Eurotherm®

by Schneider Electric

6100E
User Guide

6100E 100 mm paperless graphic recorder
Versions 5.5 and later

HA029722/2
May 2016

Restriction of Hazardous Substances (RoHS)

Product group 6100A/6180A/6100XIO/6180XIO/6100E

Table listing restricted substances

Chinese

限制使用材料一览表

产品	有毒有害物质或元素					
6100A/6180A/ 6100XIO/ 6180XIO/6100E	铅	汞	镉	六价铬	多溴联苯	多溴二苯醚
印刷线路板组件	X	O	O	O	O	O
附属物	O	O	O	O	O	O
显示器	O	X	O	O	O	O
模块	X	O	X	O	O	O
O	表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006 标准规定的限量要求以下。					
X	表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006 标准规定的限量要求。					

English

Restricted Materials Table

Product	Toxic and hazardous substances and elements					
6100A/6180A/ 6100XIO/ 6180XIO/6100E	Pb	Hg	Cd	Cr(VI)	PBB	PBDE
PCBA	X	O	O	O	O	O
Enclosure	O	O	O	O	O	O
Display	O	X	O	O	O	O
Modules	X	O	X	O	O	O
O	Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.					
X	Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.					

Approval

Name:	Position:	Signature:	Date:
Martin Greenhalgh	Quality Manager	Martin Greenhalgh	07th Aug 2008

PAPERLESS GRAPHIC RECORDER

USER GUIDE

LIST OF SECTIONS

EFFECTIVITY

This manual refers to recorders fitted with software version 5.5. To determine the software version fitted to the recorder, the 'About' screen in the System menu may be accessed as described in section 4.6.9.

PAPERLESS GRAPHICS RECORDER USER GUIDE

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SAFETY NOTES

WARNING

Any interruption of the protective conductor inside or outside the apparatus, or disconnection of the protective earth terminal is likely to make the apparatus dangerous under some fault conditions. Intentional interruption is prohibited.

Note: in order to comply with the requirements of safety standard BS EN61010, the recorder shall have one of the following as a disconnecting device, fitted within easy reach of the operator, and labelled as the disconnecting device.

a. A switch or circuit breaker which complies with the requirements of IEC947-1 and IEC947-3
b. A separable coupler which can be disconnected without the use of a tool
c. A separable plug, without a locking device, to mate with a socket outlet in the building.

1. Before any other connection is made, the protective earth terminal shall be connected to a protective conductor. The mains (supply voltage) wiring must be terminated within the connector in such a way that, should it slip in the cable clamp, the Earth wire would be the last wire to become disconnected.
2. In the case of portable equipment, the protective earth terminal must remain connected (even if the recorder is isolated from the mains supply), if any of the I/O circuits are connected to hazardous voltages*.
3. The mains supply fuse within the power supply is not replaceable. If it is suspected that the fuse is faulty, the manufacturer's local service centre should be contacted for advice.
4. Whenever it is likely that protection has been impaired, the unit shall be made inoperative, and secured against accidental operation. The manufacturer's nearest service centre should be contacted for advice.
5. Any adjustment, maintenance and repair of the opened apparatus under voltage, should be avoided as far as possible and, if inevitable, shall be carried out only by a skilled person who is aware of the hazard involved.
6. Where conductive pollution (e.g. condensation, carbon dust) is likely, adequate air conditioning/filtering/sealing etc. must be installed in the recorder enclosure.
7. Signal and supply voltage wiring should be kept separate from one another. Where this is impractical, shielded cables should be used for the signal wiring.
8. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment might be impaired.

* A full definition of 'Hazardous' voltages appears under 'Hazardous live' in BS EN61010. Briefly, under normal operating conditions, hazardous voltages are defined as being > 30V RMS (42.2V peak) or > 60V dc.

SYMBOLS USED ON THE RECORDER LABELLING

One or more of the symbols below may appear as a part of the recorder labelling.

	Refer to the manual for instructions
	Protective earth
	This recorder for ac supply only
	This recorder for dc supply only
	This recorder for either ac or dc supply
	Risk of electric shock

USER GUIDE

1 INTRODUCTION

This document describes the installation, operation and configuration of a paperless graphic recorder.

1.1 UNPACKING THE RECORDER

The recorder is despatched in a special pack, designed to give adequate protection during transit. Should the outer box show signs of damage, it should be opened immediately, and the recorder examined. If there is evidence of damage, the instrument should not be operated and the local representative contacted for instructions. After the recorder has been removed from its packing, the packing should be examined to ensure that all accessories and documentation have been removed. The packing should then be stored against future transport requirements.

2 INSTALLATION

2.1 MECHANICAL INSTALLATION

Figure 2.1 shows mechanical installation details.

Note: It is recommended that the rear face of the panel be centre-punched at suitable positions to locate the tips of the case clamps. Otherwise, particularly on smooth surfaces, the clamps can 'wander' as they are tightened, leading to inefficient clamping and possible damage to the recorder mounting slots.

The unit is inserted through the panel aperture from the front of the panel. With the weight of the recorder supported, a panel clamp is inserted into each of the mounting slots (one each on the left- and right-hand sides). The jacking screws are then tightened sufficiently to clamp the recorder into position. EXCESS FORCE SHOULD NOT BE USED IN TIGHTENING THESE SCREWS.

2 INSTALLATION (Cont.)

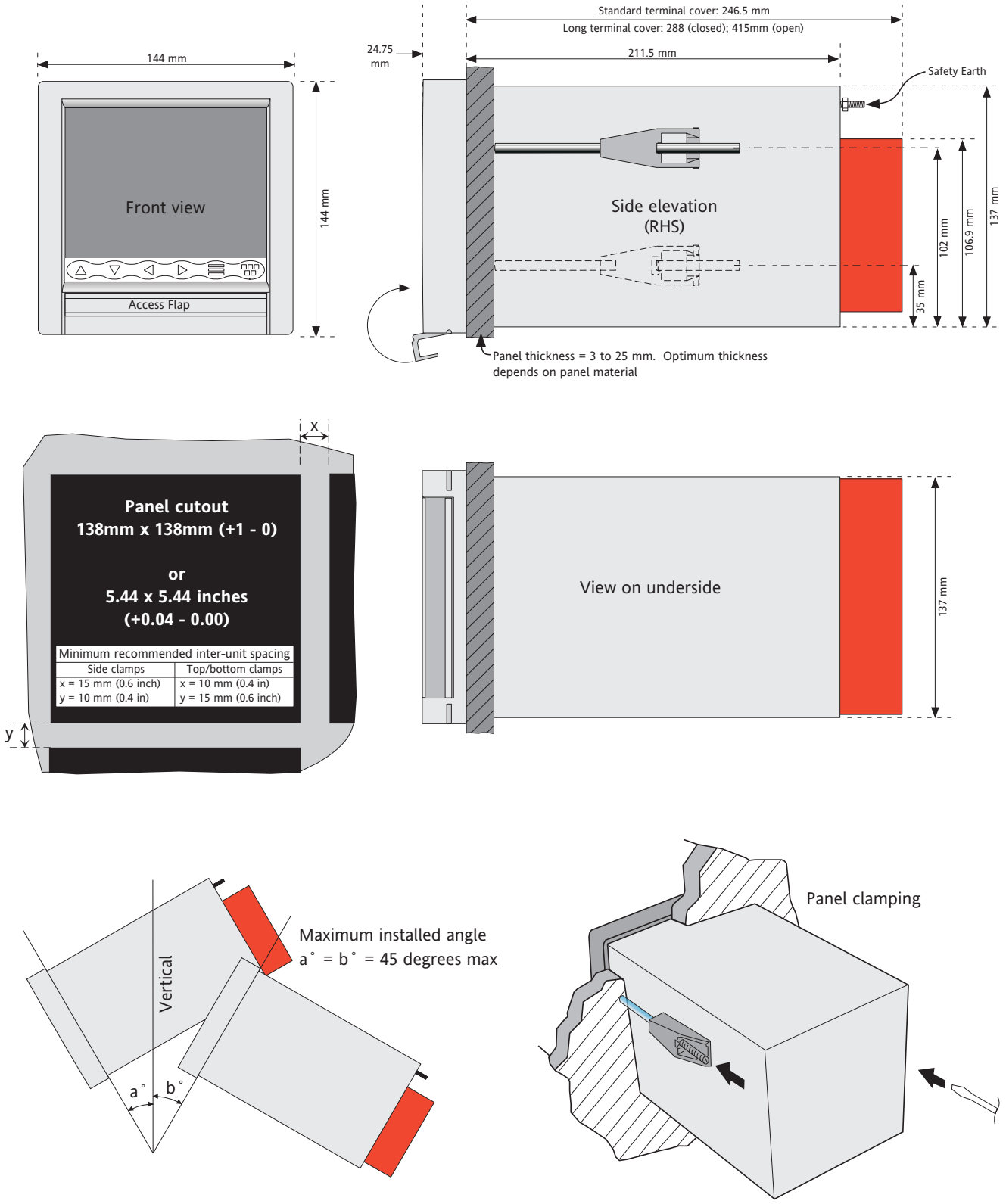


Figure 2.1 Mechanical installation

2.2 ELECTRICAL INSTALLATION

2.2.1 Signal wiring

Figures 2.2.1a shows connector locations for the recorder; figure 2.2.1b gives pinouts.

CONNECTOR WIRING DETAILS

Maximum wire size = 4.13mm^2 (11 AWG)
Minimum wire size = 0.081mm^2 (28 AWG)
Design torque = 0.35Nm.

