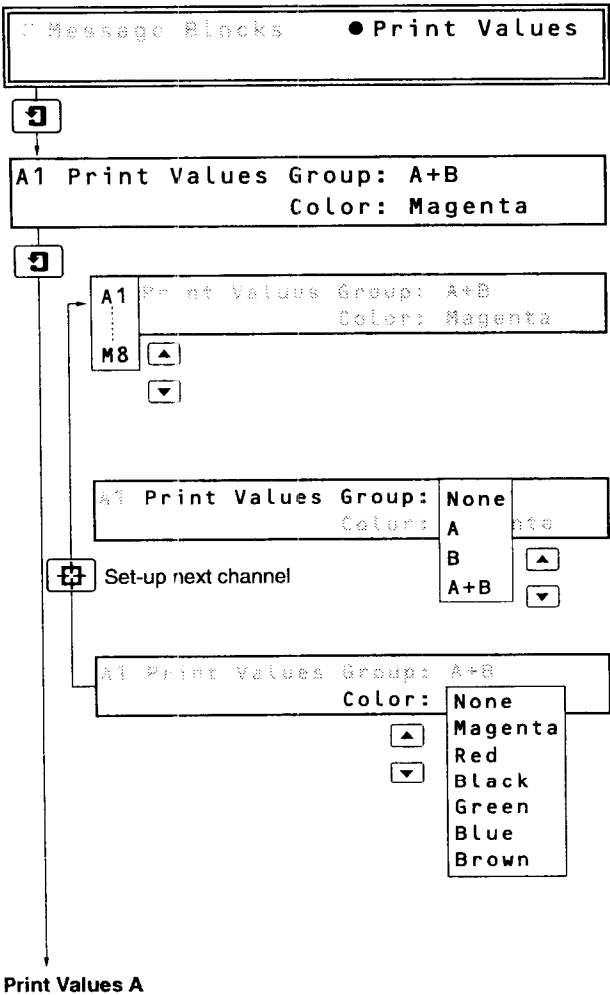
3.7.2 Print Values Page





Information

- Instantaneous values of the analog inputs and maths results can be printed on the chart.
- Two channel value groups are available with independent print sources and automatic print times.
- Each analog signal can be assigned to either or both groups.

Analog input channel values and maths block results can be assigned to a 'Values Group'. The instantaneous values of the channels in the group can then be printed, on demand, from the Operator Level – see Section 2.10/ Print Messages Page/ Printing Values Groups.



Press the  key to select the Print Values Page from the Printing menu.

Press the  key to access the page.

Print Values Group Set Up

Channel Selection

Select the channel to be assigned to a print values group. A1 to D6 or M1 to M8.

Press the  key to advance to the next parameter.

Print Values Group

Select the Print Values Group to which the channel is assigned.

Press the  key to advance to the next parameter.

Color

Select the color of the printed value.

Press the  key to advance to the next frame.



Press the **[G]** key to return to the printing menu.

**Print Source Group B**  
Select the source required to initiate printing group B  
– see Section 3.3.3/ Table 3.4.

Press the **[#]** key to advance to the next parameter.

**Print Interval Group B**  
Select the time interval required between each set of  
printed values – see group A above.

### Setting the Print Group B

Press the **[G]** key to advance to the next frame.

**Print Source Group A**  
Select the source required to initiate printing group A  
– see Section 3.3.3/ Table 3.4.

Press the **[#]** key to advance to the next parameter.

5 min – On the hour then every 5 minutes  
10 min – On the hour then every 10 minutes  
15 min – On the hour then every 15 minutes  
20 min – On the hour then every 20 minutes  
30 min – On the hour then every 30 minutes  
60 min – On the hour every hour  
120 min – Every 2 hours (ie. 2:00, 4:00 ....24:00)  
180 min – Every 3 hours (ie. 3:00, 6:00 ....24:00)  
240 min – Every 4 hours (ie. 4:00, 8:00 ....24:00)  
480 min – Every 8 hours (ie. 8:00, 16:00 and 24:00)  
720 min – Midday and midnight  
1440 min – Midnight  
OFF – Disable Group A printing

**Print Interval Group A**  
Select the time interval required between each set of  
printed values. The time interval is selectable from the  
following values:

### Setting the Print Group A

Print Values B Interval: 15 Min  
Source: See  
Table 3.4

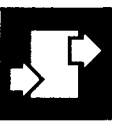
Print Values B Interval: 15 Min  
Source: PaA

Print Values B Interval: 15 Min  
Source: PaA

Print Values A Interval: 20 Min  
Source: See  
Table 3.4

Print Values A Interval: 20 Min  
Source: None

Print Values A Interval: 20 Min  
Source: None



### 3.8 Totalizer Level

#### 3.8.1 Introduction to Totalization



##### Information.

- Twelve, 8-digit totalizers which can be assigned as analog integrators to any channel or maths result, or as digital counters assigned to any digital signal.
- Count up or count down.
- Count rates – from 0.001 to 99.999 counts/second.
- External counter pulse – can be used to energize relays or digital outputs
- 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.

The totalizer option provides integration of flow rates from input signals with linear, square law or power law characteristics. More than one totalizer can be allocated to a channel and these may be switched on or off as required.

The flow total for any channel can be viewed on the digital display and reset using the front panel switches and/or a digital signal. An additional internal 'Secure' total is also provided which can only be reset after gaining access to the **CONFIGURATION LEVEL**.

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

External counter pulses up to 1.3 counts/sec can be assigned to any relay O/P – pulse duration 50mS

External counter pulses up to 0.6 counts/sec can be assigned to any digital O/P – pulse duration 750mS

#### Converting the Engineering Flow Rate – Example A and B

To calculate the count rate high, the engineering flow rate high must first be converted into units per second. The engineering range (display range) value is limited to 9999. In some circumstances the engineering flow rate high value may be greater than 9999 and the engineering range must therefore be scaled. In the calculation of units/second the actual engineering flow rate high value must be used.

$$\text{Max. flow rate in Units/Second} = \frac{\text{Actual Engineering Flow Rate High}}{\text{Engineering Range Units (in seconds)}}$$

#### Calculating the Count Rate High – Example A and B

The totalized decimal point allows the totals to be scaled between  $10^{-8}$  and  $10^0$  ie. .00000000 and 00000000 with multiplication factors of x 10 and x 100 giving 000000000 and 0000000000, the latter two increases in increments of tens or hundreds respectively.

$$\text{Count Rate High} = \frac{\text{units/second}}{\text{counter factor}} \quad \left. \vphantom{\frac{\text{units/second}}{\text{counter factor}}} \right\} \text{ Must be within the limits of 99.999 to 0.001 pulse per second}$$



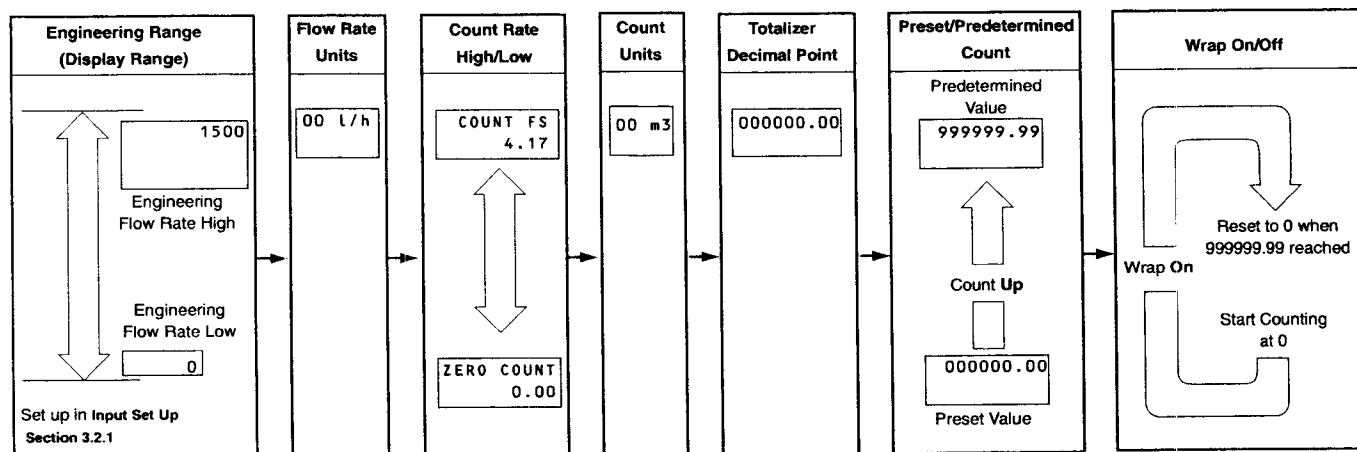
#### ...3.8.1 Introduction to Totalization

##### Example A – Setting up:

- an engineering range of 0 to 1500 representing a range of 0 to 150,000 litres per hour
- measuring effluent discharge
- count every 0.01m<sup>3</sup>
- wrap function ON, front panel total automatically reset to 0 and continues counting when predetermined value is reached.

$$\text{Range} = 150,000 \text{ l/h} = 150\text{m}^3/\text{h} \quad \text{Units/second} = \frac{150}{3,600} = 0.0417\text{m}^3/\text{s}$$

$$\text{Totalizer count full scale} = \frac{0.0417}{0.01} = 4.17 \text{ pulses/s (OK, maximum is 99.999)}$$



##### Example B – Setting up:

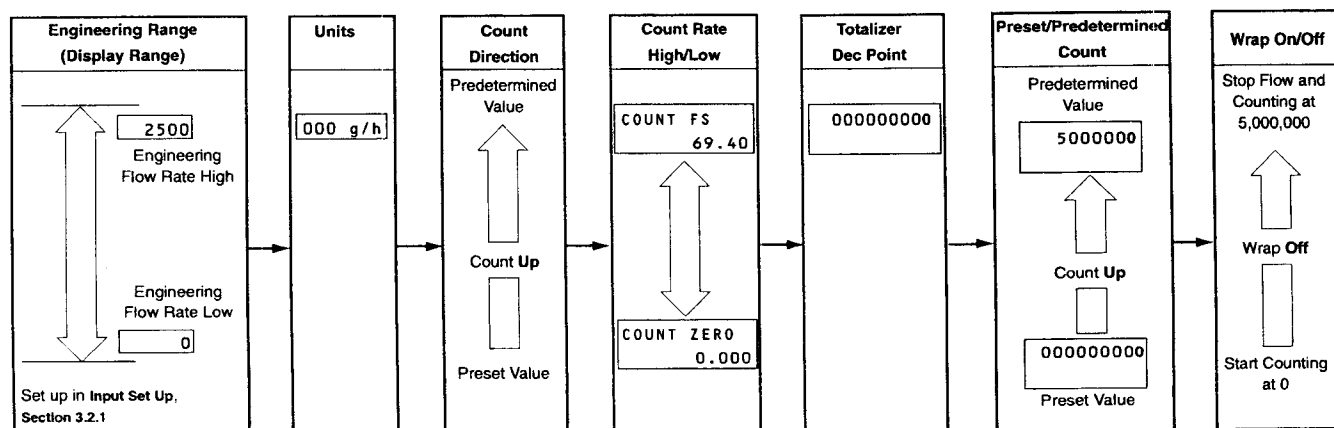
- an engineering range of 0 to 2500 representing a range of 0 to 2.5 million gallons per hour.
- filling a storage tank with a capacity of 5 million gallons.
- least significant digit of 1 gallon shown on totalizer display (viewed in the Operator Level, Totalizer Page).
- wrap function OFF, 1 second wrap pulse generated at predetermined value and combined in a logic equation to stop flow.

$$\text{Range} = 2.5 \text{ million gal/h} \quad \text{Units/second} = \frac{2.5 \times 10^6}{3600} = 694 \text{ gal/s}$$

$$\text{Totalizer count full scale} = \frac{694}{1} = 694 \text{ (too high, maximum is 99.999)}$$

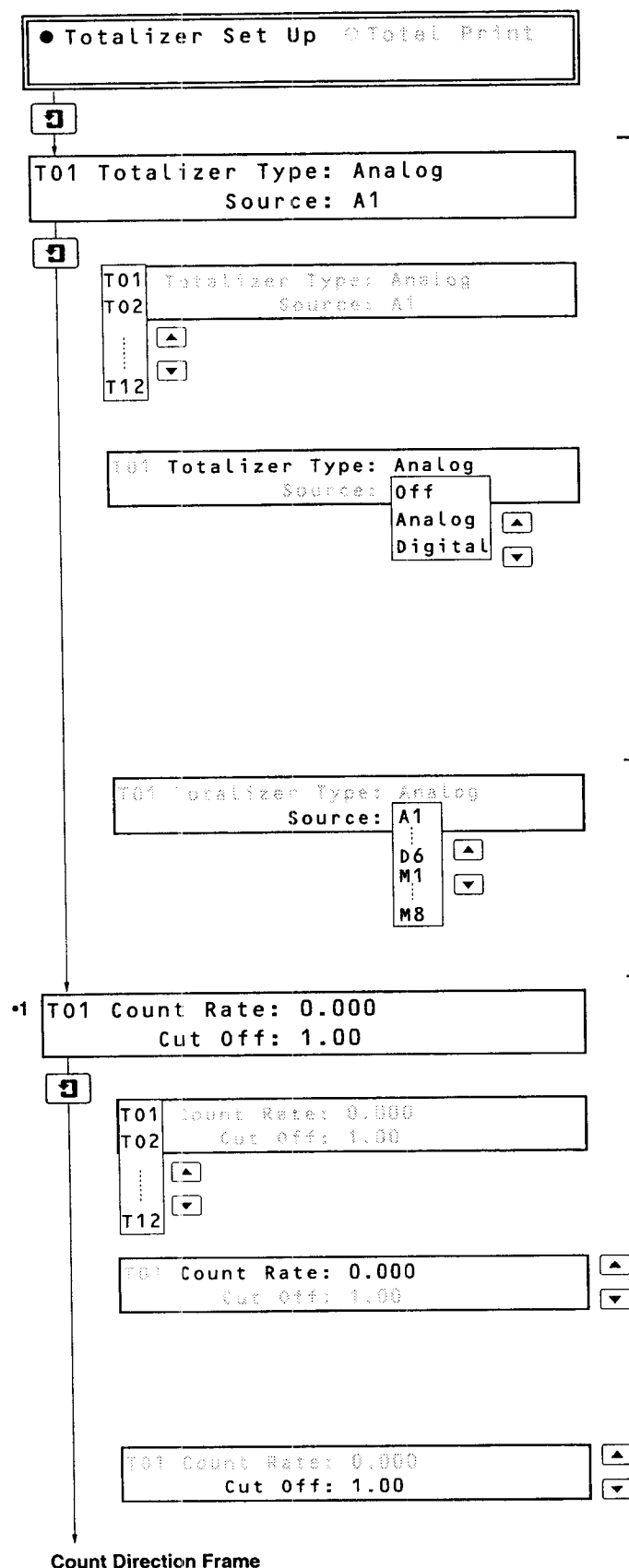
$$\text{Increasing count to every 10 gallons} = \frac{694}{10} = 69.4 \text{ (OK)}$$

Set totalizer decimal point to x10 position to increment totalizer in 10 gallon steps.





## 3.8.2 Totalizer Set Up Page



\*1 Not relevant to Digital Counter.

Press the key to select the 'Totalizer Set Up' from the Totalizer menu.

Press the key to access the page.

## Totalizer Selection

## Selecting a Totalizer

Select the totalizer to be set.

Press the key to advance to the next parameter.

## Totalizer Type

Select the totalizer type.

ANALOG – to integrate an analog signal.  
DIGITAL – to count digital pulses.



## Note.

If counting digital pulses, the maximum count frequency is 2.0 Hz for DA1 to DD1, 0.667 Hz for DE1 to DG6.

OFF – totalizer not selected.

Press the key to advance to the next parameter.

## Totalizer Source

Select the input source for the totalizer.

A1 to D6 for analog types, M1 to M8 for maths blocks.  
See Table 3.4 for digital types.

Press the key to set up another totalizer.

Press the key to advance to the next frame.

## Analog Integrator Count Control

## Selecting a Totalizer

Select the totalizer to be set.

Press the key to advance to the next parameter.

## Count Rate

Set the count rate (pulses/second) corresponding to full scale input. This is programmable from 0.001 to 99.999 in 0.001 increments.

Press the key to advance to the next parameter.