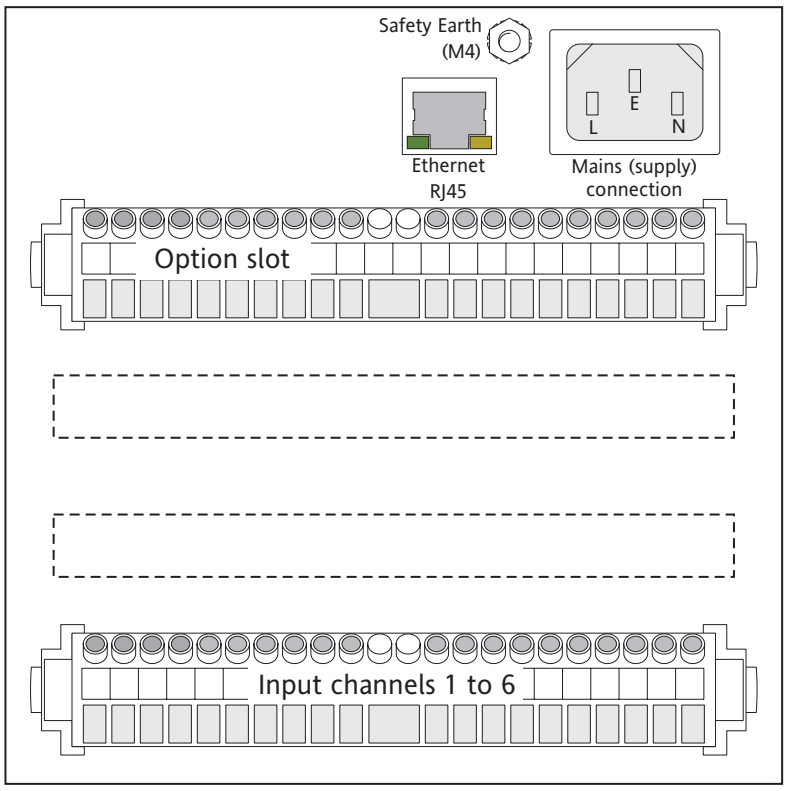


Figure 2.2.1a Connector locations

2.2.1 SIGNAL WIRING(Cont.)

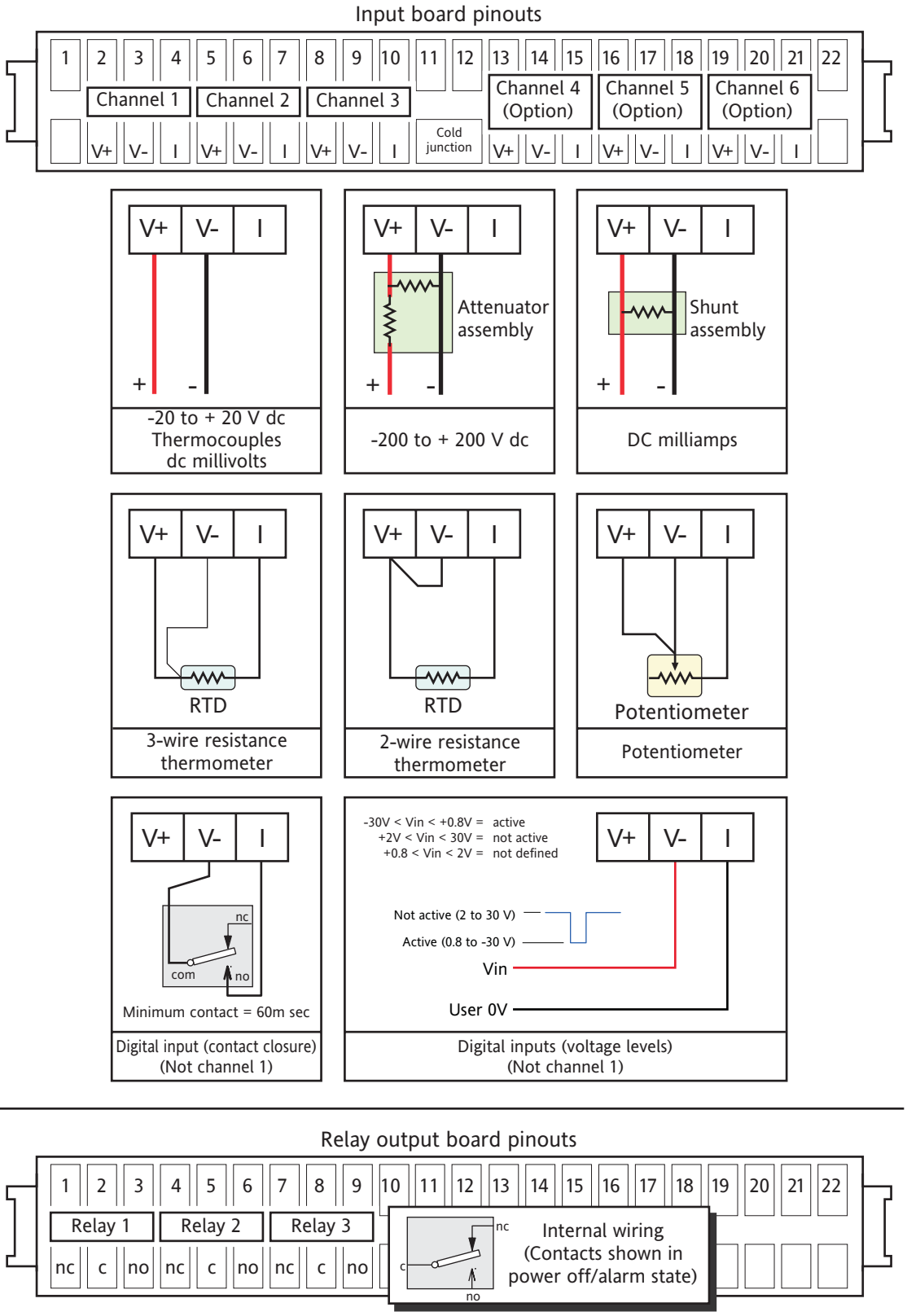


Figure 2.2.1b Pinouts

2.2.2 Supply voltage wiring

WARNING

DC supply voltages must never be applied to recorders fitted with isolated transmitter power supplies.

Note: The minimum recommended wire size is 20AWG equivalent to 16/0.2 (0.5mm^2).

LINE SUPPLY

The supply voltage to the recorder is terminated using an IEC socket which is connected to the mating plug at the rear of the recorder. The recorder is suitable for use with all ac voltages between 85 and 265 V RMS (47 to 63 Hz), and requires 50 W max. power. For recorders without transmitter power supplies, supply voltages between 110V dc and 370V dc are also suitable.

LOW VOLTAGE SUPPLY OPTION

Not suitable for recorders fitted with the isolated transmitter power supply option.

The low voltage supply option is terminated at a three-pin connector (plug mounted on recorder - socket on supply cable) as shown in figure 2.2.2. The option allows the use of ac or dc supplies with the following characteristics:

AC: 20 to 42V RMS (45 to 400 Hz)
DC: 20 to 54V (See warning above)
Power: 50 W max.

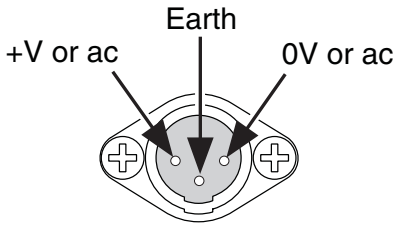
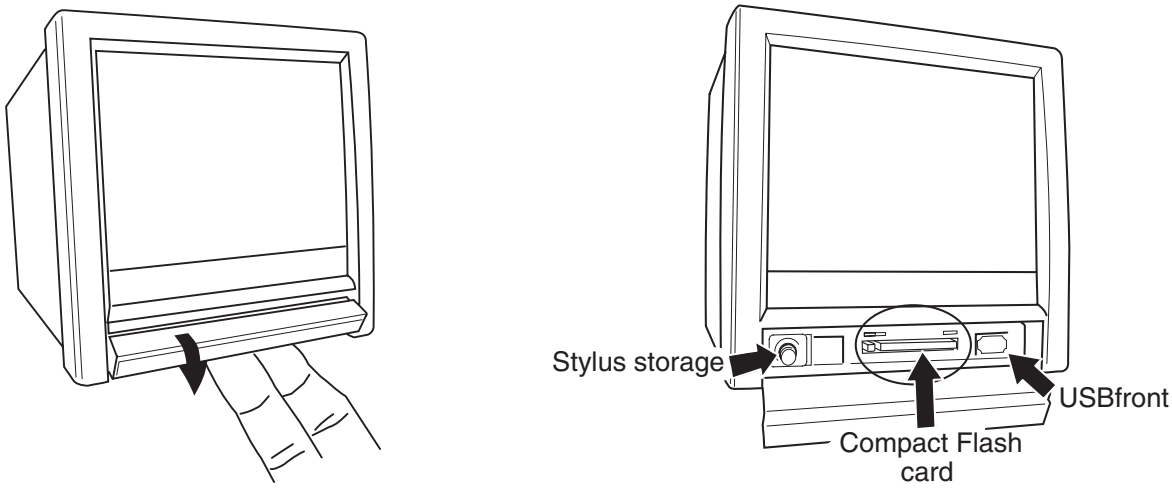


Figure 2.2.2 Low voltage supply pinout (view on fixed connector face)

2.3 ACCESS FLAP

The access flap is located immediately below the recorder screen. To open the flap, insert one or more fingers under the flap handle, and pull it outwards and down (figure 2.3). Located behind the flap are (from left to right)

1. a stylus (press to eject)
2. a slot for a Compact Flash card
3. a USB port (usbfront).



a) Insert finger(s) and pull forward and down

b) behind flap details

Figure 2.3 Access flap detail

2.3.1 Stylus

A stylus suitable for use on the touch screen is located in a storage area to the left of the Compact Flash Card slot.

2.3.2 Card slot

The slot for the Compact Flash card is located centrally behind the flap. If a card is already fitted, it is removed by a double operation of the eject button. See details in figure 2.3.2 below

CAUTION

Removal of the memory device whilst archiving is in progress causes irreparable damage to the filing structure on the device, rendering it unusable. For this reason, archiving should be suspended (section 4.1) (wait for the green section of the disk icon (section 3.1.3) to go 'white') before the device is removed. It is strongly recommended that the 'Remove Media' facility described in section 3.1.4 (Summary menu) be used to ensure that it is safe to remove the memory device.

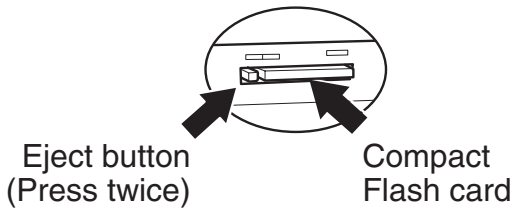


Figure 2.3.2 Compact Flash card details

2.3.2 CARD SLOT (Cont.)

LED INDICATORS

Three LED indicators are located above the card slot as shown in figure 2.3.2b, below.

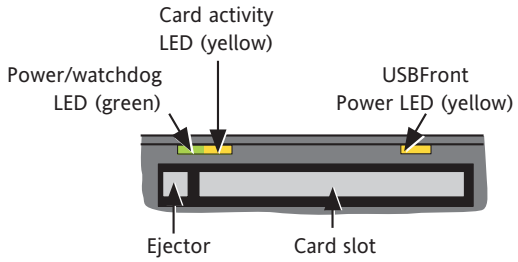


Figure 2.3.2b indicating LEDs

2.3.3 USB Front Port

A type-A USB socket is located to the right of the Compact Flash slot. This port can be used to connect a mouse, a keyboard, a barcode scanner, a 'memory stick' or a floppy disk drive.

Note: It is the responsibility of the user to establish the electromagnetic susceptibility of any USB peripheral connected to the recorder. Refer to the USB port specification in Annex A for details.

3 PROCESS VARIABLE DISPLAY

The operator interface consists of a touch-sensitive screen, showing either process variable values in one of a number of formats, or, showing configuration or operational details for use in setting up the recorder. This section (3) describes the process variable displays. Section 4 describes the Configuration displays.

Figure 3, below, depicts a typical trend display for a large-frame unit and gives details of the various areas of the display page.

Notes:

Dialogue boxes, message boxes etc. cause Process Variable displays to 'freeze' for as long as the box is on display. Root and Option menus (amongst others) time-out (i.e. are removed from the display) after approximately one minute. Messages, however, are displayed until the operator takes action to remove them. It should be noted, especially, that several message boxes may be active at one time, but only the oldest one is visible, until it is removed to reveal the 'next oldest' message, and so on.

TRUNCATION OF NUMERIC VALUES

If the amount of space on the display page is insufficient to display the full width of the process variable or scale value, then the displayed value is rounded down and the number of decimal places reduced. If the width is still too restricted, the value is displayed in 'scientific' format, or if this is still too wide, the final visible character of the integer part of the value is replaced by a '?' (as depicted in figure 3.4.3b)

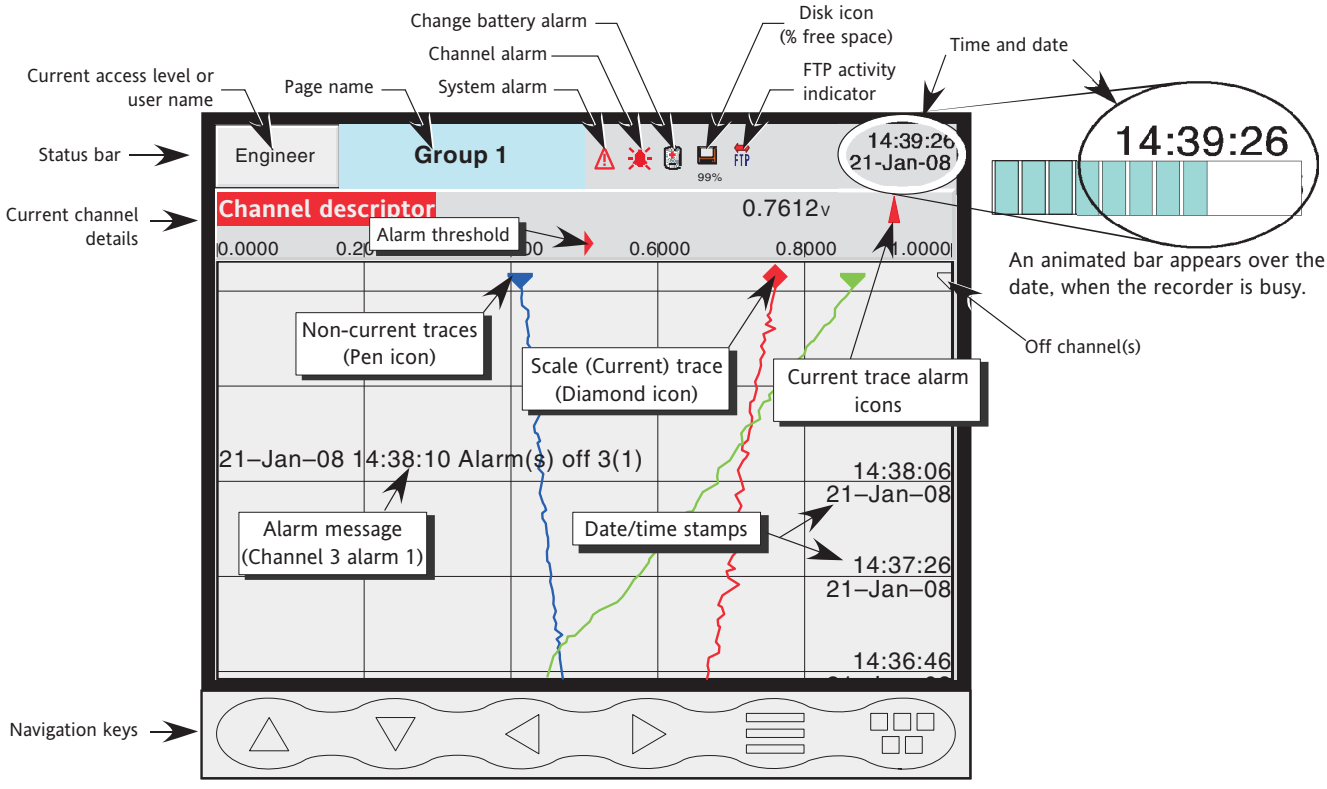


Figure 3 Trend display definitions (large frame unit)

3 PROCESS VARIABLE DISPLAY (Cont.)

CURRENT TRACE ALARM ICONS

In each of the different types of PV display, each channel's faceplate gives the status of the channel's alarms. The status of each alarm is shown by one of the icons depicted in table 3, either flashing (if it is active and unacknowledged) or on continuously (if it is active and acknowledged). (See section 3.1.4, below, for a description of how to acknowledge alarms.) Absolute alarm threshold icons and deviation alarm bars appear in any display which includes a scale. For deviation alarms the bar stretches from (Reference - Deviation) to (Reference + Deviation).

Note: 'Trigger' alarms do not display threshold marks or bars, or faceplate symbols.

	Absolute High
	Absolute Low
	Deviation in
	Deviation out
	Rate-of-change Rising
	Rate-of-change Falling

Faceplate symbols

	Absolute low	Absolute high	Deviation In / Out	Rate of change
Horizontal scales				No indication
Vertical scales				No indication
For Deviation alarms, R = Reference; d = deviation				

Scale symbols

Table 3 Alarm icons

3.1 STATUS BAR

This appears across the top of the display, and contains the items described below.

3.1.1 Current access level

There are four access levels available (Logged out, Operator, Engineer and Service), and the current level is displayed in this key at the top left hand corner of the display. Touching this key calls the login page as described in section 3.3.1 (Access to configuration) below.

3.1.2 Page name

Initially this shows the current group's descriptor. The name changes according to context for example 'Operator' or 'Config-Archive'

3.1.3 Alarm indication

This area of the display can contain a number of status icons: Instrument alarm, Channel alarm, Battery change, Disk status, FTP in progress, and so on. Pressing this area of the screen calls the 'Summary menu' - (section 3.1.4) allowing the user to view active instrument alarms, to acknowledge all channel alarms, to display the Alarm Summary or Message Log page. Media removal strategy is also controlled from this pop-up.

For channel alarm symbols refer to 'Current Trace Alarm Icons', above.

INSTRUMENT ALARM 

This indicator appears, flashing, if any of the following errors are active. The instrument alarm summary page, described in Section 3.1.4, allows the user to view such instrument alarms as are active.

Archive failed -(message)	Message explains archive failure.
Battery-backed RAM cleared	This message appears if the battery has failed, and the unit has been switched off.
Clock failure	Internal clock was corrupt at power up, or the time has never been set. Can be caused by battery failure, in which case the battery icon will also be visible. The error is cleared by setting the time and date. Server time forced to 00:00 1/1/1900.
Channel error	Indicates a hardware failure in the channel circuit or in the internal CJ temperature measurement
Channel failure	Indicates a hardware failure in the input channel circuit (see note).
DHCP Server failure	For instruments with IP address lookup set to 'Get from DHCP Server', this alarm occurs if the recorder cannot obtain an IP address from the server. See section 4.5 for details.
FTP Archiving file lost	Archive failed. A file which has not been archived, has been detected.
FTP Archiving too slow	Remote archive is too infrequent. The recorder effectively switches to 'Automatic' (section 4.3.4) to ensure that data is not lost.
FTP Primary Server Failure	This error is set if the recorder fails, after two attempts, to establish communications with the primary server as defined in Archive Configuration (section 4.3.4). After the second attempt has failed, the Secondary server is tried.
FTP Secondary Server Failure	This error is set if the recorder fails, after two attempts, to establish communications with the secondary server as defined in Archive Configuration (section 4.3.4). See also 'FTP Primary Server Failure, above.
Insufficient non-volatile memory...	There is insufficient memory available for the configuration. Can be caused by use of Rolling Average maths functions.
Internal flash: \application\ required repair	Error found in the internal file system at power-up, and corrected.
Internal flash: \history\ required repair	Error found in the internal file system at power-up, and corrected.
Internal flash: \screens\ required repair	Error found in the internal file system at power-up, and corrected.
Internal flash: \user\ required repair	Error found in the internal file system at power-up, and corrected.
Internal flash: \user\ is full	Appears if the User partition is full. To clear, either user screens must be simplified or files must be deleted from \User\, or both.
Maths Channel failure	Appears if, for example, the divisor of a divide function is zero.
Media Archiving file lost	Archive failed. A file which has not been archived, has been detected.
Media Archiving too slow	Archive is too infrequent. The recorder effectively switches to 'Automatic' (section 4.3.4) to ensure that data is not lost.

Note: Unlike other instrument alarms, Channel Failure is not self clearing. Once the cause of the failure is rectified, the recorder must be power cycled in order to clear the alarm.

3.1.3 ALARM INDICATION (INSTRUMENT ALARMS) (Cont.)

Network boot failure	The recorder is unable to establish connection with the BootP or DHCP server. This might be caused by, for example, cable failure, network hardware failure, etc.
Recording failure - (message)	Message explains recording failure - due to file error, internal overflow etc.
Removable media failure	This error is set if the archive storage device is corrupt, wrongly formatted etc. Becomes active only when an Archive is attempted.
Removable media full	Archive storage device full. Becomes active only when an Archive is in progress.
SNTP server failure	This error is set if:- a) the year received from the server is < 2001 or > 2035 or b) the configured SNTP server cannot be accessed.
Time synchronisation failure	Set if 5 or more 'Time change events' are caused by the SNTP server within 24 hrs. A 'Time change event' occurs whenever the recorder time is found to be more than 2 seconds different from the server time. The alarm does not appear until 24 hours have elapsed since the first of the five or more Time Change events occurred.
USB over current	USB power fault - too much current being drawn by a USB device (max 500 mA).
USB power fault key	USB power fault - too much current being drawn by all USB devices (max 1100 mA)
USB unsupported	Unsupported USB device inserted.

3.1.3 ALARM INDICATION (Cont.)

CHANNEL ALARM 

This red 'bell' indicator appears if any channel is in alarm. The symbol is illuminated continuously if all alarms are acknowledged or flashes if any active alarm is unacknowledged. Refer to 'ALARM ACKNOWLEDGEMENT' below, for details of how to acknowledge alarms.