## Count Cut-off

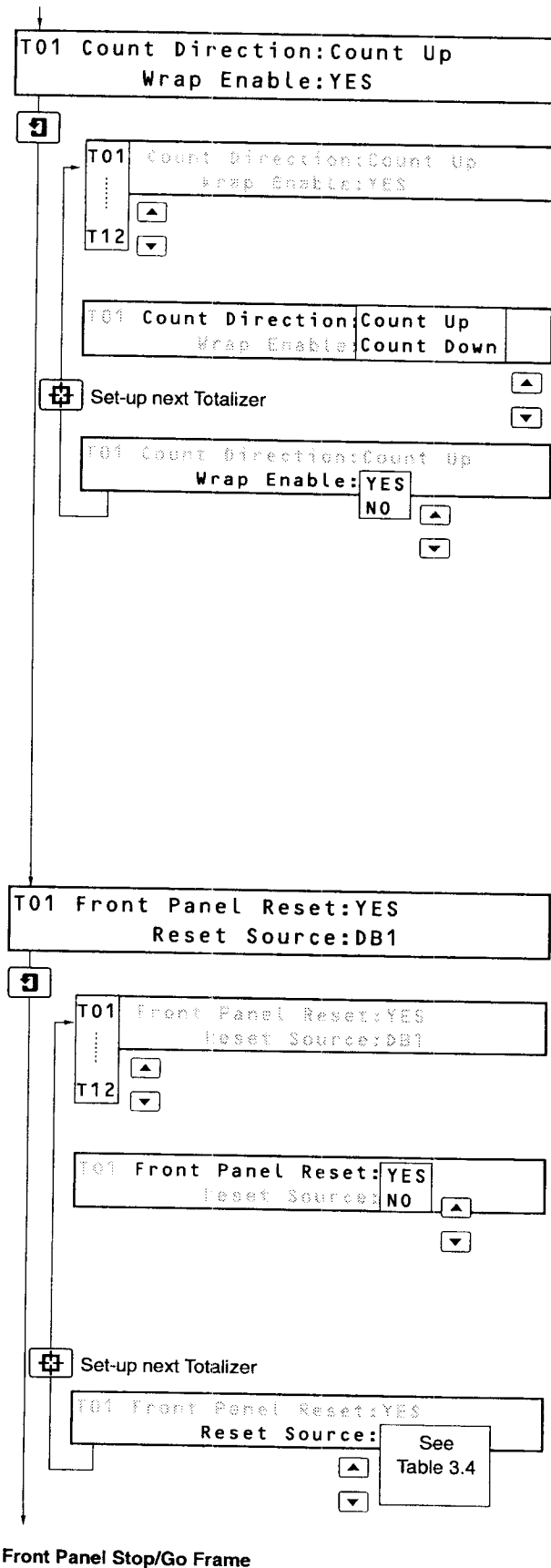
Set the lowest flow value at which the totalizer is to stop counting. Set in engineering units, the decimal point is set automatically according to the analog source.

Press the key to advance to the next frame.





#### ...3.8.2 Totalizer Set Up Page



#### Count Direction

##### Selecting a Totalizer

Select the totalizer to be set.

Press the key to advance to the next parameter.

##### Count Direction

Select either an incremental (UP) or decremental (DOWN) count.

Press the key to advance to the next parameter.

##### Wrap-around

When wrap-around is enabled, the total is automatically reset to the **Pre-set value** once the **pre-determined** value is reached.

When wrap-around is not enabled, the count is stopped when the **pre-determined** value is reached.

Select YES to enable wrap-around.



**Note.** The wrap pulse, has a duration of 750mS and occurs when the total reaches the predetermined count, irrespective of 'Wrap Enable' setting. The pulse can be assigned to a relay, digital output or digital counter.

Press the key to set up another totalizer.

Press the key to advance to the next frame.

#### Batch Total Reset Control

##### Selecting a Totalizer

Select the totalizer to be set.

Press the key to advance to the next parameter.

##### Front Panel Reset

When front panel reset is enabled the flow total can be reset to the preset value from the **Totalizer Page** in the **Operating Level**.

Select YES to enable the reset.

Press the key to advance to the next parameter.

##### Reset Source

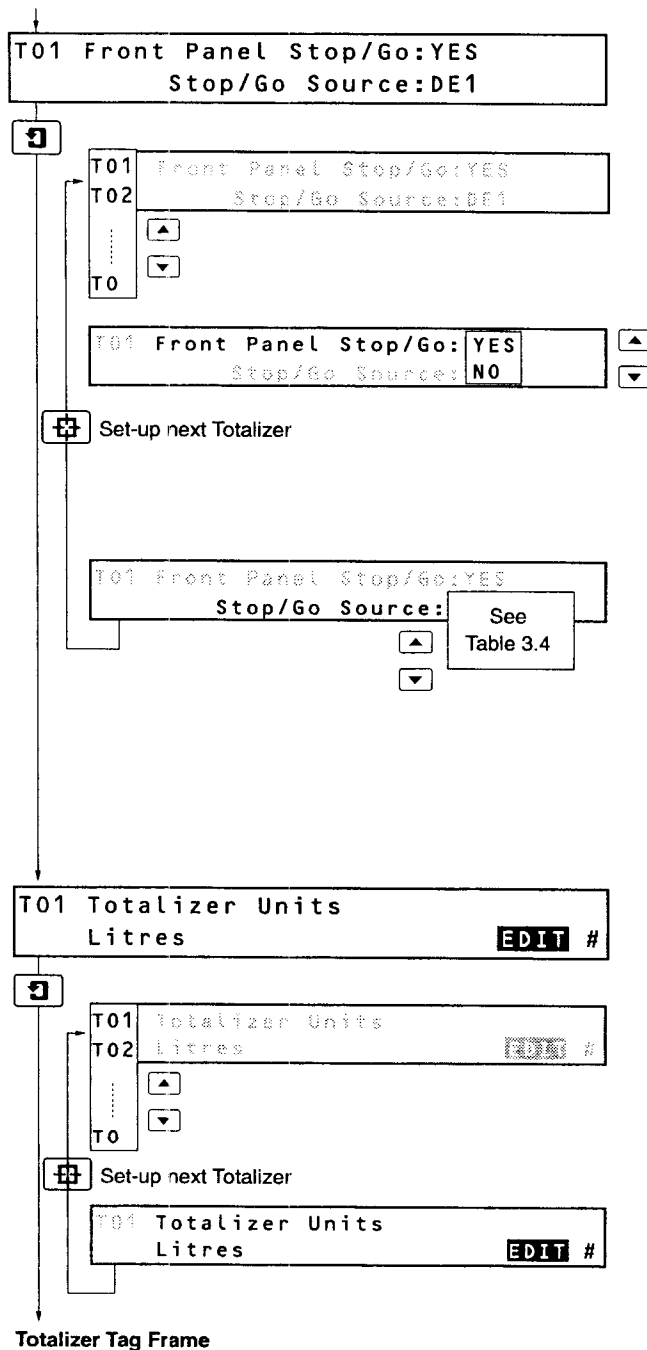
Select the source required to automatically activate the totalizer reset – see Section 3.3.3/ Table 3.4.

Press the key to set up another totalizer.

Press the key to advance to the next frame.



## ...3.8.2 Totalizer Set Up Page

**Totalizer Stop/Go Control****Selecting a Totalizer**

Select the totalizer to be set.

Press the key to advance to the next parameter.

**Front Panel Stop/Go**

When front panel stop/go is enabled the flow total counter can be started and stopped from the **Totalizer Page** in the **Operator Level**.

Select YES to enable stop/go.

Press the key to advance to the next parameter.

**Stop/Go Source**

Select the digital source required to automatically stop and start the totalizer – see Section 3.3.3/ Table 3.4.

Source activated	–	Chart Go.
Source de-activated	–	Chart Stop.

Press the key to set up another totalizer.

Press the key to advance to the next frame.

**Setting the Totalizer Units****Selecting a Totalizer**

Select the totalizer to be set.

Press the key to advance to the next parameter.

**Totalizer Units**

Units of up to six characters can be set.

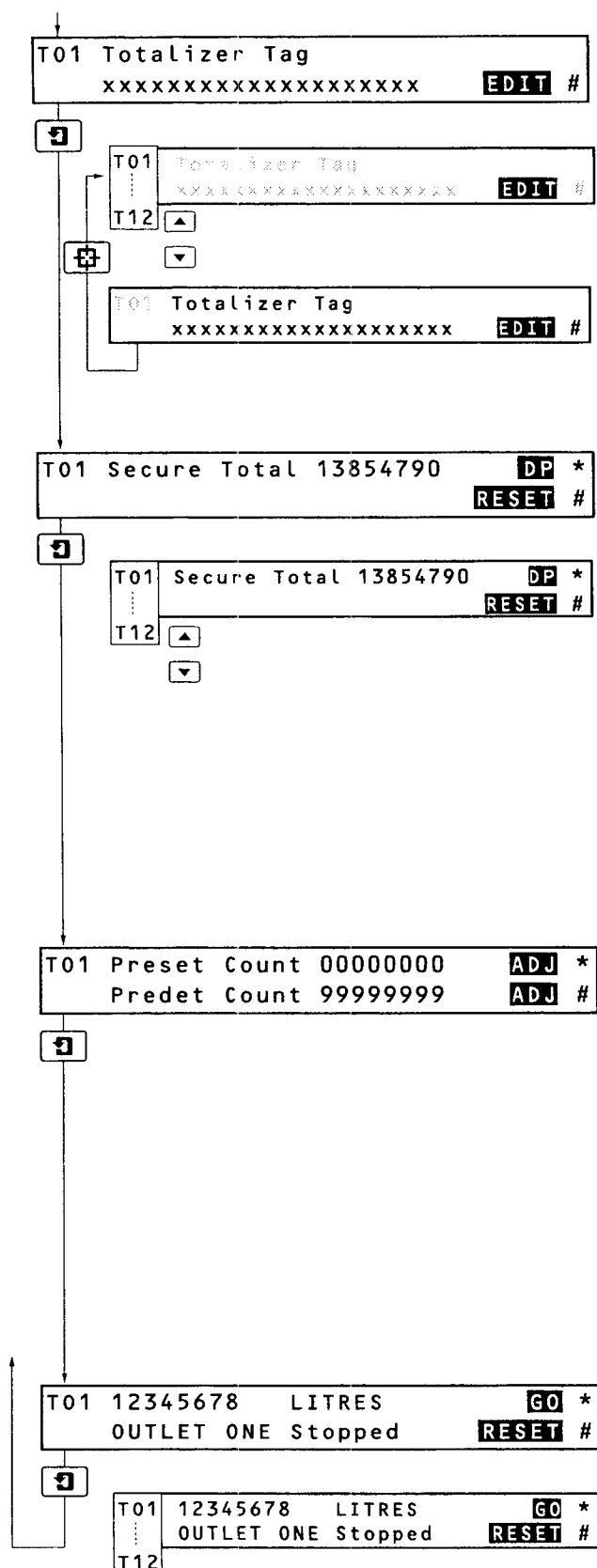
Press the key to edit the units – see front fold out.

Press the key to set up another totalizer.

Press the key to advance to the next frame.



## ...3.8.2 Totalizer Set Up Page

**Setting the Totalizer Tag**

A totalizer name of up to 20 characters can be set.

**Selecting a Totalizer**

Select the totalizer to be set.

**Totalizer Tag**

Press the key to edit the totalizer name – see front fold-out.

Press the key to advance to the next frame.

**Secure Total**

The secure total is independent of the displayed flow total and can comprise up to eight digits

**Selecting a Totalizer**

Select the totalizer to be set.

Press the key to adjust the decimal point position in the batch and secure totals, the preset and predetermined counts.

(The DP can be positioned between limits  $\times 10^{-8}$  and  $\times 10^2$ ).

Press the key to reset the secure total.  
Resets to 0 if counting up or 99999999 if counting down.

Press the key to set up another totalizer.  
Press the key to advance to the next frame.

**Totalizer Preset Value**

Set the value to which the total reverts when it is reset. Begin with the first digit indicated by the cursor ( \_ ). Pressing the key stores the digit value and advances the cursor to the next digit. Repeat for all digits to be set.

**Totalizer Predetermined Value**

Set the value required to cause a reset of the total if wrap is set on, or the value at which the totalizer is to stop counting. Setting is as for **Totalizer Preset Value** above. Repeat for all digits to be set.

**Note.** For standard continuous counting set **Preset Value** to 00000000, **Predetermined Value** to 99999999 and wrap to YES.

**Totalizer Value**

Displays the current value, units and tag for each totalizer.

Select the totalizer to be displayed.  
Press the key to reset the batch total.  
Press the key to advance to the next parameter.  
Press the key to select 'Stopped' or 'Running'.

Press the key to return to the Totalizer menu.



3.8.3 Totalizer Print Page

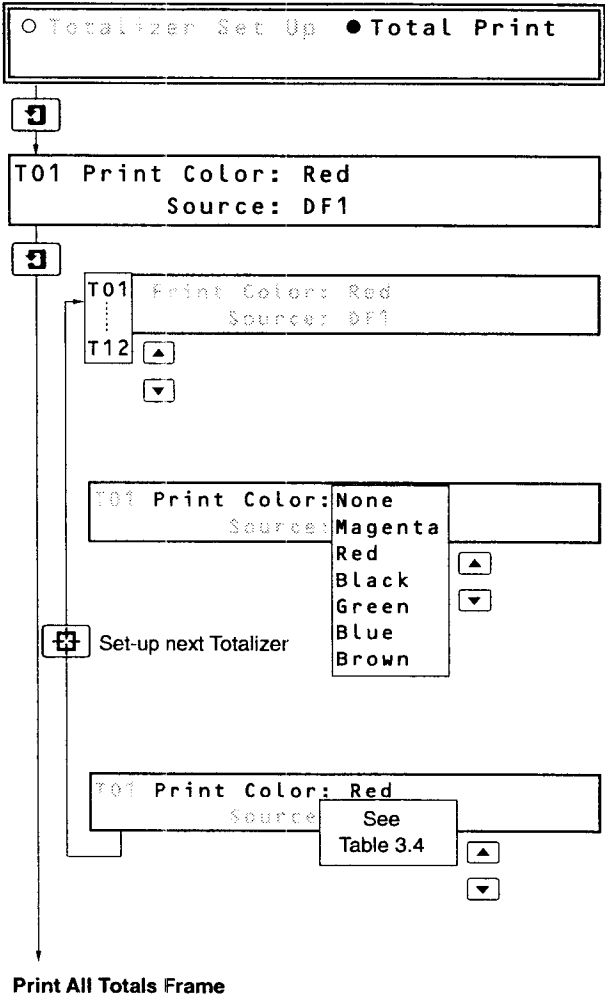
*i*

**Information**

- Printing of totalizer identity, value and tag.
- Printing of individual values triggered from internal or external digital signal.
- Values can be printed via digital signal or at pre-configured time intervals.

*\**

**Note.** Totalizer values are always 'fast' printed.



Press the **F1** key to select 'Totalizer Print' from the Totalizer menu.

Press the **F1** key to access the page.

**Selecting a Totalizer**  
Select the totalizer to be set.

Press the **F2** key to advance to the next parameter.

**Print Color**  
The totalizers can be printed in any of the available colors except Z-trace.

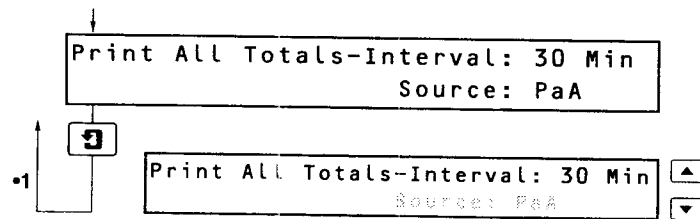
Press the **F3** key to advance to the next parameter.

**Print Pen Source**  
Select the source required to initiate printing  
– see Section 3.3.3/ Table 3.4.

Press the **F4** key to set up another totalizer.  
Press the **F1** key to advance to the next frame.



#### ...3.8.3 Totalizer Print Page



#### Setting the Print Totals Interval

##### Print Totals Interval

Select the time interval required between each set of printed values. The time interval is selectable from the following values:


- 5 min – On the hour then every 5 minutes
- 10 min – On the hour then every 10 minutes
- 15 min – On the hour then every 15 minutes
- 20 min – On the hour then every 20 minutes
- 30 min – On the hour then every 30 minutes
- 60 min – On the hour every hour
- 120 min – Every 2 hours (ie. 02:00, 04:00 ....24:00)
- 180 min – Every 3 hours (ie. 03:00, 06:00 ....24:00)
- 240 min – Every 4 hours (ie. 04:00, 08:00 ....24:00)
- 480 min – Every 8 hours (ie. 08:00, 16:00 and 24:00)
- 720 min – Midday and midnight
- 1440 min – Midnight

Press the  key to advance to the next parameter.