CHANGE BATTERY 

This flashing indicator first appears when the battery voltage (checked every 15 minutes) indicates that the battery is approaching the end of its useful life. The indicator continues to flash until the battery is replaced (B2.2 in Annex B). The indicator does not appear if the battery is not fitted.

DISK ICON

This shows the free space available on whatever mass storage medium is fitted (if any), and selected for Archive destination (note 1). The disk icon appears soon after the device is inserted (but see note 2). During archiving, the colour of the central area of the disk changes to green (see note 3). No other disk activity (e.g. save/restore configuration) is indicated.

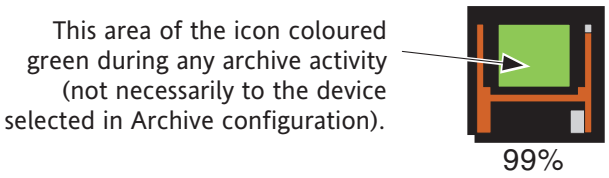


Figure 3.1.3 Archive activity indication

Notes

1. The icon appears only when a memory device is present, AND when that memory device has been selected in the 'Archive to media' selection in archive configuration (section 4.3.4). For example: if a memory stick is inserted in 'usbfront', but Archive to Media is set to 'mediacard', then the disk icon ap.pears only if a suitable card is present in the 'mediacard' slot.
2. When a disk is inserted into a USB floppy disk drive which is connected to the recorder, the disk icon appears only after the disk has been accessed, (either by reading from it or writing to it), or after the file system has been opened by touching the 'file' key. (This note does not apply for disks which have been inserted before the disk drive is plugged in.)
3. The central area goes green whenever local archiving is taking place - not only when archiving is taking place to the memory device selected in Archive configuration.

FTP ICON 

The FTP icon appears to the right of the disc icon position whenever transfer activity is taking place.

3.1.4 Summary menu

This pop-up display appears if the Alarm Indication area at the top of the display is touched. Figure 3.1.4 shows the display.

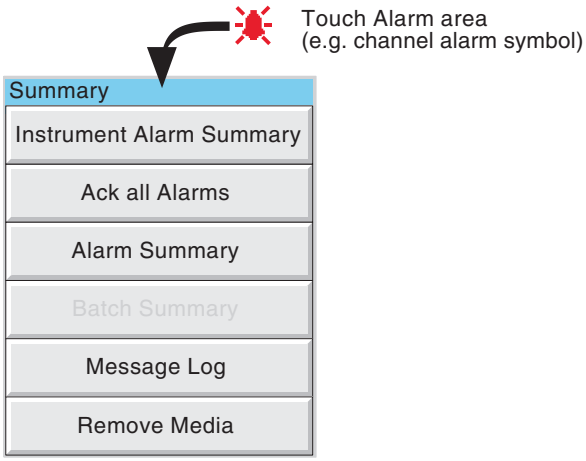


Figure 3.1.4a Summary pop-up menu

INSTRUMENT ALARM SUMMARY

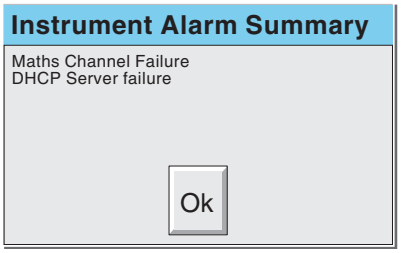


Figure 3.1.4b Typical Instrument alarm summary display

This contains a list of the currently active instrument alarms. For a list of possible alarms and their definitions, see section 3.1.3, above.

ACK ALL ALARMS

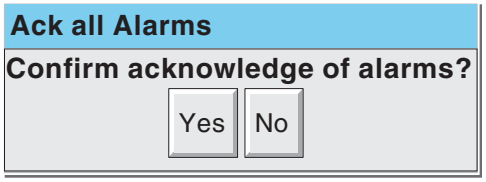


Figure 3.1.4c Ack all Alarms display

'Yes' confirms all active, unconfirmed alarms.

This page can also be displayed by touching an alarm in the alarm summary page, described below.

3.1.4 SUMMARY MENU (Cont.)

ALARM SUMMARY PAGE

As shown in figure 3.1.4d, below, the alarm summary page contains the following information for the current group:

1. Alarm identifier. This appears as a point ID, followed by the relevant alarm number in parentheses. For example, Alarm 1 on maths channel 6 would appear as: D6 (1). Maths channels are prefixed by 'D'. Totalisers are prefixed by 'T' and Counters are prefixed by 'C'. Input channels are not prefixed.
2 Alarm threshold for absolute alarms only
3 The current process value for the point
4 An alarm symbol (see Table 3). Alarm symbols flash until acknowledged.

Notes:

1. Alarms are always listed in Point/Alarm order with input channels first, followed by derived channels, totalisers and counters, if these options are fitted.
2 When the alarm source returns to its non-alarm state: Unlatched alarms are removed from the list whether or not they have been acknowledged; latched alarms remain displayed until acknowledged. See section 4.3.3 for a description of alarm types and actions.
3. There are no time or history components associated with the Alarm Summary. If Alarm messages have been enabled in the group's configuration (section 4.3.2), then alarm initiation/acknowledgement times and dates can be found from the trend and trend history displays, described in section 3.4 or in Message log described later in this section.
4. If an alarm is active on a channel which is not included in any group, then although the channel alarm symbol will flash, the alarm will not appear in any of the alarm summary pages.

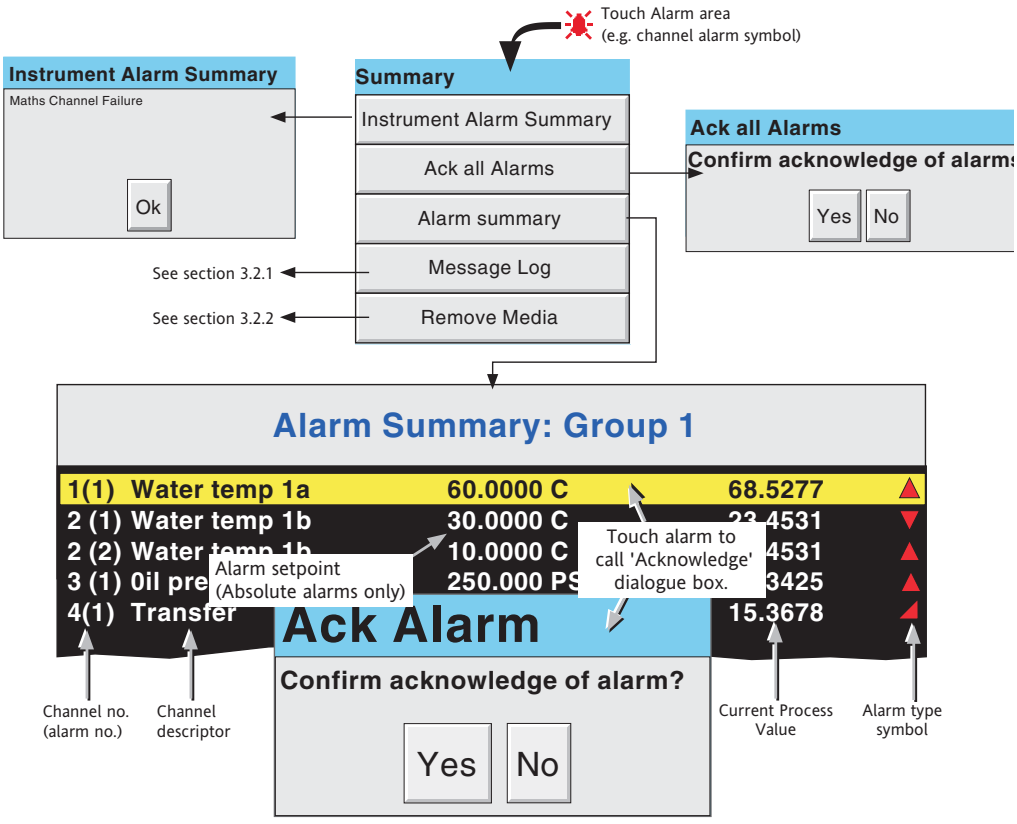


Figure 3.1.4d Alarm Summary display

3.1.4 SUMMARY MENU (Cont.)

ALARM ACKNOWLEDGEMENT

Alarms can be acknowledged individually, on a group basis, or globally (all alarms).

INDIVIDUAL ALARMS

Individual alarms are acknowledged from the alarm summary page by touching the relevant item (highlights yellow), then touching 'Yes' in the resulting pop-up confirmation box. Figure 3.1.3a, above, attempts to show this process.

GROUP ALARMS

Alarms can be acknowledged on a group basis by calling the alarm summary page, then pressing the Options key (section 3.2), the 'Ack Group Alarms' key and finally, 'Yes' in the resulting pop-up confirmation box. Figure 3.1.4e below, attempts to show this process.

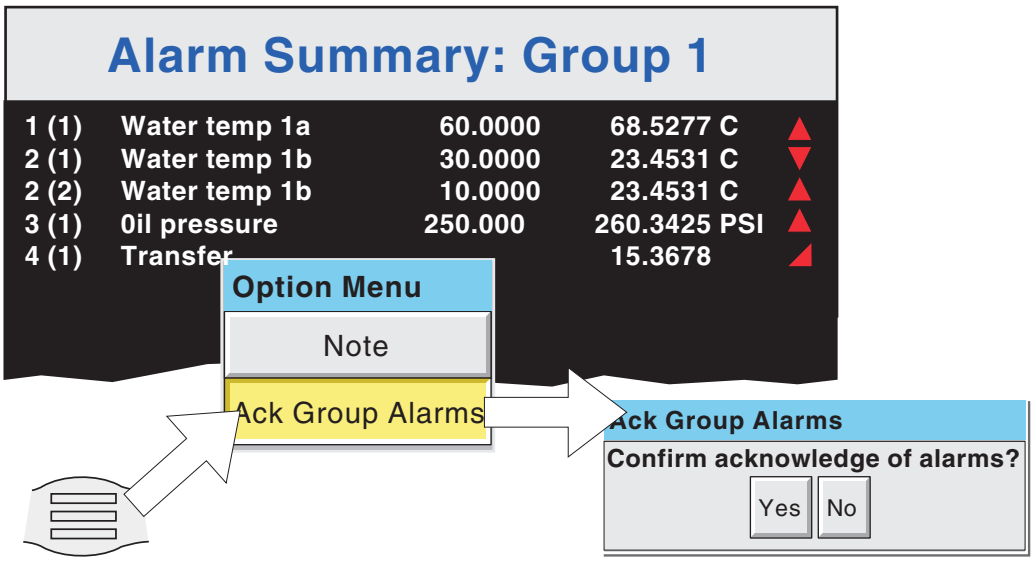


Figure 3.1.4e Group Alarm acknowledgement

ALL ALARMS

To acknowledge all active alarms, touch (e.g.) the channel alarm icon at the top of the screen. From the resulting 'Summary' menu, select 'Ack all Alarms', then finally, touch 'Yes' in the resulting pop-up confirmation box.

Note: The options menu is context sensitive, and may, therefore, not appear as illustrated above.

BATCH SUMMARY

Not applicable this model of recorder

3.1.4 SUMMARY MENU (Cont.)

MESSAGE LOG

Note: Message log can also be selected using the Root menu/Goto View/Message log key.

If there are more messages than can be displayed in the height of the screen, a scroll bar appears to allow 'hidden' messages to be displayed.

Messages are retrieved from the history files in batches of 100 messages. If there are more than 100 messages, 'Earlier messages..' appears after the hundredth message. Touching 'Earlier messages..' calls the option menu, and touching 'Earlier messages..' in this menu, calls the next batch of 100, and so on. If applicable, operating 'Later messages..' / 'Later messages..' calls the previously displayed 100 messages.

As can be seen from figure 3.1.4f the list of messages can be 'filtered' both by type and by time. For example, setting the message type to 'Alarm' and the period filter to 'Last Day' excludes all messages except alarm messages which have occurred within the previous 24 hours. (For clarity, the figure shows both filters open. In fact, only one can be open at a time)

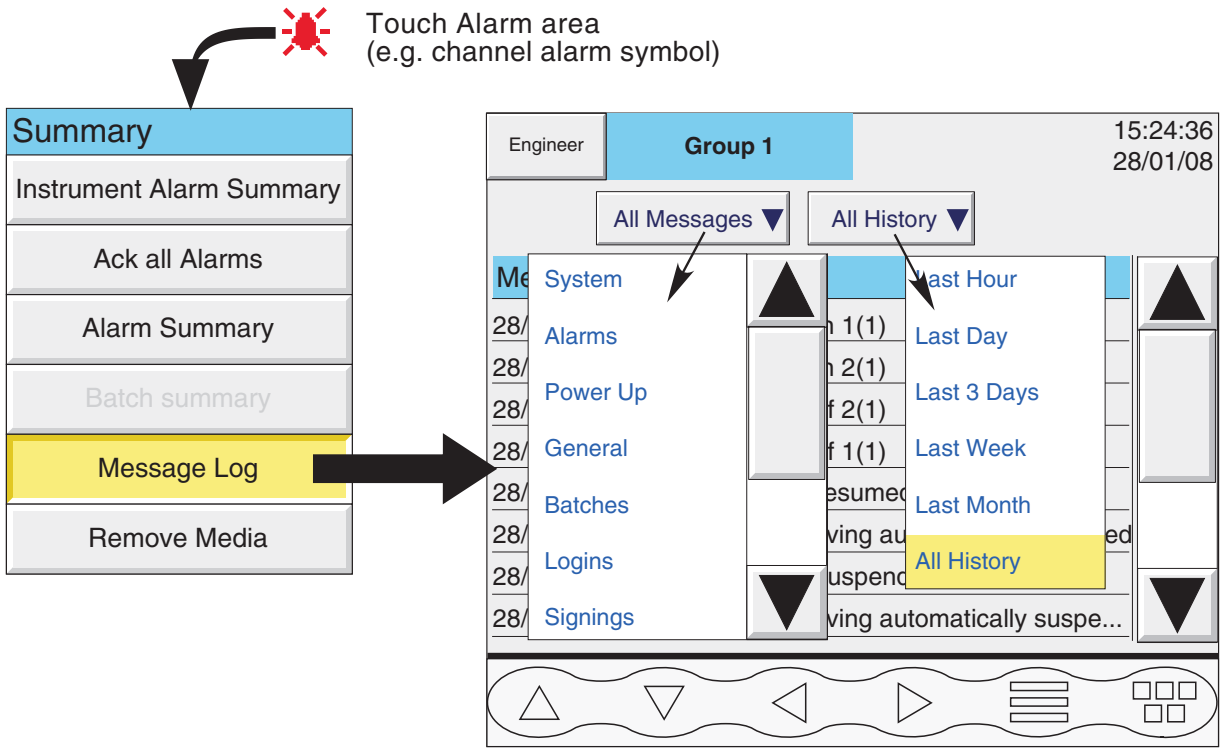


Figure 3.1.4f Message log page showing filters

MESSAGE TYPE FILTER

All Messages	All messages are displayed
System	Only System messages and instrument alarms are listed
Alarms	Only alarm on/off and acknowledgement messages appear.
Power Up	Displays power up messages only including Config Revision and Security revision. See 'About' (section 4.6.8) for more details.
General	Displays operator notes/custom messages etc.

3.1.4 SUMMARY MENU (Cont.)

MESSAGE TYPE FILTER (Cont.)

Batches	Not applicable to this recorder model
Logins	Lists only changes in login.
Signings	Not applicable to this recorder model
Audit trail	Not applicable to this recorder model
Reports	Not applicable to this recorder model.

PERIOD FILTER

This picklist allows the user to select one of the following to define the period of time that the message list is to encompass:
All History, Last Month (28 days), Last Week, Last 3 Days, Last Day or Last Hour.

OPTION MENU

Touching a message (highlights yellow) calls the Option Menu* as shown in figure 3.1.4g, below.

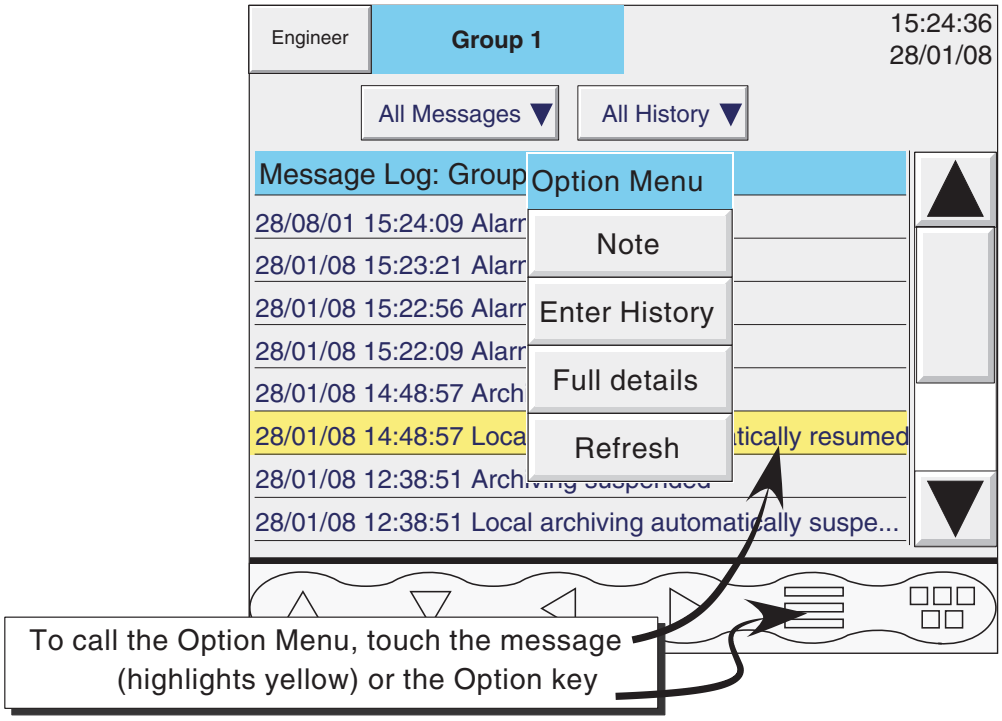


Figure 3.1.4g Message Log options menu

Note	See section 3.5.
Enter history	Operating the Enter History key causes the recorder to display that page of history which includes the highlighted message. See section 3.4.1 for details of trend history. When in Trend history mode, operating the Message Log key calls that message log page which contains those messages which are nearest the trend history cursor time.
Full details	If the highlighted message is wider than the display, the whole message can be displayed by operating the 'Full Details' key.
Refresh/Earlier messages../Later messages..	'Refresh' places (at the top of the screen), any messages, which have occurred since the Message Log page was last entered, or since the last 'Refresh'. If earlier or later messages have been selected, then 'Refresh' is replaced by 'Earlier messages..' or 'Later messages..' as appropriate, and operating the key calls the next or previously displayed group of 100 messages to the display respectively.

* See overleaf

3.1.4 SUMMARY MENU (Cont.)

Message Log option menu (Cont.)

* The option menu can also be called by touching the option key. In this case:

a. Enter History calls the current Trend History display, as described in section 3.4.1, and

b. Because no message is highlighted, the 'Full Details' key is not enabled,

Notes:

1 Selecting 'Enter History' whilst either 'Earlier Messages' or 'Later Messages' is highlighted calls the current History page.

2 If the Option Menu has 'timed out' leaving a message highlighted, and the option key is operated, then this is equivalent to reselecting the message.

REMOVE MEDIA

This key is provided to help ensure that any local memory storage device is removed only when it is 'safe' to do so.

Touching the key results in either an 'OK to remove archive media', or a 'DO NOT REMOVE Archive Media! message, as appropriate. See figure 3.1.4h

Caution

Removal of Compact Flash cards whilst archiving is taking place can lead to permanent, irreparable damage to the device, rendering it unusable.

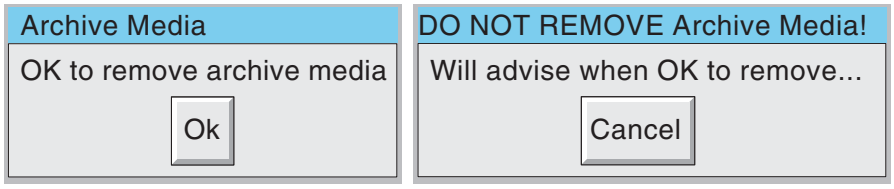


Figure 3.1.4h Remove archive media messages

3.2 NAVIGATION KEYS

Below the display screen are six printed keys which allow the user to perform various context-related tasks such as changing display mode (section 3.4), accessing the recorder configuration, archiving data etc. In addition to this set of keys, left and right arrow keys and open/close folder keys appear when relevant.