##### Print Totals Source

Select the source required to initiate printing of all of the 12 totalizers – see Section 3.3.3/ Table 3.4.

Press the  key to return to the Totalizer menu.

- 1 Totalizers that are set to OFF are NOT printed – see Section 3.8.2/ Totalizer Set Up Page/ Totalizer Type.



### 3.9 Maths Level

#### 3.9.1 Maths Blocks Page

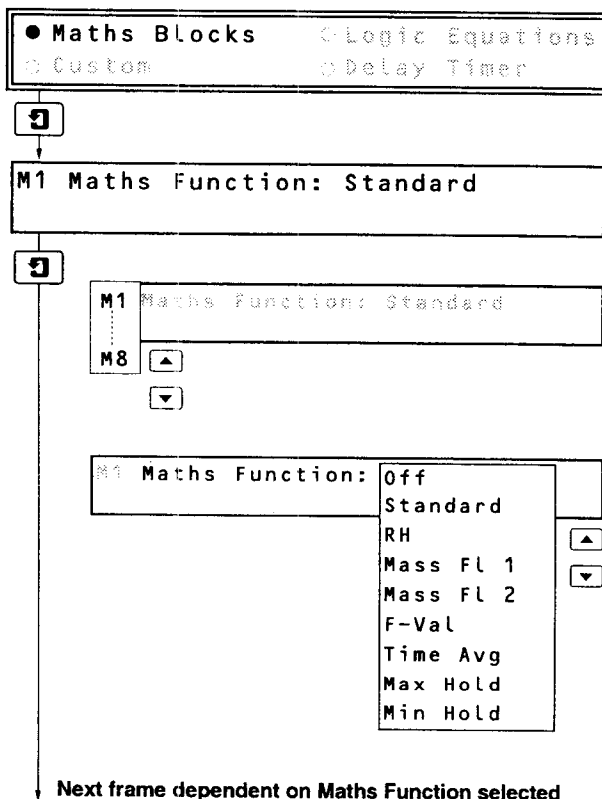


##### Information

- 8 programmable maths blocks.
- Each maths block can be configured for any maths function, (i.e. relative humidity, mass flow, arithmetic (Standard), F value, Time Average, Maximum or Minimum hold).
- Programmable engineering units and result tag for each block.



**Note.** The fault detection level on the maths block result is preset to 10%, irrespective of the level set in the Input Setup Page – see Section 3.2.1



Press the key to select 'Maths Blocks' from the Maths menu.

Press the key to access the page.

#### Maths Block Selection

##### Selecting a Maths Block

Select a maths block to configure.

Press the key to advance to the next parameter.

##### Maths Function Type

Select the maths function required:

Standard	–	Arithmetic operations
RH	–	Relative humidity
Mass Fl 1	–	from volume flow
Mass Fl 2	–	from differential pressure
F-Val	–	F-values from temperature
Time Avg	–	Time average
Max Hold	–	Maximum value held
Min Hold	–	Minimum value held

Press the key to advance to the next frame.

The next frame displayed is dependent upon the maths function selected.



#### ...3.9.1 Maths Blocks – Standard

The standard maths block consists of a series of up to 4 operands and 3 operators.

Operands can be any of the following:

- an analog input (A1 to D6),
- a maths result (M1 to M8),
- a user definable constant (K1 to K16).

Operators can be any of the following:

- + (addition),
- (subtraction),
- x (multiplication),
- / (division),
- H (high select)
- L (low select)
- M (median)
- End (equation terminator)



**Note.**

The L and H functions return the lowest and highest input variable respectively and require at least 2 operands to be entered.

The M function returns the median of the input variables and requires 3 operands to be entered. The second operator is automatically set to M when using this function.

The 'End' function is an equation terminator and is entered when the equation does not require the full range of parameters.



**Note.** The elements in each equation are calculated sequentially ie. elements 1, 2 and 3 are evaluated first and this result is then combined with elements 4 and 5. The resultant is combined with elements 6 and 7 to give the equation result.

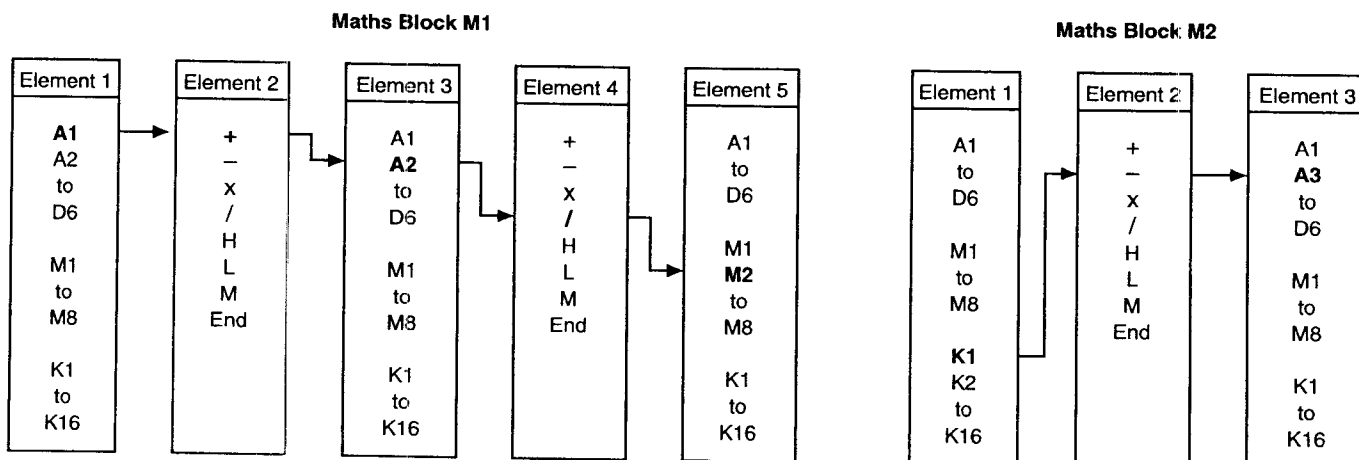
To enter an equation involving brackets it is necessary to use another maths block.

#### Example 1

To evaluate the equation: 
$$\frac{A1 + A2}{K1 - A3}$$
 proceed as follows:

Enter maths block 1 as  $M1 = A1 + A2 / M2$

Enter maths block 2 as  $M2 = K1 - A3$





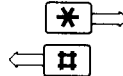
## ...3.9.1 Maths Blocks – Standard

↓ from Maths Function frame

M1 Standard CONST \*  
:A1 :+ :A2 :x :M2 :/ :A3

**9**

M1 Standard CONST \*  
:A1 :+ :A2 :x :M2 :/ :A3  
↑  
K16 ↓



## Equation and Constant

## Setting the Operand

Select the first operand.

If a constant is required press the **CONST** key.

K1 Constant Value: 11.54 DP \* ↑  
K16 EXIT # ↓  
↓

Select the constant to be set.

Press the **DP** key to advance to the next parameter.

Set the constant value required.

Press the **CONST** key to set the decimal point.

Press the **EXIT** key to exit the constant set up frame.

Press the **DP** key to advance to the next parameter.

## Setting the Operator

Select the first operator.

M1 Standard CONST \*  
:A1 :End :A2 :x :M2 :/ :A3  
+ ↑  
- ↓  
x  
/  
H  
L  
M

Press the **DP** key to advance to the next parameter.

M1 Standard CONST \*  
:A1 :+ :A2 :x :M2 :/ :A3

M1 Standard CONST \*  
:A1 :+ :A2 :x :M2 :/ :A3

M1 Standard CONST \*  
:A1 :+ :A2 :x :M2 :/ :A3

M1 Standard CONST \*  
:A1 :+ :A2 :x :M2 :/ :A3

M1 Standard CONST \*  
:A1 :+ :A2 :x :M2 :/ :A3

Set the remaining parameters as above.

Press the **9** key to advance to the Eng Lo/Hi frame.

Eng Lo/Hi

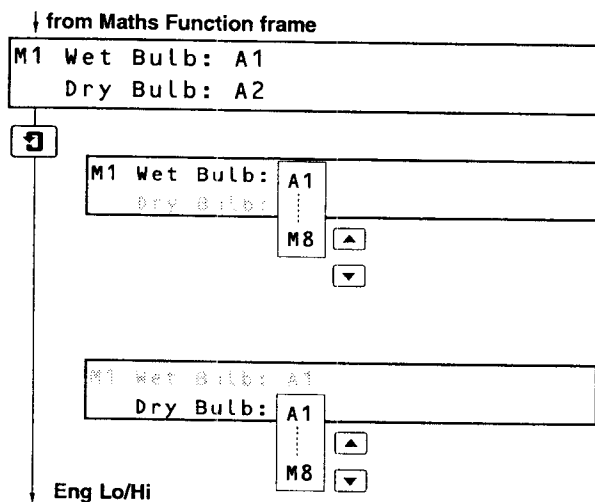




#### ...3.9.1 Maths Blocks – Relative Humidity (RH)

The relative humidity calculation requires two inputs, one from a wet bulb sensor and one from a dry bulb sensor. Both of these inputs are configured as variables. RH tables are based on the use of an aspirated pyrochrometer having an air velocity of at least 11.5 feet per second or 3.5 meters per second across the bulb sensors.

Inputs used for wet and dry bulb measurement must be in the ranges 0 to 100°C or 32 to 212°F. The result must be set to 0 to 100.0% RH.



#### Setting the RH Sensors

##### Wet Bulb Sensor

Select the input source to be assigned to the wet bulb sensor. The source is selected from analog inputs A1 to D6 or maths functions M1 to M8.

Press the  key to advance to the next parameter.

##### Dry Bulb

Select the input source to be assigned to the wet bulb sensor. The source is selected from analog inputs A1 to D6 or maths functions M1 to M8.

Press the  key to advance to the Eng Lo/Hi frame.



### ...3.9.1 Maths Blocks – Mass Flow 1 and 2

There are two types of mass flow calculations available.

**Mass Flow 1** – uses a volume flow input as the basis for the calculation

The standard formula for mass flow 1 is as follows:

$$\text{Mass Flow 1} = k V \frac{P}{P_r} \frac{T_r}{T}$$

where:

k = Scaling constant

V = Input a (input from volume flow source)

P = Pressure (pressure input source)

T = Temperature (temperature input source)

T<sub>r</sub> = Reference temperature (set as a constant)

P<sub>r</sub> = Reference pressure (set as a constant).

The temperature units used by the input source must be specified as all calculations use absolute temperatures and conversion is made if the input uses °C or °F.

**Mass Flow 2** – uses a differential pressure (dp) input as the basis for the calculation.

The formula used for mass flow 2 is as follows:

$$\text{Mass Flow 2} = k \sqrt{h} \sqrt{\frac{P}{T} \frac{T_r}{P_r}}$$

where:

h = differential pressure head

Some differential pressure (dp) sensors incorporate a square root linearizer and therefore produce an output linear to flow. In these instances no additional linearization within the recorder is required. Where the input from the dp sensor is linear to dp head the square root linearizer must be used – see Section 3.2.1/ Input Set Up Page/ Linearizer Type.

**The formula used internally is:**

$$M = k a \sqrt{\frac{P}{T} \frac{T_r}{P_r}}$$

where:

input a = linearized flow signal.

The linearized flow signal is produced by the transmitter or derived from the signal linearized within the recorder.

When using mass flow, care must be taken in sizing the differential transmitter. Variations in pressure and temperature affect the dp developed across the flow device. In its basic form:

$$m = \sqrt{h \frac{P}{T}}$$



**Note.** As pressure P decreases, the dp (h) increases. Likewise, as temperature T increases this also causes an increase in dp (h). If the variation in temperature/pressure is sufficient to cause the dp to exceed the range of the dp transmitter, then errors occur in calculating the mass flow. It is therefore generally recommended to size the flow system on minimum pressure and maximum temperature conditions to ensure the dp transmitter remains within its calibrated range.



#### ...3.9.1 Maths Blocks – Mass Flow 1 and 2

**Example A** – calculating the mass flow of water from the volume flow.

At a temperature of 60°F (520°R) and an absolute pressure of 14.696 p.s.i.a., 1 gallon (US) of water has a mass of 8.334 lbs.

To calculate the mass flow of water from the volume flow the following settings are used:

- A1 – volume flow of water (gal/min)
- A2 – temperature of water (°F)
- A3 – pressure of water (p.s.i.a.)
- M2 – result of maths block 2 (lb/min)

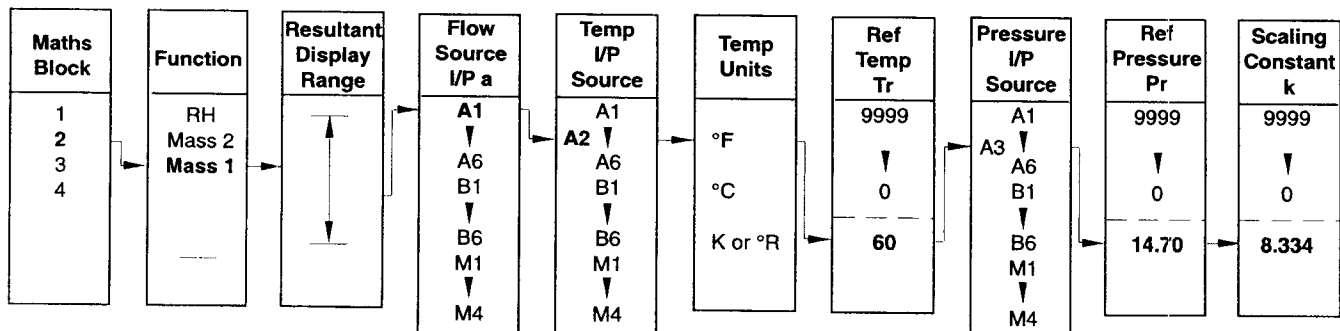
$$\text{Mass Flow 1} = k \cdot V \cdot \frac{P}{P_r} \cdot \frac{T_r}{T}$$

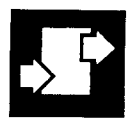
therefore the equation is:

$$\text{Mass Flow 1 (lb/min)} = 8.334 \times \text{Volume (gal/min)} \times \frac{\text{measured pressure (psi)}}{14.696 \text{ p.s.i.a.}} \times \frac{520^\circ\text{R}}{\text{measured temperature } ^\circ\text{R}}$$

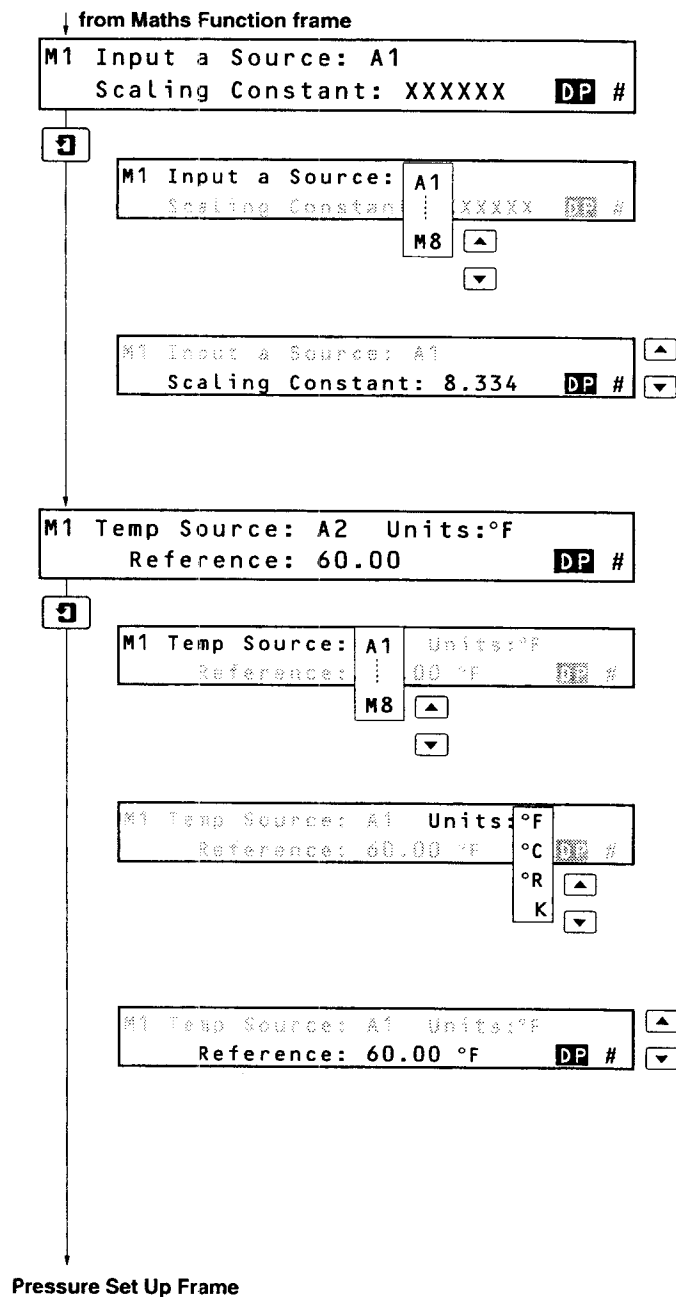
The example below shows the construction of Maths block 2 with the following selected:

- Maths block function – Mass Flow 1
- Display range –
- Flow source – A1
- Temp source – A2
- Temp units – °F
- Temp ref – 60 (60°F = 520°R)
- Pressure source – A3
- Ref pressure – 14.70 p.s.i.a.
- Scaling constant – 8.334





## ...3.9.1 Maths Blocks – Mass Flow 1 and 2



## Mass Flow 1 or 2

**Flow Input Source**

Select the source assigned to the flow input, A1 to D6 or M1 to M8.