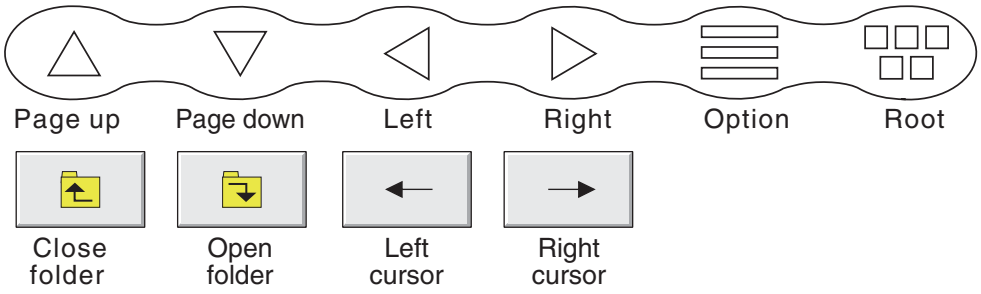


Figure 3.2 Navigation keys

3.2.1 Key functions

Page up	Used, as appropriate, to recall the previous (higher level) display page, to call the previous display mode and to scroll through previous text entries. Where relevant, the function of this key is mimicked by the 'Close folder' key.
Page down	Used, where appropriate, to call a further (lower level) display page, to call the next display mode and to scroll through previous text entries. Where relevant, the function of this key is mimicked by the 'Open folder' key.
Left arrow	Used to navigate backwards through a text string when editing or to select the previous channel whilst in configuration. Where relevant, the function of this key is mimicked by the 'Left cursor' key.
Right arrow	Used to navigate forwards through a text string when editing or to select the next channel whilst in configuration. Where relevant, the function of this key is mimicked by the 'Right cursor' key.
Option	Calls a pop-up Options menu allowing the user to carry out functions such as entering/quitting history, turning channel cycling on and off etc. according to context.
Root	Calls the 'Root Menu' as described below. To quit the Root menu, touch the root key again.

ROOT MENU KEYS

Home	Causes a return to the 'Home' page (vertical trend display) from any page in the recorder.
Operator	Causes the top level Operator page to appear. The appearance of this display is dictated by the security level that the recorder is set to, and by the access level of the user. As despatched from the factory, the recorder is in 'logged out' mode and the Operator page contains only 'Archive', 'Security' and 'System' keys. Further details appear in 'Access to configuration' below.
File	Allows the file system in that area of Flash memory that is accessible to the user, and the file system on any bulk storage device fitted, to be viewed. See section 5 for details.
Remove Media	This key is provided to help ensure that any local memory storage device is removed only when it is 'safe' to do so. Touching the key results in either an 'OK to remove archive media', or a 'DO NOT REMOVE Archive Media! message, as appropriate. For more details see section 3.1.4.
Go to View	Allows the user to select a display mode, as shown in figure 3.2.1. As an alternative, display modes can be scrolled-through using the up and down arrow navigation keys. Goto View also offers an alternative means of entry to the Alarm Summary page described in section 3.1.4, and also allows entry to the Message Log pages, described below.
Goto Group	Not used on this recorder model.

3.2.1 KEY FUNCTIONS (Cont.)

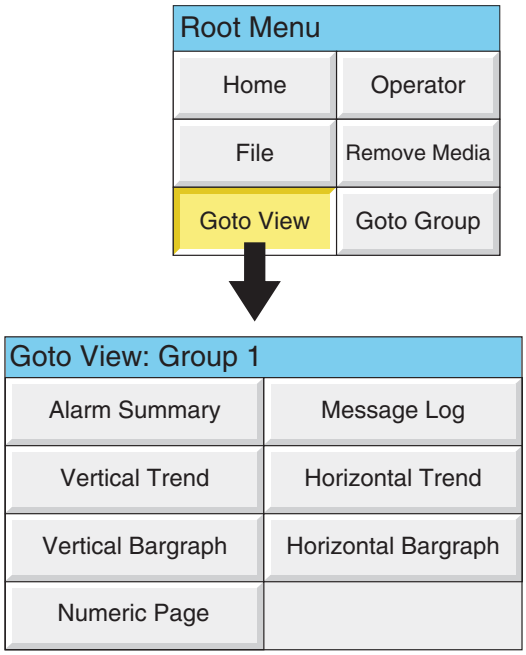


Figure 3.2.1 Root menu with Goto View sub menu

ALARM SUMMARY

The Root menu/Goto View/Alarm summary key calls the Alarm summary page to the screen. Alternatively, Alarm summary can be selected from the Summary menu. See section 3.1.4 for more details of the alarm summary page.

MESSAGE LOG

The Root menu/Goto View/Message log key calls the Message Log page for to the screen. Alternatively, Message Log can be selected from the Summary menu. See section 3.1.4 for full details of the message log.

3.3 FIRST SWITCH-ON

When power is applied the recorder initialises, and once this process is complete, the home page is displayed. It is unlikely that this will contain any useful information because the input channels will not, as yet, have been configured to suit the type of input signals being applied to them, as described in section 4.

Notes:

1 There is no on/off switch associated with the recorder.

2 Date, time and the message 'Power Up' are printed on the chart each time power is applied to the recorder, followed by a similar message giving 'Config Revision' and 'Security Revision' (always zero for this recorder model.

3 A red line is drawn across the width of the chart at power up

The recorder has four security levels as follows:

Logged out	No access to recorder configuration is possible. Only Archive, Login/security and the System 'About' functions can be accessed - via the root menu.
Operator	As 'Logged out', but alarms may be acknowledged.
Engineer	Accessed by entering '100' as the password (section 3.3.1, below). Full access to all recorder functions is available.
Service	Full access to all recorder functions and to areas of recorder memory for diagnostic purposes. For use only by Service Engineers.

3.3.1 Access to Configuration

1 As shown in figure 3.3.1a, once the recorder has initialised, touch the current access level key

2 Touch the 'Logged out' field and then touch 'Engineer' from the resulting picklist.

3 Touch the blank Password area to call the keyboard display (see figure 3.3.1b).

4 Touch <Numeric><1><0><0><OK> to enter the password '100'. The screen reverts to the 'Home' page.

5 Operation of the Root key followed by a touch on the Operator key calls the top level page allowing access to the Archive, Save/Restore, Config, Security, Network and System areas described in section 4 below.

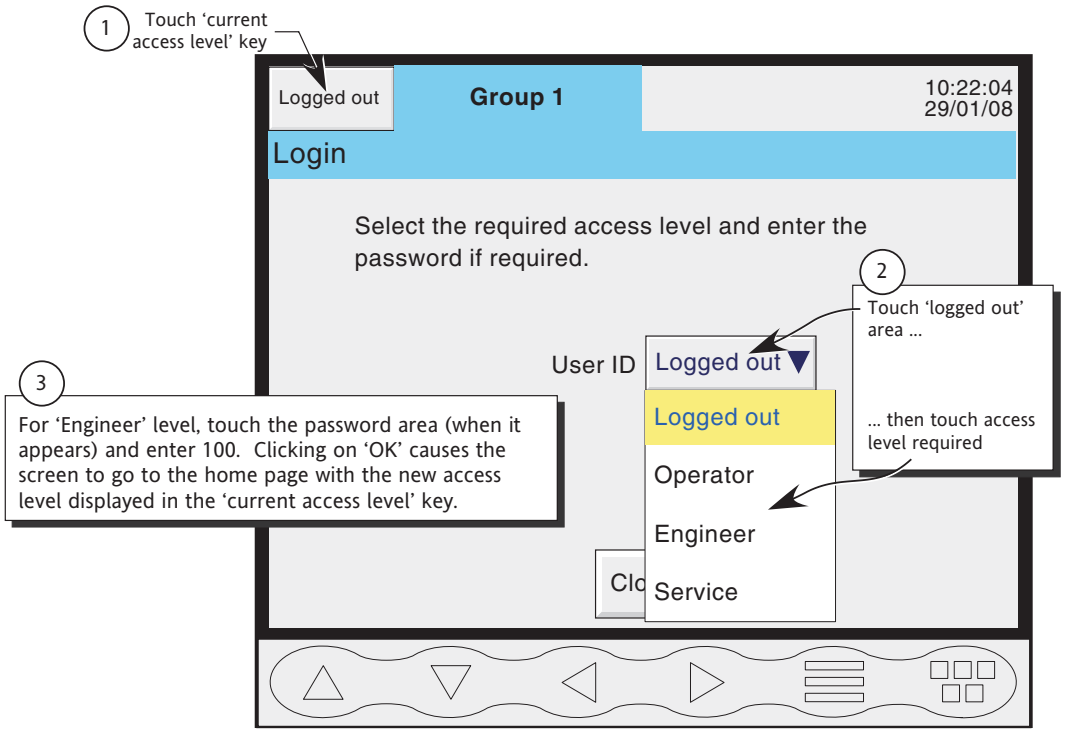


Figure 3.3.1a Access to configuration

Note:

The login screen, above, can also be called by operating the Root menu, then 'Operator' then 'Security', then 'Login'. In such a case, the screen reverts to the 'Operator' page rather than returning to the home page once login has been achieved.

3.3.1 ACCESS TO CONFIGURATION (Cont.)

TEXT STRING ENTRY

The keyboard which appears when the password area is touched is the same as that which appears when any non-numeric text string entry is required (e.g. channel descriptor). Figures 3.3.1b and 3.3.1c below are an attempt, within the limitations of the illustrating process, to depict the available keyboards and thus the available character set. Actual entry of the text string is by touching the relevant keys.

When editing existing text strings, the existing text string appears highlighted, and will be replaced in its entirety by the first character entered. To avoid this, the left arrow key* can be touched to 'unhighlight' it. The down and up arrow keys can be used to scroll through previously entered text strings.

Immediately below the keyboard are six keys with the functions listed below. When active, the background colour changes to yellow for as long as the key is active.

Shift*	Once the shift key has been pressed, the next-entered letter appears as a capital; subsequent letters are in lower case.
Caps*	When pressed, all subsequent letters appear as capital letters until the Caps key is operated again
BSpc	This backspace key deletes character to the left of the cursor.
Ovr	If selected, the next-entered character replaces (overwrites) the existing character to the right of the cursor position. If not selected, the next-entered character in inserted into the existing text string at the cursor position.
Ok	Used to save the new text string and to return to the page from which the keyboard was called.
Cancel	Causes a return to the page from which the keyboard was called without saving the new string.

*Notes

1. The character on each display key is always a capital letter, whether or not the actual character being entered is in capitals or lower case.
2. The cursor keys mimic the function of the left and right arrow Navigation keys.
3. As an alternative, text may be entered using a suitable keyboard connected via the USB port behind the access flap.

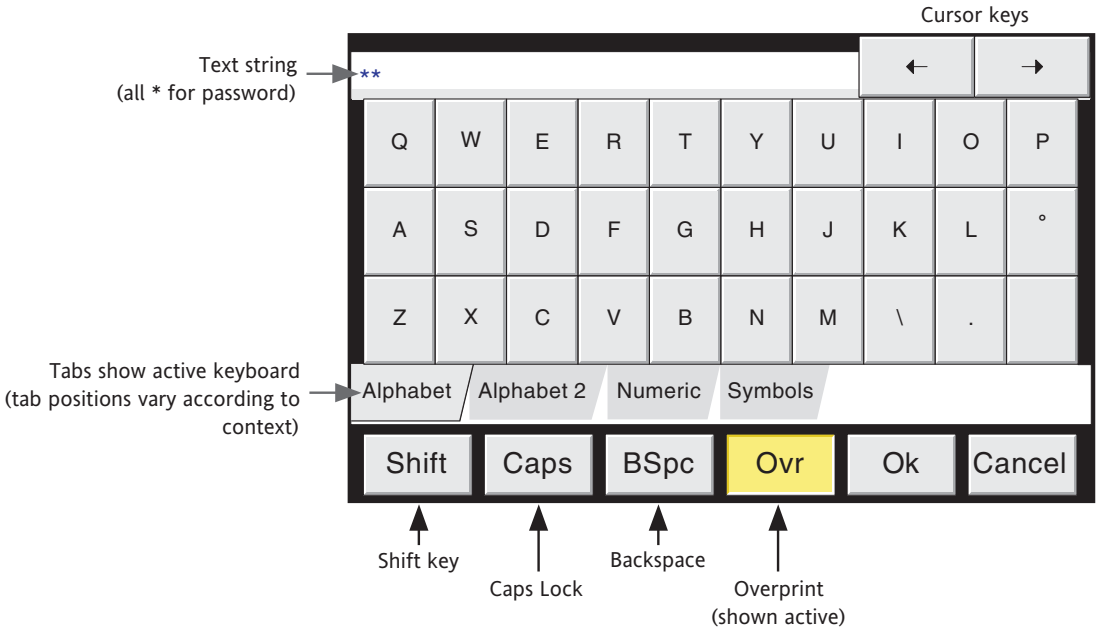


Figure 3.3.1b Alphabet 1 keyboard

3.3.1 ACCESS TO CONFIGURATION (Cont.)

TEXT STRING ENTRY (CONT.)

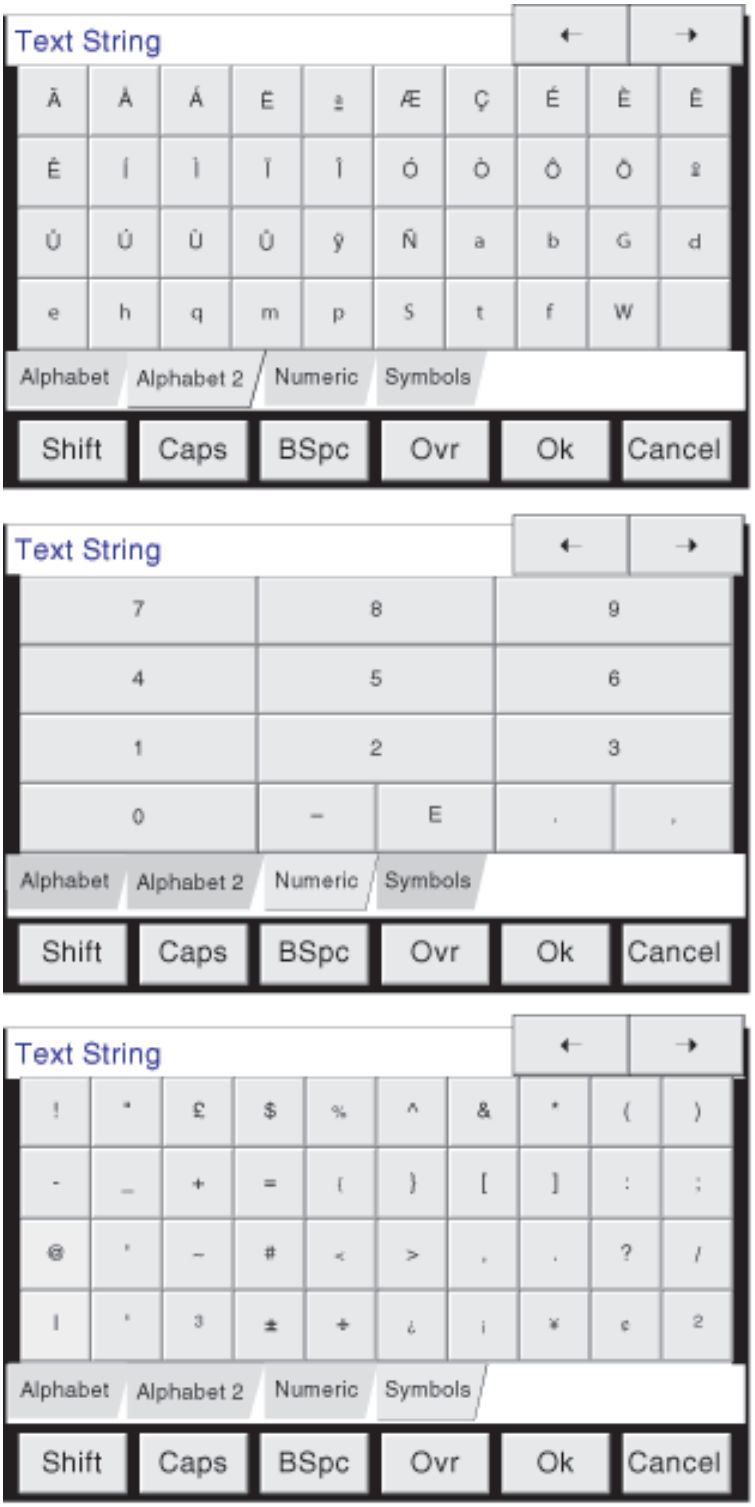


Figure 3.3.1c Alternative keyboards

3.4 DISPLAY MODES

The display modes described below allow the currently displayed group's process values (channels, totalisers etc.- known collectively as points) to be displayed as vertical or horizontal 'chart' traces, as vertical or horizontal bargraphs or as numeric values. The various display modes are cycled-through using the up/down arrow keys, or a specific mode (or view) can be selected from the Root Menu 'Goto View' key. The Home key returns the user to the Vertical Trend display from anywhere in the Operator or Configuration pages in the recorder.

TREND HISTORY

Trend history, allows the user to review group history. The maximum amount that can be reviewed depends on a number of factors, including how many points are configured, how rapidly the traces are changing and so on. At a recording rate of 20 mm/hour (see group configuration - section 4.3.2), with all channels configured, a minimum of 30 day's worth of traces is available for viewing, provided that the group contents are not re-configured during this period (in which case, the history starts at the end of the re-configuration). The amount of trace visible on the screen depends on the recording rate, the higher the rate, the less trace is visible at any one time.

Notes:

1. Trend history mode is available only for groups with 'Recording Enable' enabled (Group configuration - section 4.3.2), and only for vertical, horizontal or circular trend dispplay modes.
2. Trend history mode is vertical for vertical and horizontal for horizontal trend mode.
3. Channel cycling is inhibited in trend history mode. To increment the current channel, touch the faceplate.
4. Group faceplates are not displayed in trend history mode.
5. Operation of the 'Root/Goto View/Message Log' key (section 3.2.1), when in history mode, displays a message log page containing messages which occurred at or near the selected cursor time.

To enter trend history mode, the option key can be used (as shown for vertical trend mode in figure 3.4.1b), or the trace area of the screen can be continuously touched until the screen blanks prior to re-drawing. A 'Preparing History, please wait' message appears whilst the re-drawing calculation is taking place. Although tracing stops whilst trace history mode is active, no data is lost. Process Variable values are saved in the recorder memory. Alarms are still scanned-for and any associated action taken.

The trend history display is similar to the real-time trend display, but with a dark background and with the addition of a slider control and arrow keys for selecting that part of trend history which is to be displayed. The controls are used as follows:

1. Touching an arrow key causes the trace history to move an incremental amount.
2. Holding an arrow key continuously, causes continuous movement.
3. Touching and dragging the slider, whilst observing the time/date display, allows the user to select the section of history exactly. Touching the slider bar either side of the slider causes a page shift in the relevant direction. The Page up and Page down keys can also be used to provide this function.

On first entry to trend history mode, the channel value and the time and date shown in the faceplate are those at the top (vertical trend) or right-hand (horizontal trend) edge of the chart. Touching the screen causes a cursor to appear at point of screen contact. This cursor can be touched and dragged to provide a reference point on the current trace. The displayed value date and time refer to the cursor intersection with the current channel. To return to real-time trending, the Option key is operated, followed by 'Exit History'.

3.4 DISPLAY MODES (Cont.)

TIME CHANGE RECORDS

For vertical and horizontal trend modes a line is drawn across the width of the chart whenever a time discontinuity in the record occurs. These lines disappear if a configuration change is made which causes group history to be lost (such as adding a channel to a group).

Red line	A red line is drawn on the trend history chart at power up.
Blue line	A blue line indicates that recording has been disabled/enabled in Group Configuration (section 4.3.2), or by a recording job (section 4.7.9).
Green line	A green line appears if there has been a time change as a result of a clock job (section 4.7.6), an SNTP synchronisation or by the operator physically changing the recorder time.

Note: Changes from standard time to daylight saving time and back again are not 'green lined' in this way.

3.4.1 Vertical Trend display

This display (figure 3.4.1b) shows each point in the display group as though it were being traced on a white chart.

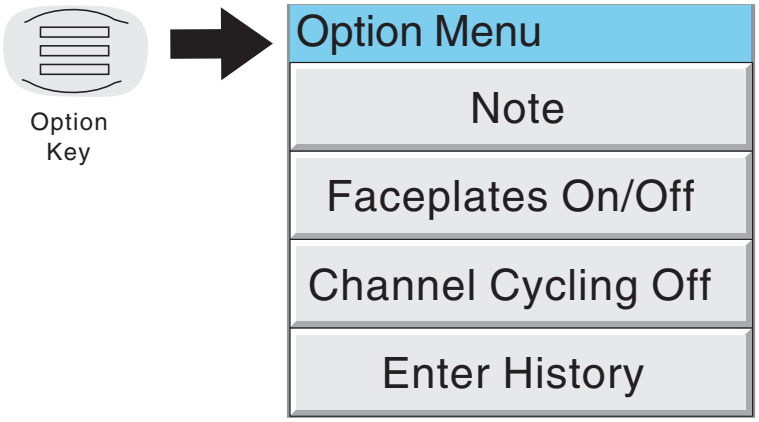
One of the channels is said to be the 'current' or 'scale' channel. This channel is identified by its diamond shaped pen icon and by its descriptor, digital value and scale being displayed on a 'faceplate' across the full width of the screen, above the chart. If a channel is included in the display group but its status is 'not good' for some reason, then its pen icon is hollow.