Press the **[F4]** key to advance to the next parameter.

**Scaling Constant**

Set the value which represents the scaling constant (k), between 0 and +9999.

Press the **[F2]** key to set the decimal point.

Press the **[F4]** key to advance to the next frame.

**Temperature Setup****Temperature Input Source**

Select the source assigned to the temperature input, A1 to D6 or M1 to M8.

Press the **[F4]** key to advance to the next parameter.

**Temperature Units**

Select the input source temperature units.

(The calculation is performed in Absolute units. If the Temp Source is in °F or °C an internal correction factor is applied automatically).

Press the **[F4]** key to advance to the next parameter.

**Reference Temperature**

Set the value (in the same units as the Temp Source) which represents the reference temperature, between 0 and +9999.

Press the **[F2]** key to set the decimal point.

Press the **[F4]** key to advance to the next frame.

Continued on next page.



#### ...3.9.1 Maths Blocks – Mass Flow 1 and 2

↓ from Temperature Setup Frame

M1 Press Source: A3 Units:bara  
Reference: 10.00 bara **DP** #

M1 Press Source: A1 Units:bara  
Reference: 10.00 bara **DP** #  
M8 ▲  
▼

M1 Press Source: A1 Units  
Reference: 10.00 bara  
psig  
barg  
psia  
bara ▲  
▼

M1 Press Source: A1 Units:bar A  
Reference: 10.00 bara **DP** # ▲  
▼

↓ Eng Lo/Hi

#### Pressure Set Up

##### Pressure Input Source

Select the source assigned to the pressure input, A1 to D6 or M1 to M8.

Press the **⚙** key to advance to the next parameter.

##### Reference Pressure Units

Select the input source pressure units.

Press the **⚙** key to advance to the next parameter.

##### Reference Pressure

Set the value (in the same units as the pressure source) which represents the reference pressure, between 0 and +9999.

Press the **⌵** key to set the decimal point.

Press the **⏏** key to advance to the Eng Lo/Hi frame.



### ...3.9.1 Maths Blocks – F-Value

The application of F-value measurement enables sterilizing cycles to be shortened, relative to the traditional time versus temperature cycles commonly adopted.

The ability of heat to kill micro-organisms varies with the type of organism and increases exponentially with rising temperature. By definition, steam sterilization has a target temperature of 121.1°C and dry heat sterilization 170°C.

Therefore, the time taken in sterilization is reduced if the temperature is increased.

**Example** – An increase in temperature from 121°C to 122°C reduces the time to kill an equal number of organisms by a factor of 26%.

The F-value calculation gives an equivalent time (in minutes) at a target temperature taking account of the time taken to approach and the time exceeding the target sterilization temperature.

The F-value is calculated using the general formula:

$$F_{val(t)} = F_{val(t-1)} + \frac{(10^{\frac{(T - T_{ref})}{z}})}{60}$$

Where

$F_{val(t)}$	=	Current F-value
$F_{val(t-1)}$	=	F-value at last sample
$T$	=	Actual temperature
$T_{ref}$	=	Target temperature
$z$	=	Z-factor (ie. the temperature interval representing a factor of 10 reduction in killing efficiency)

### Example – A typical steam sterilizing cycle – Fig. 3.6

The period AB is the chamber evacuation part of the cycle, when the chamber is evacuated and purged to remove the air. The ramp up to final sterilizing temperature starts at B. The thermal conductivity of the load determines the time taken to achieve point D, but is typically 30% of the total cycle time. It is in the area CD and EF that F-values make their contribution to shortening sterilization time, by accumulating credit for time spent approaching and receding from the sterilizing temperature.

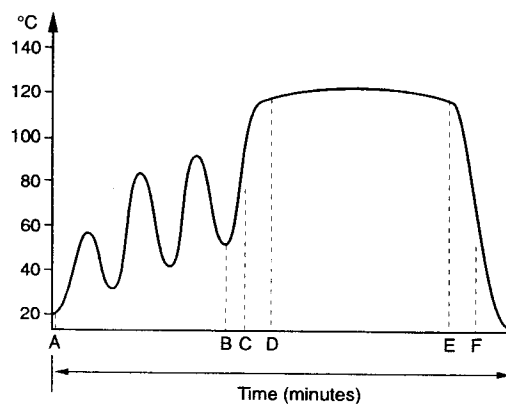
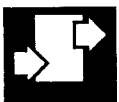


Fig. 3.6 A Typical Steam Sterilization Cycle

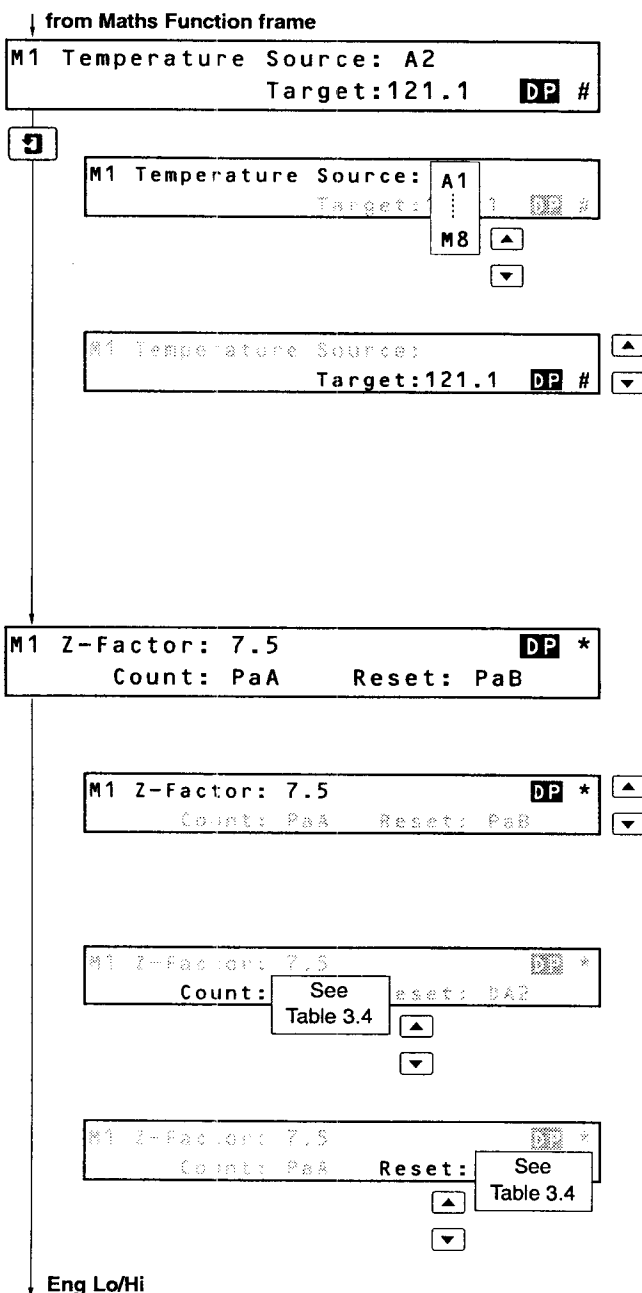


#### ...3.9.1 Maths Blocks – F-Value



##### Information

- User configurable variables – analog inputs or maths results.
- Internal and external digital start and end calculation signals.
- Sample time of 720ms resulting in an accuracy of within 2%.




##### F-value


###### Temperature Source

Select the source on which to perform the calculation, A1 to D6 or M1 to M8.

Press the  key to advance to the next parameter.

###### Target

Set the target sterilization temperature.  
Press the  key to set the decimal point.


 **Note.** The temperature units are automatically selected dependent upon the units assigned to the input on which the calculation is being performed.

Press the  key to advance to the next frame.

##### Z-factor

The Z-factor represents a factor of 10 reduction in the death rate of an organism and is unique to each organism.

Set the Z-factor.

Press the  key to set the decimal point.

##### Sampling Interval

Select the digital source to start the calculation – see Section 3.3.3/ Table 3.4.

**Example** – Set process alarm PaA to start the calculation when the measured temperature (A1) reaches 100°C.

Press the  key to advance to the next parameter.

Select the digital source to reset the calculation – see Section 3.3.3/ Table 3.4.

**Example** – Set process alarm PaB to reset the calculation when the maths result (M1) reaches 10 F-value units and also activate an alarm relay to give an audible signal.

Press the  key to advance to the Eng Lo/Hi frame.

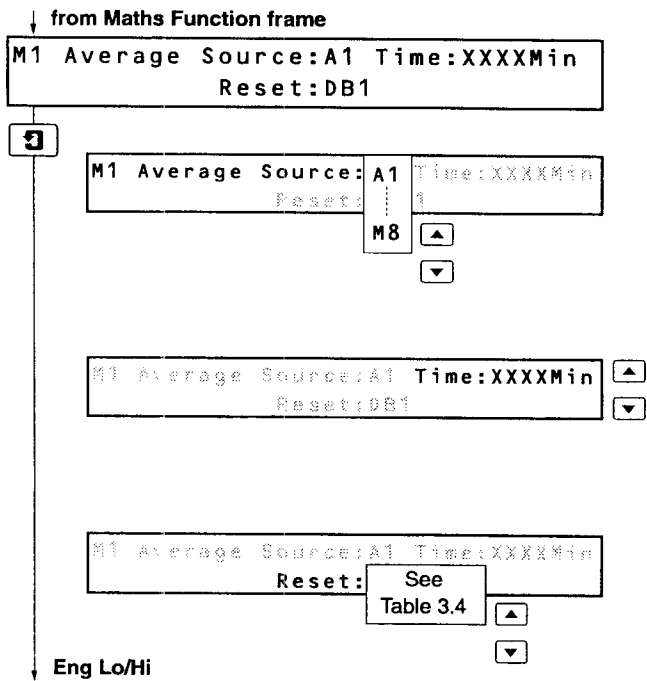


...3.9.1 Maths Blocks – Time Average



Information

- The time average function averages out a continually varying input over a set time period.
- User configurable variables – analog inputs or maths results.
- Reset to the current input value by internal or external reset signals.
- Output updated to average value at the end of the time period and held at that value until the end of the next time period.



Average

Input Source

Select the input source to be averaged,  
A1 to D6 or M1 to M8.

Press the  key to advance to the next parameter.

Time

Set the time period (1 to 1440 minutes) over which the input  
source is to be averaged.

Press the  key to advance to the next parameter.

Reset Signal

Select the source signal to reset the result  
– see Section 3.3.3/ Table 3.4.

Press the  key to advance to the Eng Lo/Hi frame.



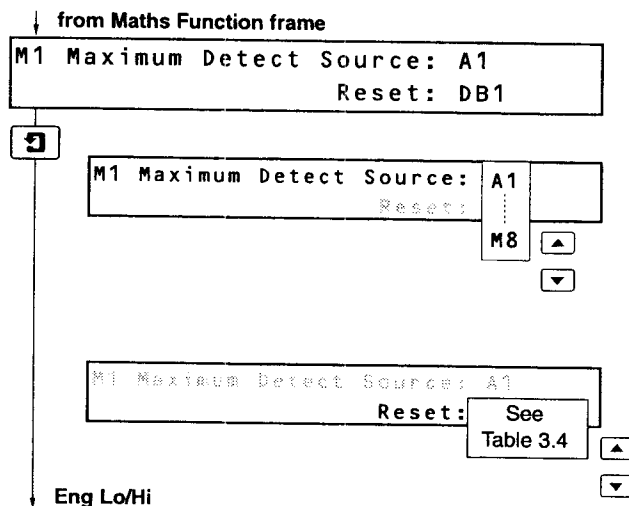


#### ...3.9.1 Maths Blocks – Maximum and Minimum Hold



##### Information

- Holds the maximum and minimum values of the input since the last reset.
- Output set to the current input value on reset.



##### Hold Maximum Value

###### Input Source

Select the input source to be held at maximum, A1 to D6 or M1 to M8.

Press the key to advance to the next parameter.

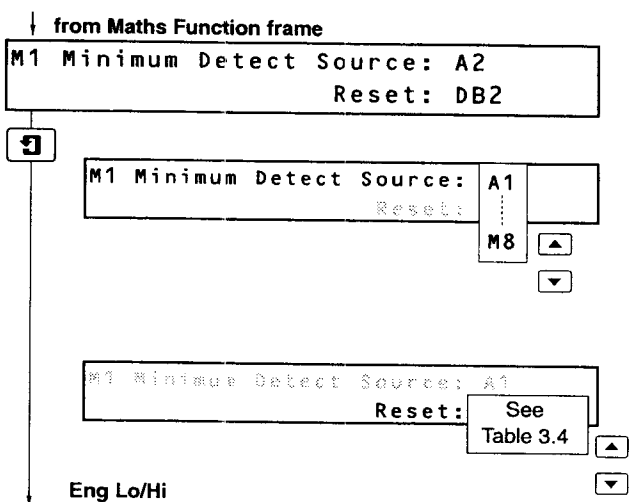
###### Reset Signal

Select the source signal to reset the result  
– see Section 3.3.3/ Table 3.4.

Press the key to advance to the Eng Lo/Hi frame.



**Note.** When reset signal is active, output can change if inputs vary.



##### Hold Minimum Value

###### Input Source

Select the input source to be held at minimum, A1 to D6 or M1 to M8.

Press the key to advance to the next parameter.

###### Reset Signal

Select the source signal to reset the result  
– see Section 3.3.3/ Table 3.4.

Press the key to advance to the Eng Lo/Hi frame.



**Note.** When reset signal is active, output can change if inputs vary.



## ...3.9.1 Maths Blocks – Engineering Lo and Hi

from    Standard  
RH  
Mass Flow  
F-value  
Average  
High  
Low

M1 Eng Lo/Hi: XXXXX : XXXXX    DP \*  
Eng Units: XXXXX    EDIT #

⏏

M1 Eng Lo/Hi: XXXXX : XXXXX    DP \*    ▲  
Eng Units: XXXXX    EDIT #    ▼

M1 Eng Lo/Hi: XXXXX : XXXXX    DP \*    ▲  
Eng Units: XXXXX    EDIT #    ▼

M1 Eng Lo/Hi: XXXXX : XXXXX    DP \*    ▲  
Eng Units: XXXXX    EDIT #    ▼

M1 Maths Tag  
XXXXXXXXXXXXXXXXXXXX    EDIT #

**Engineering Lo and Hi Values**

The values are set in units relevant to the Maths Block Function type i.e. F-value, RH etc.

**Setting the Engineering Lo and Hi values**

Set the lower limit for the engineering value (within limits –999 to +9999).

Press the ⏏ key to advance to the next parameter.

Set the upper limit for the engineering value. (within limits –999 to +9999).

★ **Note.** If the maths block output exceeds the engineering span limits by  $> \pm 10\%$  a maths block failure signal is generated which can be assigned to an alarm – see Section 3.3.3/ Alarm Acknowledge Page/ Table 3.4.

Press the \* key to set the decimal point.

Press the ⏏ key to advance to the next parameter.

**Engineering Units**

Press the ⏏ key to edit the engineering units –see front fold out.

Press the ⏏ key to advance to the next frame.

**Maths Result Tag**

Press the ⏏ key to edit the result tag.

Press the ⏏ key to return to the Maths menu.

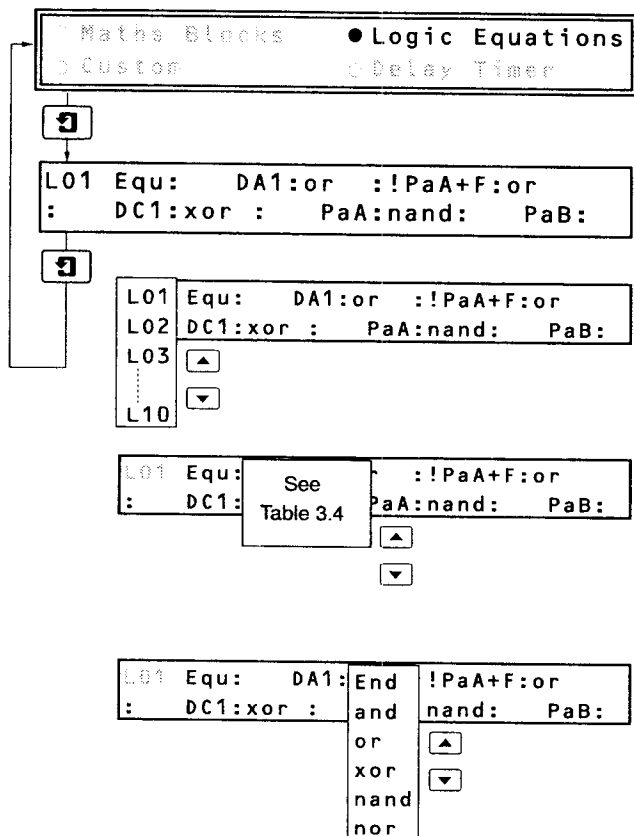


## 3.9.2 Logic Equations Page



### Information.

- 10 programmable logic (Boolean) equations.
- Up to 9 elements (5 operands) per equation.
- Equations can combine internal and external digital signals, e.g. alarms, digital inputs, other logic equation results, real time alarms etc.
- Equations can be used to activate many instrument functions, e.g. alarm acknowledgements, pen events, changes of chart speeds, value printing and relay outputs, etc.



Press the key to select 'Logic Equations' from the Maths menu.

Press the key to access the page.

### Logic Equation Set Up

#### Logic Equation Number

Select the logic equation to be set.

#### Logic Equation Construction

Select the digital source to appear in the equation – see Section 3.3.3/ Table 3.4.

Select the required Boolean expression – see Table 3.7.

Input State		Output State				
A	B	And	Nand	Or	Nor	Excl. Or
0	0	0	1	0	1	0
0	1	0	1	1	0	1
1	0	0	1	1	0	1
1	1	1	0	1	0	0

Table 3.7 Boolean Expression Results

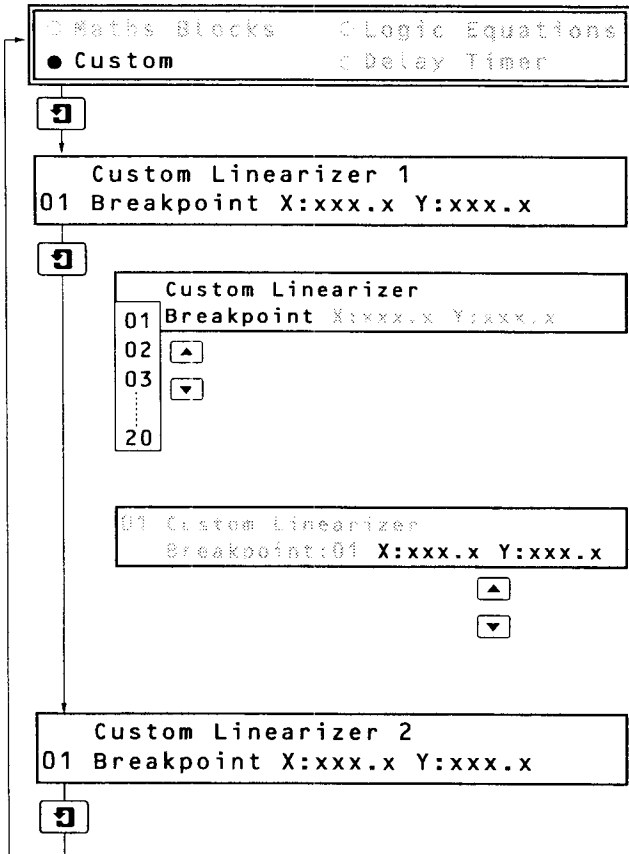


### 3.9.3 Custom Linearizer Page



#### Information.

- Two custom linearizers.
- 20 breakpoints per linearizer.
- Variable spacing on x and y axis to allow optimization of breakpoints.



Press the key to select 'Custom' from the Maths menu.

Press the key to access the page.

#### Linearizer 1

#### Setting the Linearizer Breakpoints

Select the breakpoint to be set.

Press the key to advance to the next parameter.

#### Setting the x and y co-ordinates

Set the value of the co-ordinates as % of span (0.0% to 100.0%).

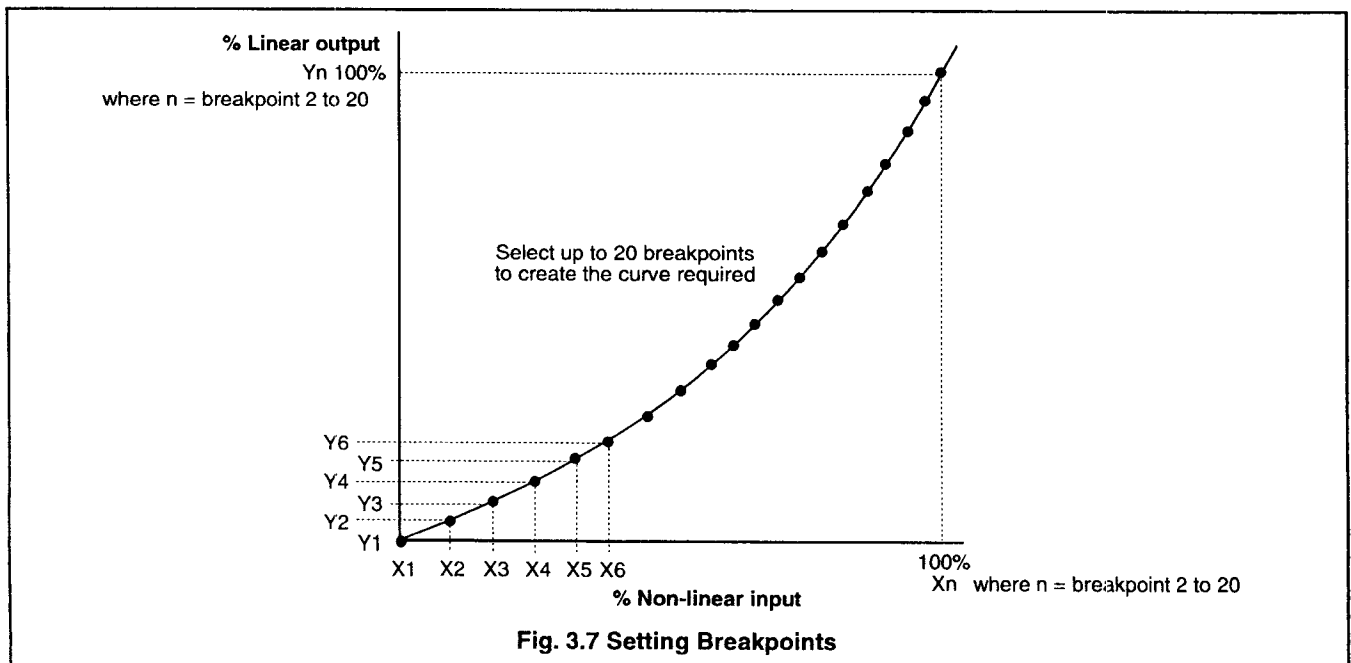
Press the key to set another breakpoint.

Press the key to advance to the next parameter.

#### Linearizer

Set linearizer 2 in a similar way to linearizer 1.

Press the key to return to the Maths menu.



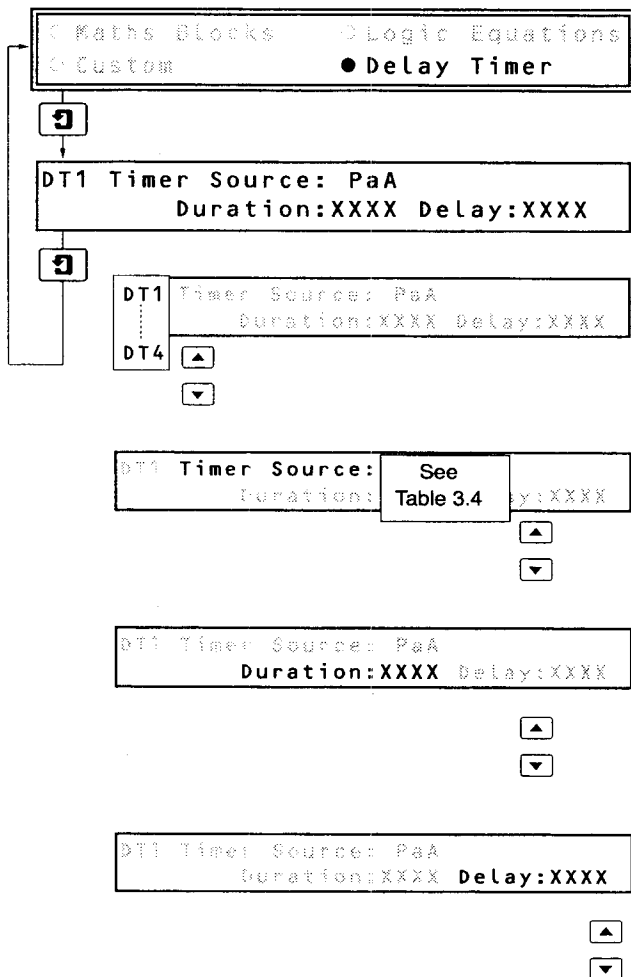


### 3.9.4 Delay Timer Page



#### Information.

- Four independent timers.
- Timer is triggered on the positive-going edge of the trigger source.
- Trigger source must remain stable for a minimum of 250ms to guarantee recognition.
- Once triggered, a timer cannot be retriggered until it has timed out.



Press the key to select 'Delay Timer' from the Maths menu.

Press the key to access the page.

#### Setting the Delay Timer

##### Channel to be Set

Select the timer to be set.

Press the key to advance to the next parameter.

##### Timer Source

Select the source used to trigger the timer – see Section 3.3.3/ Table 3.4

Press the key to advance to the next parameter.

##### Timer Duration

Set the length of time that the timer is active. 0 to 9999 seconds.

Press the key to advance to the next parameter.

##### Timer Delay

Set the length of time between the trigger being recognized and the timer becoming active, 0 to 9999 seconds.

Press the key to return to the Maths menu.

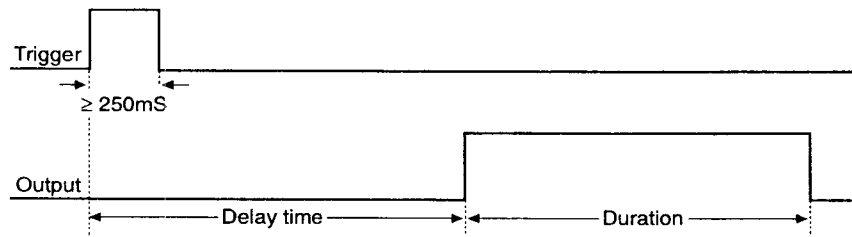


Fig. 3.8 Delay Timer



### 3.10 Memory Card Level

The Memory Card option allows datalogging and instrument configuration storage using the following memory cards:

SRAM	64K	SRAM	1M
SRAM	128K	SRAM	2M
SRAM	256K	SRAM	4M
SRAM	512K		



#### Information.

- Allows configuration storage and datalogging in a form which can be imported directly onto a PC-based spreadsheet.
- Allows datalogging and instrument configurations to be stored on the same card.
- Up to 32 files can be stored (including any volume label).
- Files can only be deleted by reformatting the card.



#### Note.

The recorder does not work with Flash EPROM, ROM or EPROM cards.

Cards must be formatted on the recorder or on a PC using the following procedure.

#### 3.10.1 Using a PC to Format Memory Cards

Memory cards can be formatted on PCs that have been fitted with certain types of PCMCIA card reader. This method is faster than using the recorder and does not require data logging to be interrupted for longer than is absolutely necessary.



**Note.** Memory cards cannot be formatted using a PC unless the format image from a blank card of the same capacity has first been created on the PC.



**Information.** Not all memory card readers and associated driver software have the facility to transfer card format images between memory card and PC.

The following notes apply generally to stand-alone memory card readers. For information on using specific card readers to format memory cards, refer to the manufacturer's instructions.

- 1) Ensure that the memory card reader and associated software is installed and running on a PC.
- 2) Insert a newly-formatted memory card into the card reader.
- 3) Create an image of the memory card format on the PC.
- 4) To format another memory card on the PC for use in the recorder, first insert the card requiring formatting into the card reader installed on the PC.
- 5) Copy the format image file created in step 3 to a formatted card of the same capacity.



#### 3.10.2 Memory Card Formatting

This page is displayed only if a Memory Driver Board is fitted.



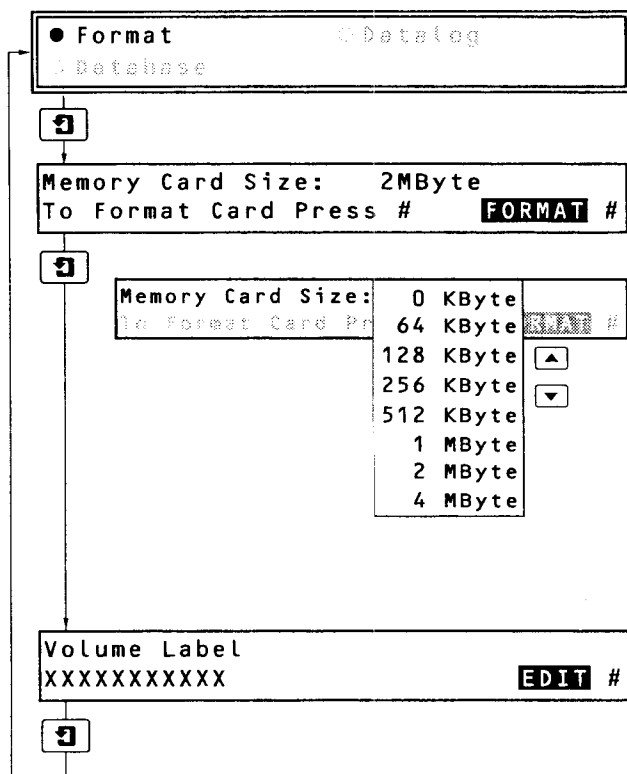
##### Information.

- All memory cards must be formatted before they can be used.
- **DOS format** allows configuration storage and datalogging in a form which can be imported directly onto a PC-based spreadsheet.
- The memory card's name (volume label in DOS) can be edited.
- The memory card's size is required to successfully format the card. Sizes available are 64kB, 128kB, 256kB, 512kB, 1MB, 2MB and 4MB.
- Formatting can only take place when datalogging is not active.



##### Note.

A memory card can only be formatted if datalogging is stopped or invalid. Before installing the card, note its memory size.



Press the **FORMAT** key to select 'Format' from the Memory Card menu.

Press the **FORMAT** key to access the page.

#### Formatting a Memory Card

##### Memory Card Size and Format

Select the required card size.

Press the **FORMAT** key to format the card.



Memory Card Format  
ACTIVE

Once formatting is complete, the display reverts automatically to the 'Memory Card Size' frame.

Press the **FORMAT** key to advance to the next frame.

##### Volume Label

A card name of up to 11 characters can be set.

Press the **EDIT** key to edit the card name – see front fold out.

Press the **FORMAT** key to return to the Memory Card menu.



### Error Messages

The following error messages may be displayed during the formatting procedure.

Error Message	Error Condition	Action
Memory Card Error CARD ABSENT	The card is absent or not inserted properly.	Fit the memory card correctly
Memory Card Error CARD WRITE PROTECTED	The card is write protected.	Move the write protect tab to the unlocked position
Memory Card Error CARD NOT FORMATTED	The card is not formatted	Format the card
Memory Card Error CARD FULL	The card has no file space left (ie. 32 files already stored) or insufficient memory available	Remove the card and fit a card with sufficient memory space available

**Table 3.8 Error Messages**

### Memory Card Capacity

The data storage capacity is dependent on the memory card size and the scan time. Use the following formula to calculate the running time of a memory card for a given scan time.

$$\text{Card Running Time (hrs)} = \frac{\text{scan interval (secs)} \times \text{useable bytes}}{(13 + [\text{No. of channels} \times 7]) \times 3600} \quad \text{hrs}$$

Where:

Scan interval = 3 to 3600 seconds

Usable bytes = number of bytes usable for data logging – see Table 3.9

No. of channels = 1 to 24.

Card Size	Usable Bytes
64k	63,488
128k	129,024
256k	260,096
512k	521,216
1M	1,045,504
2M	2,092,032
4M	4,186,112

**Table 3.9 Usable Bytes**



**Note.** The above calculations are only applicable if alarms are set to OFF – see Section 3.3.1/Process Alarms





### 3.10.3 Datalog Page



#### Information.

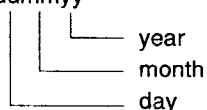
- Data formatted for direct viewing on spreadsheet.
- Recording of up to 24 channels (analog inputs, maths results or totalizer results).
- Recording of process alarm states.
- Date and time stamping of data.
- Channel tags and units recorded for each channel.
- Scan times variable from 3 to 3600 seconds.

#### Filenames

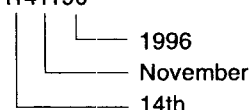
Logged data is saved to a unique filename. The filename comprises eight or less characters.

All files are automatically given the extension 'PRx' where 'x' is initially '1'. The instrument provides a default filename which is in the following form:

**Default file = PRddmmyy**



**File created on 14th November 1996 = PR141196**



The default filename may be edited by the user. The instrument searches the card directory to ensure that the filename selected is unique and then opens a new file with this name. An error message is displayed if this name already exists.

Some spreadsheets are limited to files of 8192 rows. In order to meet this requirement the instrument automatically starts a new file when 8192 rows of data are exceeded. The new file has the same filename as before but the extension is incremented, e.g. PR1 becomes PR2. If the instrument is powered-down then powered-up again while datalogging is active, datalogging automatically resumes but the data is stored onto a new file. This file has the same filename as before but the extension is incremented e.g. PR1 becomes PR2.

If datalogging is stopped, the card can be removed to be viewed on a PC, and then returned to the instrument where datalogging can be resumed onto the same file. However, if a new filename is created data cannot then be appended to any existing files. The number of channels and the channel sources are fixed on creation of the file and cannot be edited later. In order to store different channel data a new file has to be created. The scan interval may be changed at any time without creating a new file.

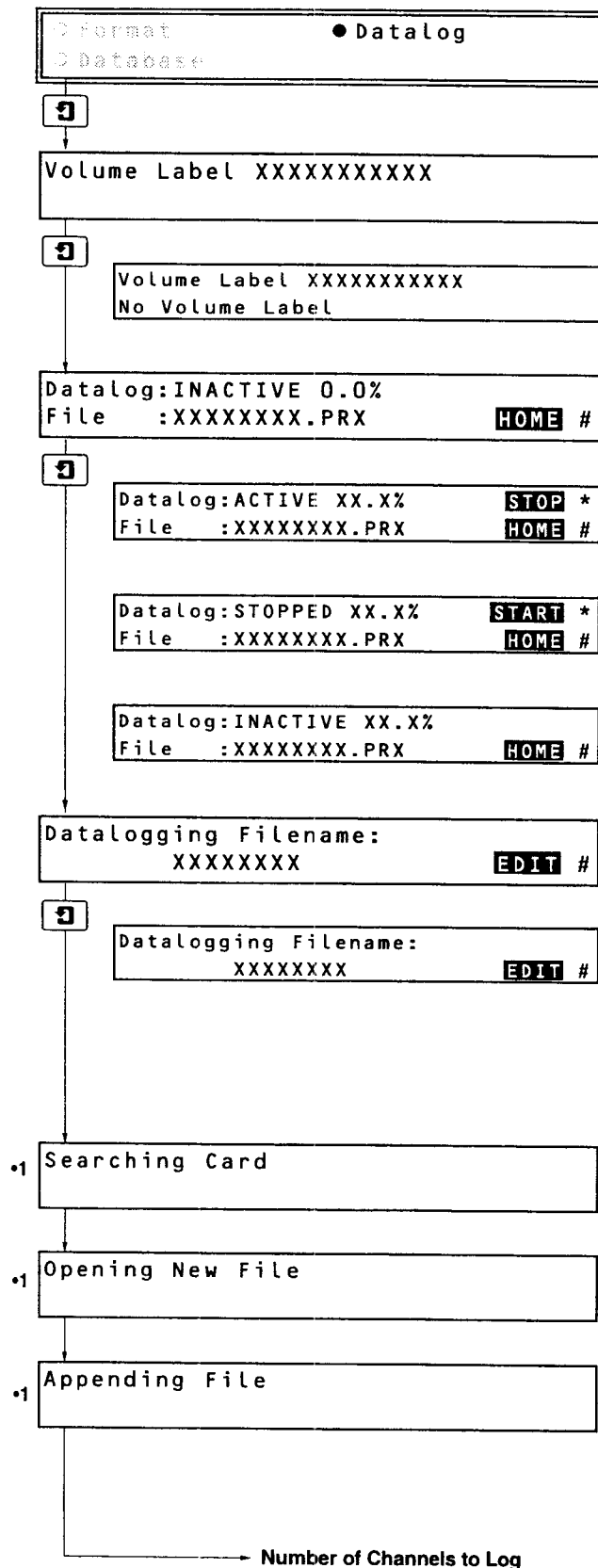
Error Message	Error Condition	Action
Memory Card Error CARD ABSENT	The card is absent or not inserted properly.	Fit the memory card correctly
Memory Card Error CARD WRITE PROTECTED	The card is write protected.	Move the write protect tab to the unlocked position
Memory Card Error CARD NOT FORMATTED	The card is not formatted	Format the card
Memory Card Error CARD FULL	The card has no file space left (ie. 32 files already stored) or insufficient memory available	Remove the card and fit a card with sufficient memory space available
Memory Card Error FILE EXISTS	The file name is already used.	Choose another file name

**Table 3.10 Error Messages**



### ...3.10.3 Datalog Page

This page is displayed only if a memory Card is fitted.



Press the key to select 'Datalog' from the Memory Card menu.

Press the key to access the page.

#### Volume Label

The card name is displayed.

If the card has no name 'NO VOLUME LABEL' is displayed. To edit the card name see Section 3.10.2./ Memory Card Formatting/ Volume Label.

Press the key to advance to the next frame.

#### Datalogging Status 1

The current datalogging status, % card space remaining and file name are displayed.

**Datalog Active** – To stop datalogging and advance to the channel set up parameters press the key.

**Datalog Stopped** – Datalogging was previously active and has been stopped. Press the key to restart datalogging.

**Datalog Inactive** – Datalogging has not been started.

Press the key to advance to the next frame.

#### Datalogging Filename

Enter the datalog file name.

Press the key to edit the file name – see front fold out. A name of up to 8 characters can be set.

Press the key to advance to the next frame.

The card database is searched automatically to verify the file name.

Press the key and edit the name.

#### Processing Displays

If there is an error when searching the card for the filename an error message is displayed – see Table 3.10/ Section 3.10.3

**Opening New File** – Displayed whilst a new file is created.

**Appending File** – Displayed whilst an existing file is amended. Data is added after the last entry in the existing file.

\*1 Not displayed if datalogging status is 'ACTIVE'.



No. Of Channels To Log:	24
Scan Interval	:3600Secs

No. Of Channels To Log: 24  
Scan Interval :3600 Secs

01 Memory Card Channel: A1 ENTER \*

01 Memory Card Channel: A1 ENTER \*

D6

M1


M8

T01

T12

```
Datalog:INACTIVE 0.0%      START *
File      :XXXXXXXXX.PRX    HOME  #
```

Datalog Start Source :	See
Datalog Stop Source :	Table 3.4

Press the  key to return to the Memory Card menu.



### 3.10.4 Database Set Up Page



#### Information.

- Allows storage of the instrument's configuration onto a memory card.
- Configuration stored as a DOS-compatible file.
- Allows data to be downloaded to any recorder fitted with the memory card option.
- Configuration files on the memory card can also be backed-up onto hard or floppy disk using a PC.
- Up to 32 files can be stored on a card.
- Configuration files and DOS format datalogging files can be stored on the same drive.

### Filename Restrictions



#### Information.

- Any DOS compatible filename of up to eight characters can be entered by the user.
- Each file is automatically given the extension '.CFG' (Configuration).
- Existing filenames cannot be re-used or deleted (unless card is re-formatted).



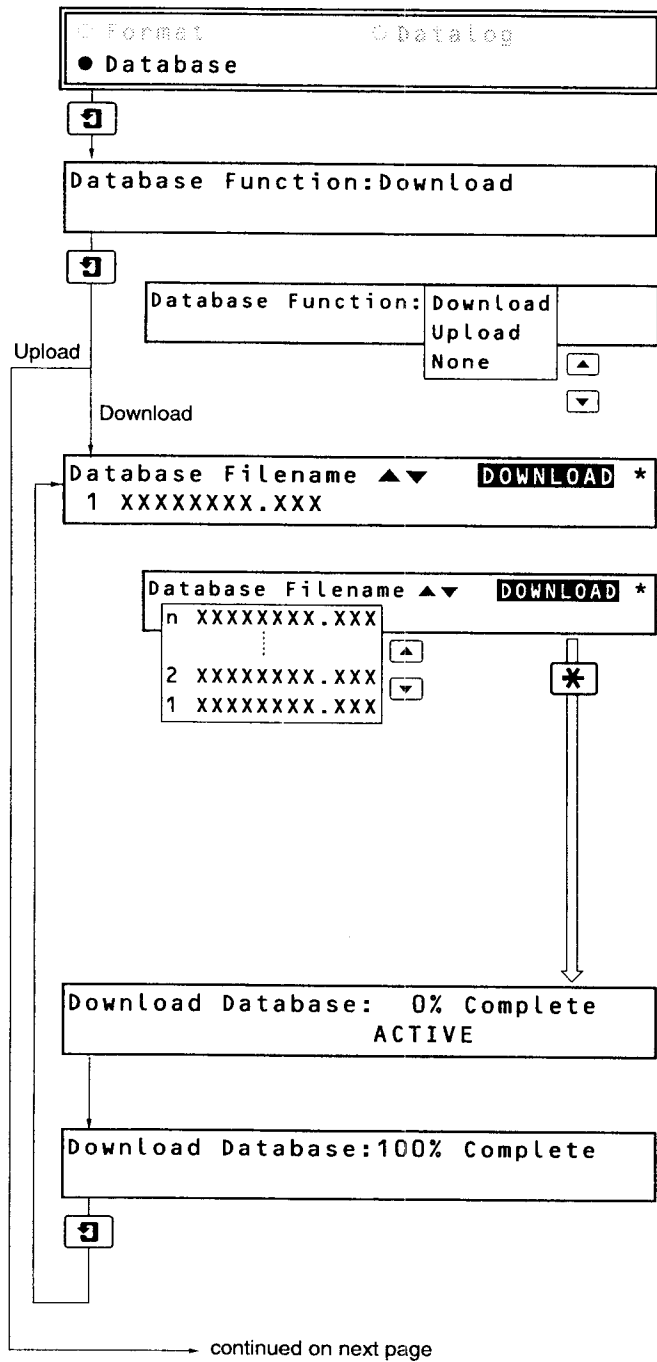
**Note.** Datalogging must be stopped in the **Memory Card Datalog Page** before entry to this page is enabled.



### ...3 CONFIGURATION

#### ...3.10.4 Database Set Up Page

This page is displayed only if a memory Card is fitted.



Press the [F1] key to select 'Database' from the Memory Card menu.

Press the [F1] key to access the page.

#### Database Function

Select the database function required.  
If the card has not been formatted the only option is NONE.

#### Downloading the Database from the Card

The current database filename is displayed.

Press the [Up] and [Down] keys to choose a file from the card directory.

Press the [F1] key to download the chosen file.  
If the chosen file cannot be downloaded, 'DOWNLOAD \*' is not displayed.

#### Processing Displays

If an error is encountered whilst searching the card for the filename, an error message is displayed – see Section 3.10.3/ Table 3.10

Displayed while data is downloaded from the card.

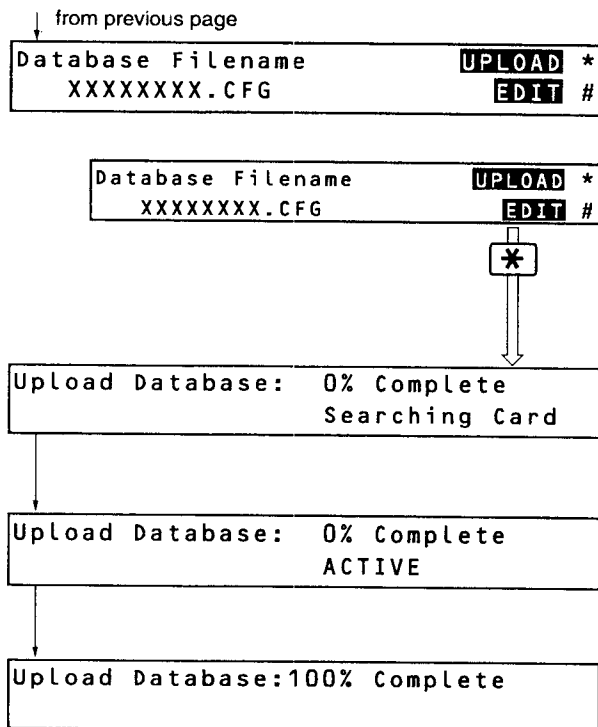
Displayed once download is complete.

Press the [F1] key to download another file.

Continued on next page.



### ...3.10.4 Database Set Up Page



#### Uploading the Database to the Card

Press the **[F2]** key to edit the database file name.

Press the **[F10]** key to upload the database to the card.

Displayed during search of card (ie. for valid file name, sufficient space etc.)

Displayed while data is uploaded to the memory card.

Displayed once upload is complete.

#### Error Messages

If an error is encountered whilst searching the card an error message is displayed – see Section 3.10.3/ Table 3.10.



## 4 INSTALLATION

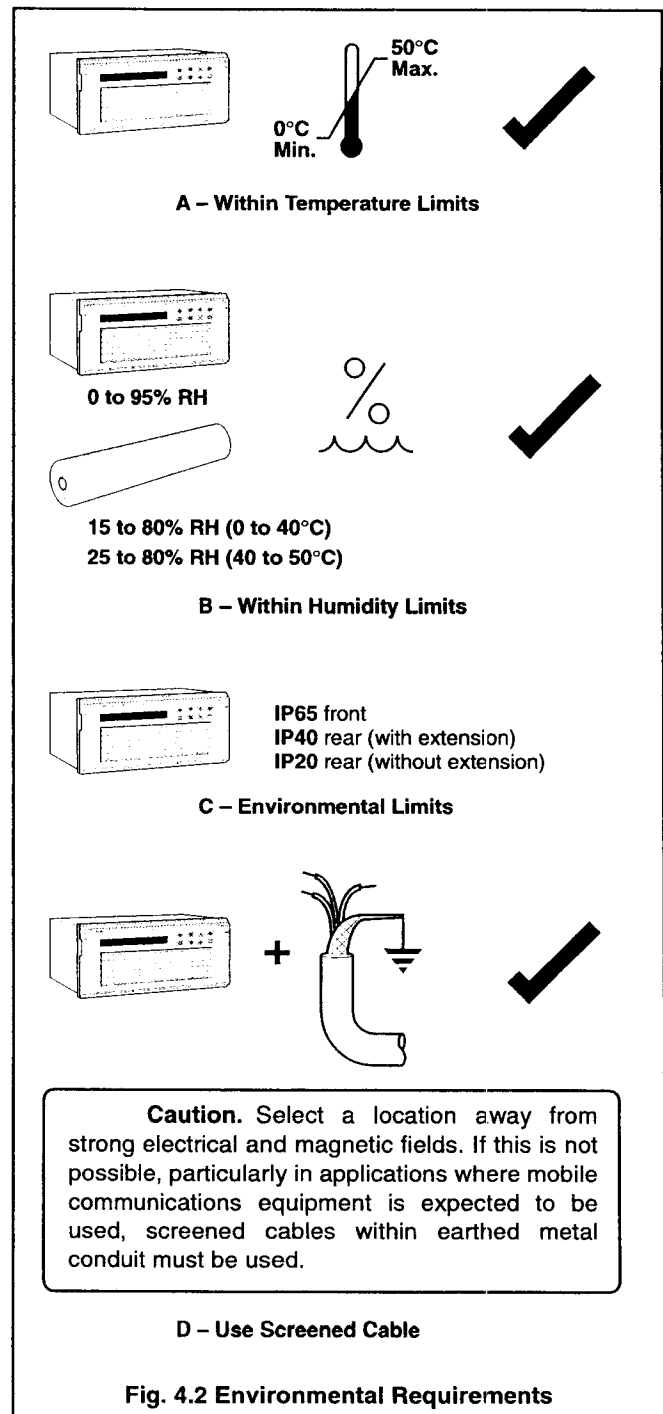
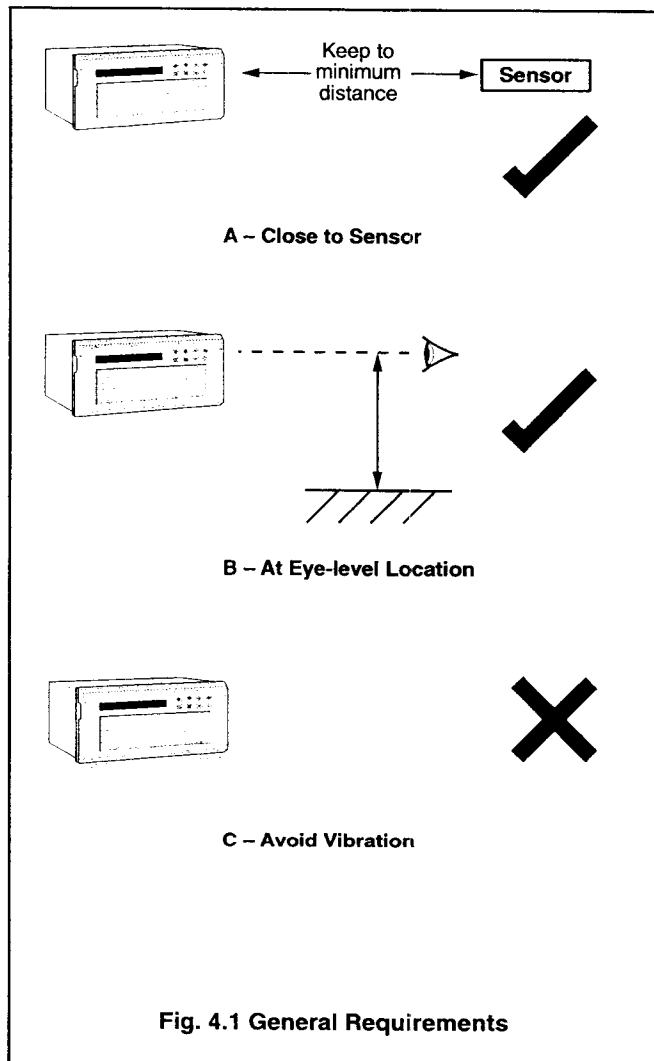
### EC Directive 89/336/EEC

In order to meet the requirements of the EC Directive 89/336/EEC for EMC regulations, this product must not be used in a non-industrial environment.



**Warning.** Before making any connections, ensure that the power supply, any powered control circuits and high common mode voltages connected to the instrument are switched off.

### 4.1 Siting – Figs. 4.1 and 4.2





## 4.2 Mounting – Figs. 4.3 and 4.4

Dimensions in mm (in.)

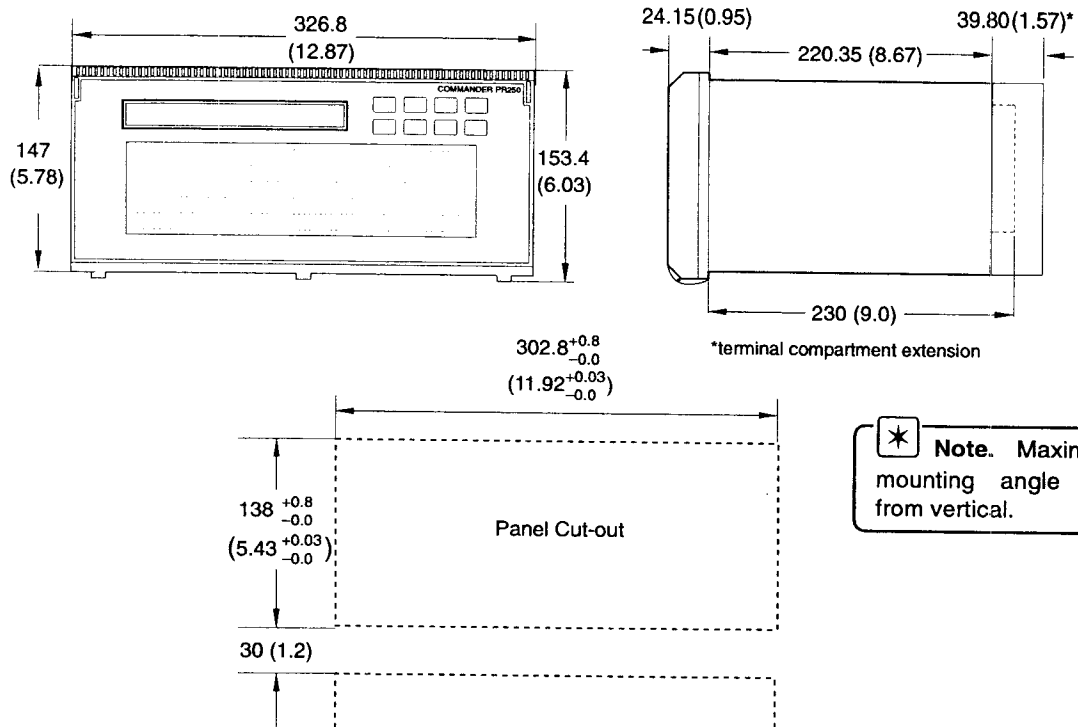


Fig. 4.3 Overall Dimensions

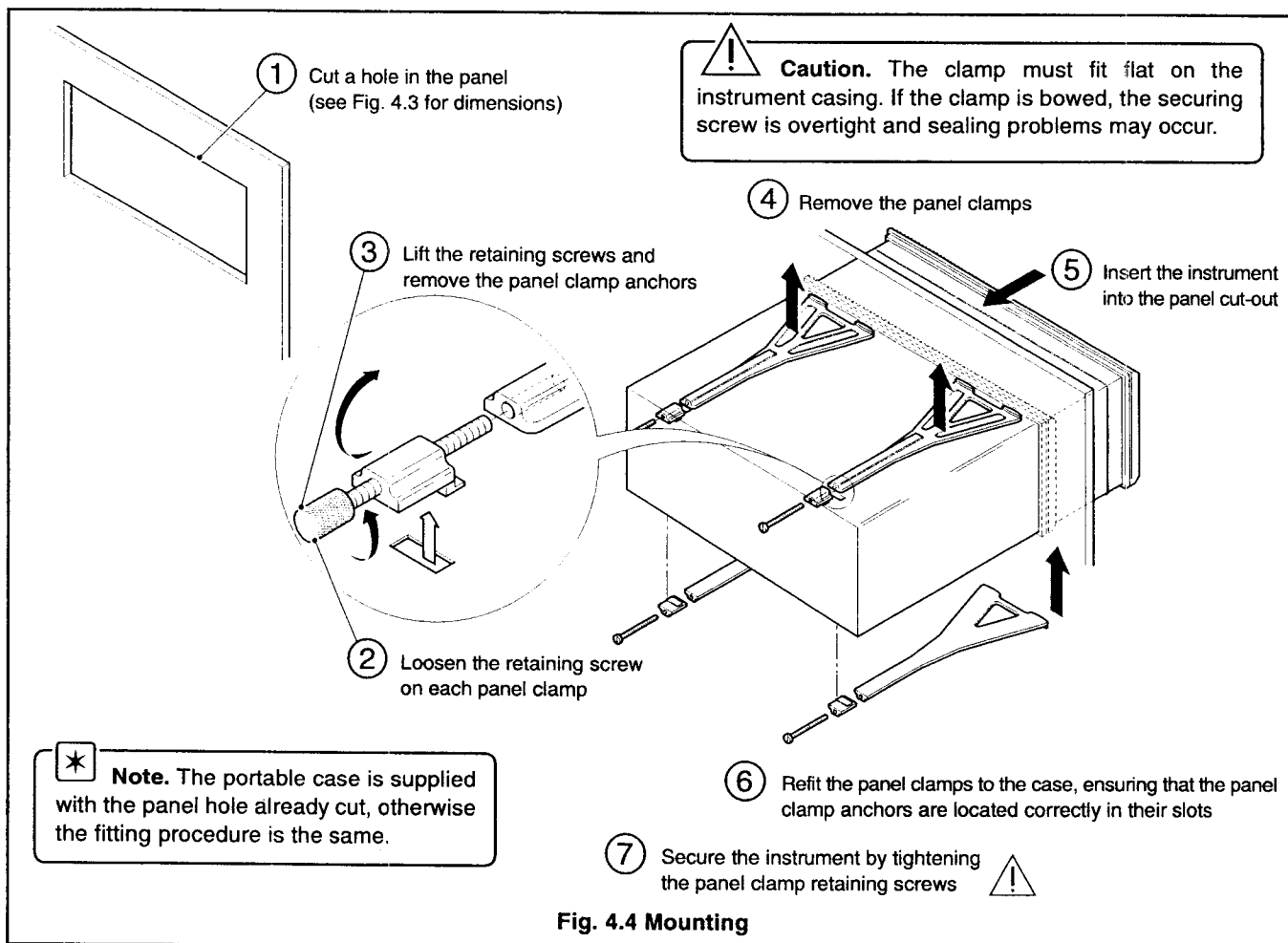




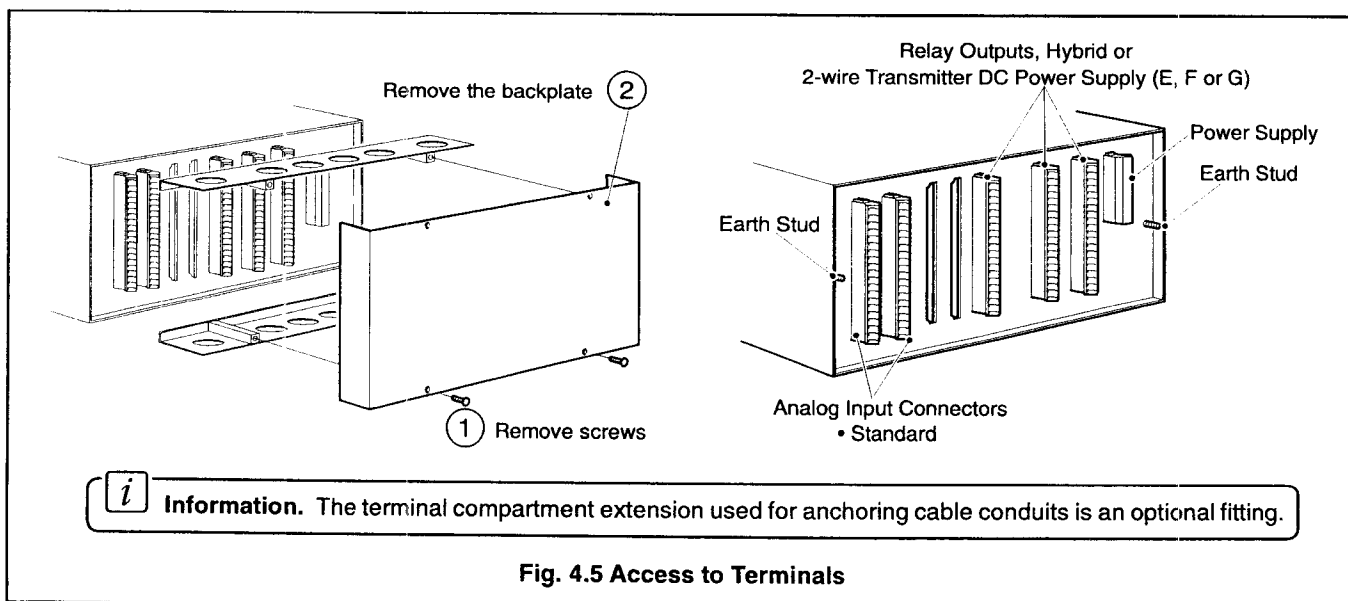
### ...4.2 Mounting – Figs. 4.3 and 4.4



**Information.** For IP65 protection, a minimum panel thickness of 3mm (0.12 in.) is recommended.



### 4.3 Access to Terminals and Connections – Fig. 4.5

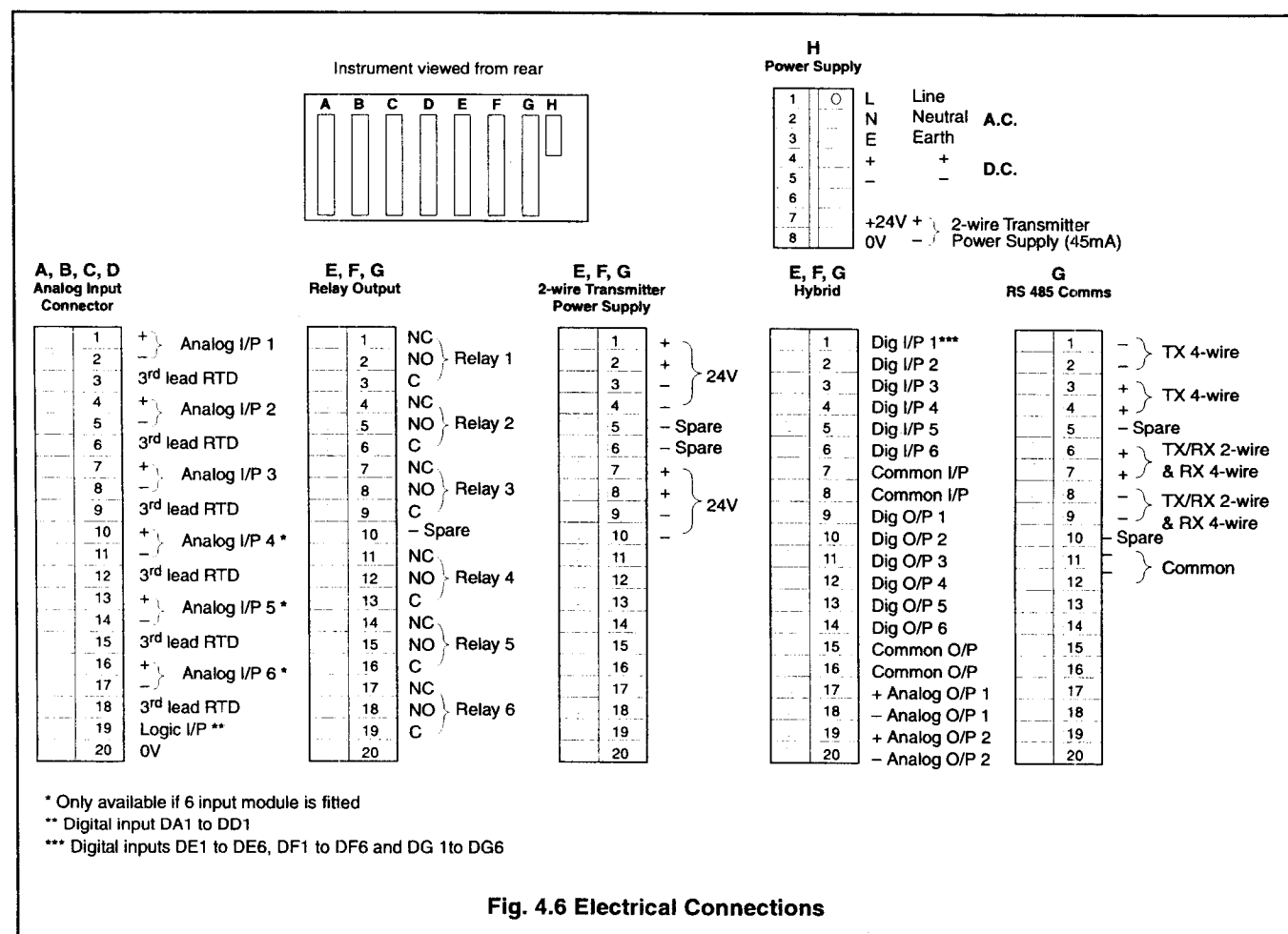




## 4.4 Electrical Connections – Fig. 4.6

**Note.**

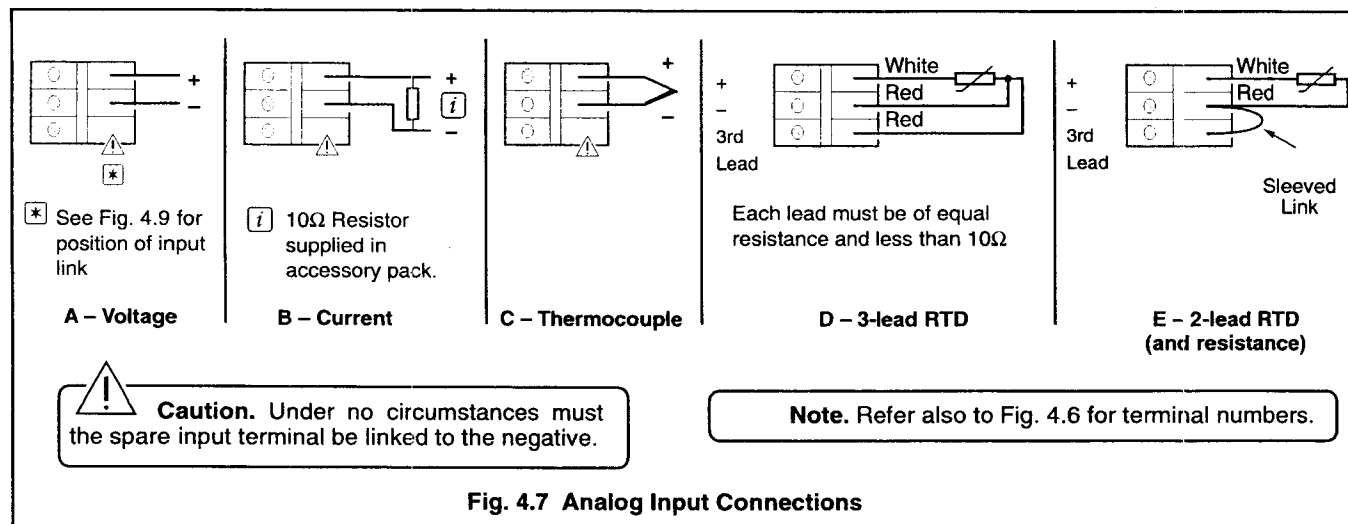
- Always route signal leads and power cables separately, preferably in earthed metal conduit.
- It is strongly recommended that, for signal inputs and relay connections, screened cable is used, with the screen connected to the earth stud.
- The terminals accept cables up to 2.5mm<sup>2</sup> cross-section.





## 4.5 Analog Input Connections

### 4.5.1 Current and Voltage – Fig 4.7



#### Caution.

- To avoid damage to multi-channel instruments, high common mode voltages up to 250V r.m.s. max. must be present on all channels, or not at all.
- The maximum channel-to-channel voltage (between any two channels) must not exceed 12.5V or permanent damage to the instruments input circuitry may occur. To prevent such damage link the negative terminals on all inputs. For applications where the available 12.5V isolation is required, this link should not be fitted.

### 4.5.2 Thermocouple – Fig. 4.7

Use the correct compensating cable between the thermocouple and the terminals – see Table 4.1.

Automatic cold junction compensation (ACJC) is incorporated but an independent cold (reference) junction may be used.

### 4.5.3 Resistance Thermometer (RTD) – Fig. 4.7

On applications requiring long leads 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.

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 4.1 Thermocouple Compensating Cable



#### 4.5.4 Accessing the Analog Input links – Fig. 4.8

To gain access to the analog input links the chassis must be removed.

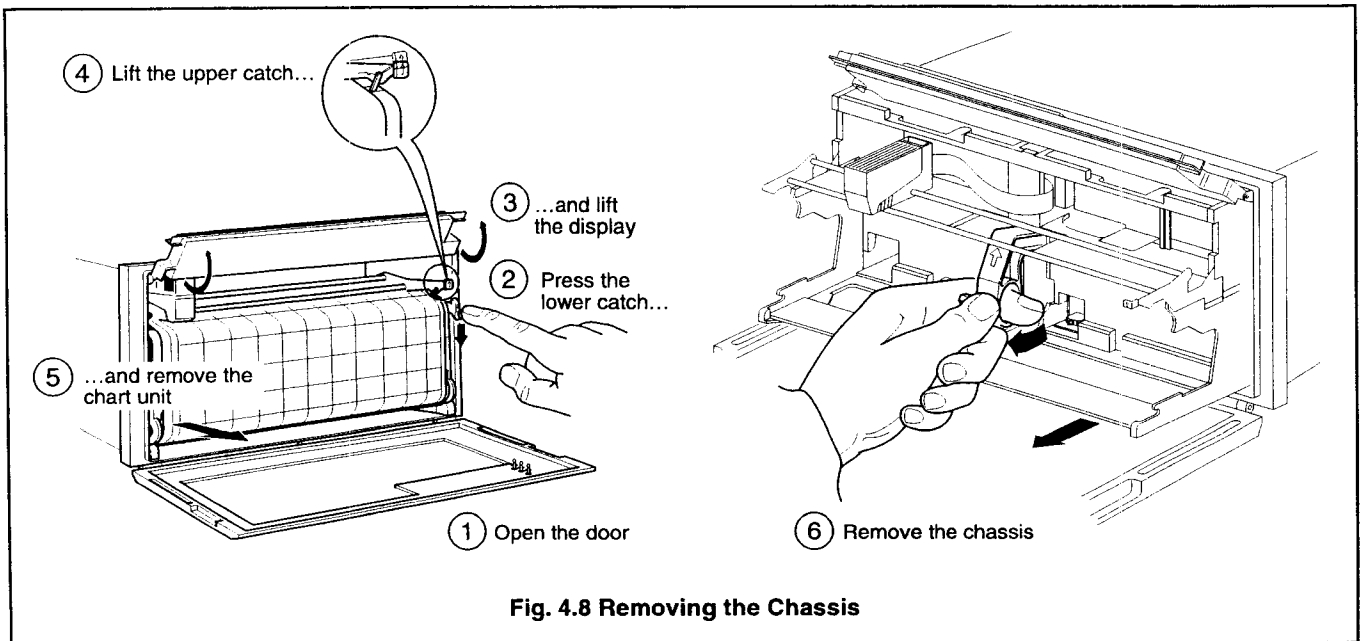


Fig. 4.8 Removing the Chassis

#### 4.5.5 Setting Analog Input links – Fig. 4.9

The analog inputs must be set up for the input type required – See Fig 4.9

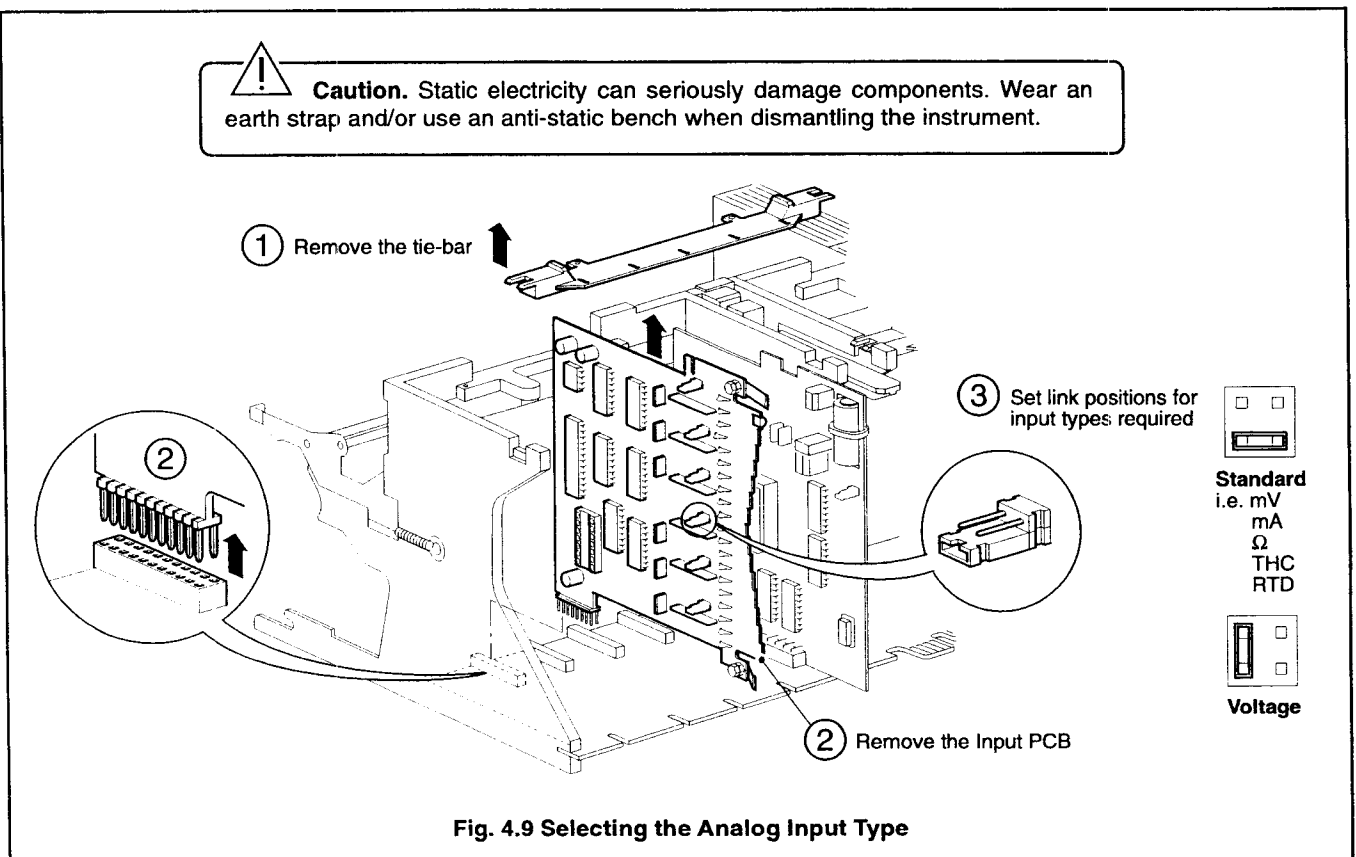


Fig. 4.9 Selecting the Analog Input Type



### 4.6 Transmitter Power Supply Connections – Fig. 4.10

**i** **Information.** The power supply board provides a 24V supply capable of driving two 2-wire transmitters. Two additional 24V power supplies are provided on the transmitter power supply module boards, each of which is capable of driving two 2-wire transmitters.

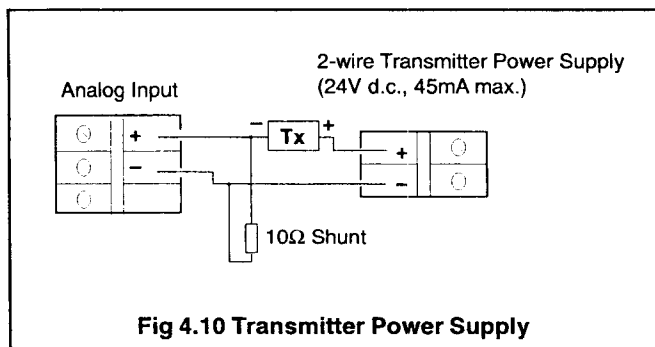


Fig 4.10 Transmitter Power Supply

### 4.7 Digital Input Connections – Fig 4.11

One digital input is provided on each analog input board. A further six digital inputs are provided on the Hybrid option board.

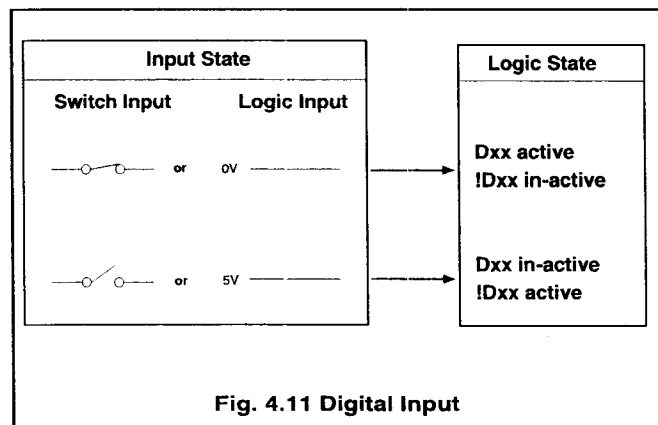


Fig. 4.11 Digital Input

### 4.8 Digital Output Connections – Fig 4.12

Six digital outputs are provided on the Hybrid option board.

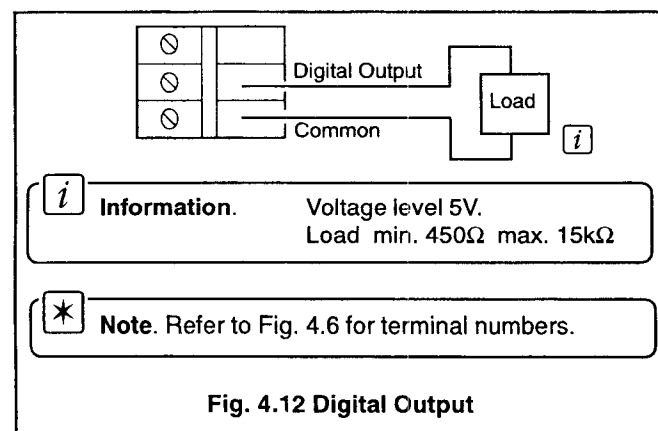


Fig. 4.12 Digital Output

### 4.9 Relay Output Connections – Fig. 4.12



#### Note.

- The maximum total combined current flowing through the relays is 36A.  
The maximum individual relay current is 5A.
- The polarity is set up in the **Relay Output Module Page** – see Section 3.5.1/ Select Output Polarity.

### 4.10 Power Supply Connections

#### 4.10.1 AC Mains Connections– Fig. 4.13

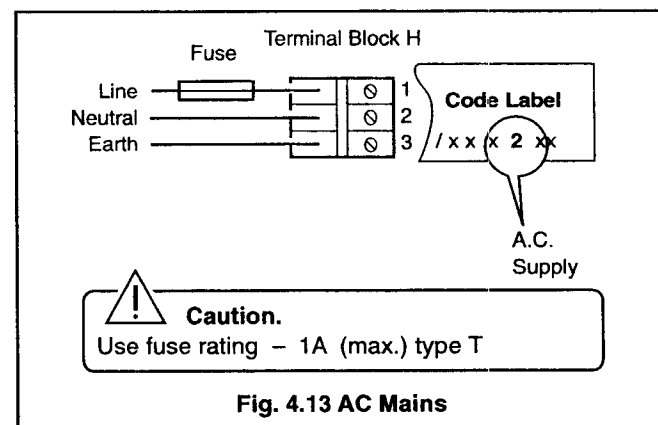


Fig. 4.13 AC Mains

#### 4.10.2 24V AC/DC Supply Connections – Fig. 4.14

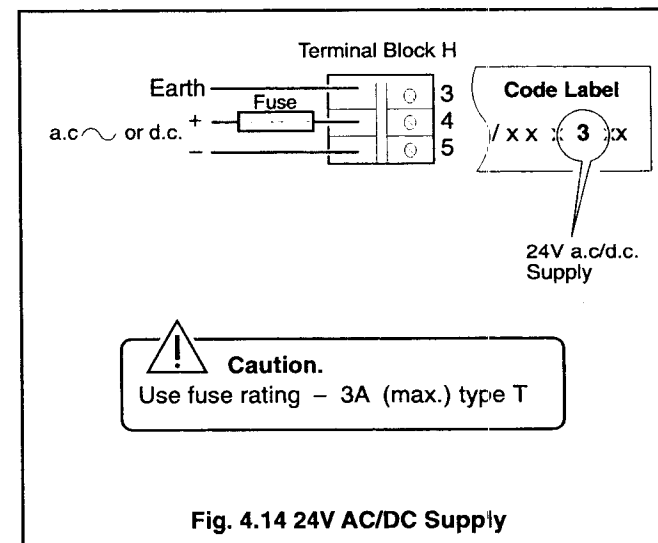


Fig. 4.14 24V AC/DC Supply



#### 4.11 500V Protected Input Board Connections

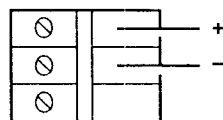


##### Information.

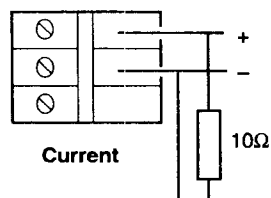
- No RTD or resistance measurements.
- Maximum millivolt range 200mV.
- All standard current and thermocouple ranges apply.



**Note.** The input circuitry withstands up to 500V transient voltage between input channels. There is **no** galvanic isolation between the inputs and other instrument circuitry.



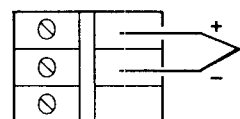
Millivolts



Current



**Information.** The resistor is supplied in the accessories pack



Thermocouple



**Note.** Refer to Fig. 4.6 for terminal numbers.

Fig. 4.15 500V Protected Input Board Connections

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