Faceplates for all the group channels can be displayed, by using the Faceplates On/Off key in the Option menu. If selected 'On', faceplates (showing colour, descriptor, digital value and units) for all the group's channels appear either above the current channel's faceplate or, if there are too many to fit across the screen, at the right hand edge of the screen. When necessary, a slider bar appears to allow further (hidden) faceplates to be viewed.

Each channel in the display group becomes the 'current' channel, in turn, for approximately 10 seconds – i.e. the channels are cycled-through, starting with the lowest numbered channel. Once the final channel in the group has been displayed for 10 seconds, the lowest numbered channel is returned to and the sequence repeats. This scrolling process can be enabled or disabled using the Channel Cycling On (Off) key in the Option menu.

To select a particular channel to be the current channel, the relevant pen icon can be touched. To cycle through the channels manually, the faceplate area is touched repeatedly until the required channel is reached.

The Horizontal Trend display can be called using the down arrow key. Alternatively, any enabled display mode can be selected using the Root Menu, 'Goto View' key.



See section 3.5 for 'Operator Notes' details

Figure 3.4.1a Option Menu (Typical)

3.4.1 VERTICAL TREND DISPLAY (Cont.)

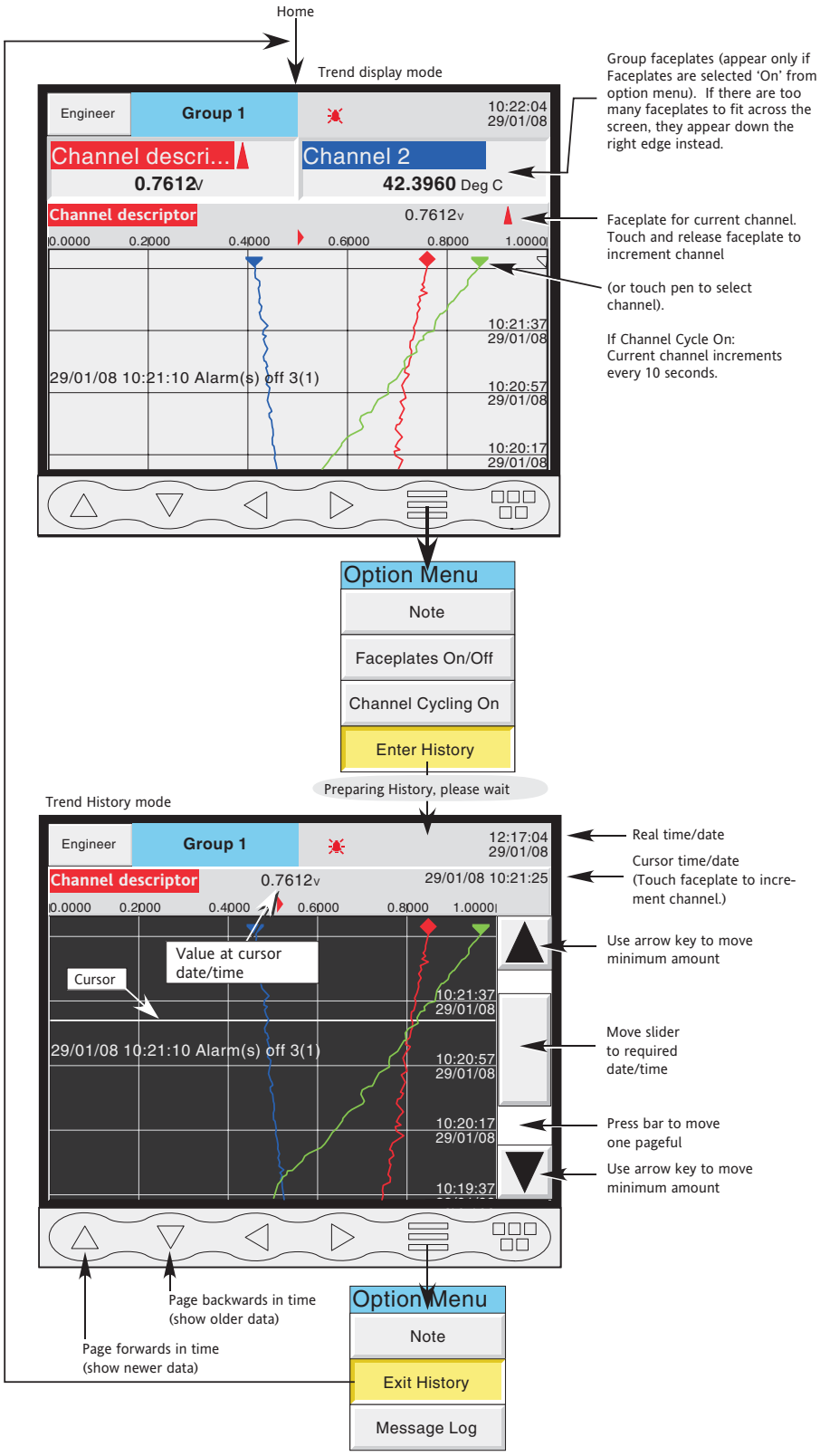


Figure 3.4.1b Trend display mode and trend history mode

3.4.2 Horizontal Trend display

Entered from the Vertical Trend display by means of the down arrow key, or selected via the Root Menu 'Goto View' key, this display mode (figure 3.4.2a) is similar to the Vertical Trend display described in section 3.4.1 above, except that the traces are produced horizontally rather than vertically.

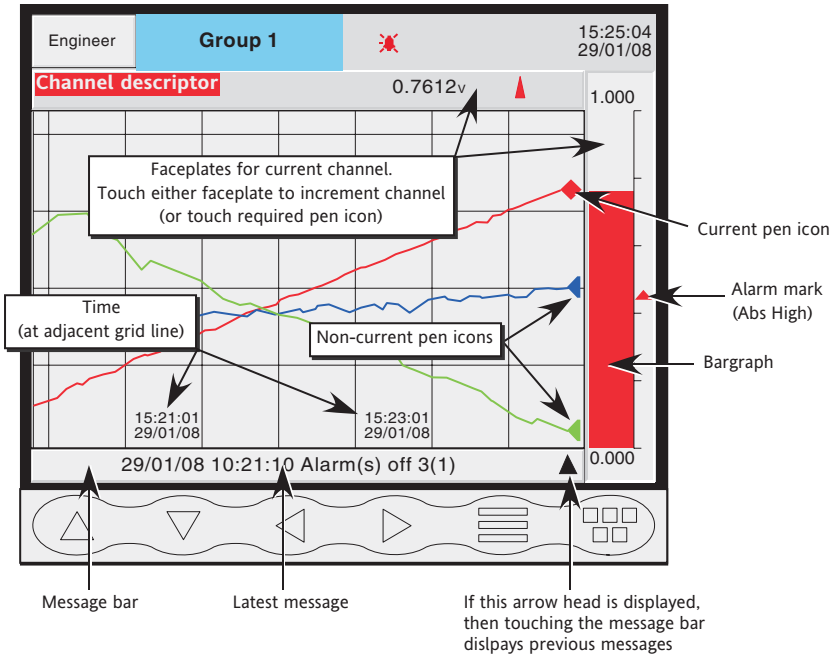


Figure 3.4.2a Horizontal Trend Display

One of the channels is defined as being the 'current' or 'scale' channel and this is identified on the chart by its pen icon being diamond shaped rather than triangular as for non-current channels. If a channel is included in the display group, but its status is 'not good' for some reason, then its pen icon is hollow. Each channel in the display group becomes the 'current' channel, in turn, for approximately 10 seconds – i.e. the channels are cycled-through, starting with the lowest numbered channel. Once the final channel in the group has been displayed for 10 seconds, the lowest numbered channel is returned to and the sequence repeats. This scrolling process can be stopped using the Channel Cycling key in the Option menu.

There are two faceplates associated with this display mode, one above the 'chart', showing the current channel's descriptor and its digital value; the other - to the right of the 'chart' - showing a bargraph representation of the current channel's value, together with a scale showing the low and high range values for the channel. Touching either of these faceplates causes the current channel number to increment. To select a particular channel to be the current channel, the relevant pen icon can be touched. In either case, the bargraph and the background colour of the channel descriptor take the colour of the new current channel.

Touching the trace for a few seconds, or using the Option key then 'Enter History' calls the Horizontal trend history page. See section 3.4, above for more details.

Time and date are printed on the 'chart' immediately to the right of grid lines, and it is to these grid lines that the printed time and date relate.

3.4.2 HORIZONTAL TREND MODE (Cont.)

Below the 'chart' is a message bar, containing the latest message. If there is more than one message, an arrow head icon appears near the right-hand end of the message bar. If this arrow head appears, then touching the message bar calls a pop-up box (figure 3.4.2b) which displays the latest messages. If there are more messages than can be displayed in the box, a slider control appears, which can be used to access previous messages, up to a total of 60 messages. Further messages, cause the oldest messages to be discarded to keep the total to 60.

Note: At power-up, only those messages which occurred within the 'time width' of the page are displayed

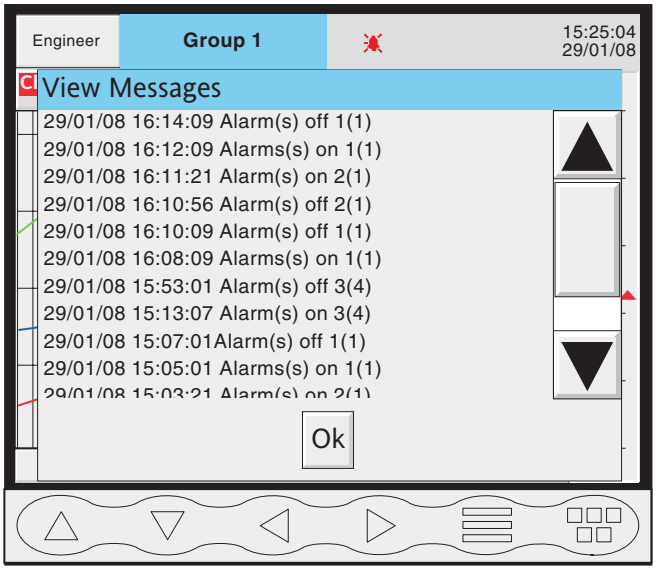


Figure 3.4.2b Horizontal Trend mode message dialogue box

The vertical bargraph mode can be called by using the down arrow key. Alternatively, a new display mode can be selected using the Root Menu, 'Goto View' key.

3.4.3 Vertical bargraph

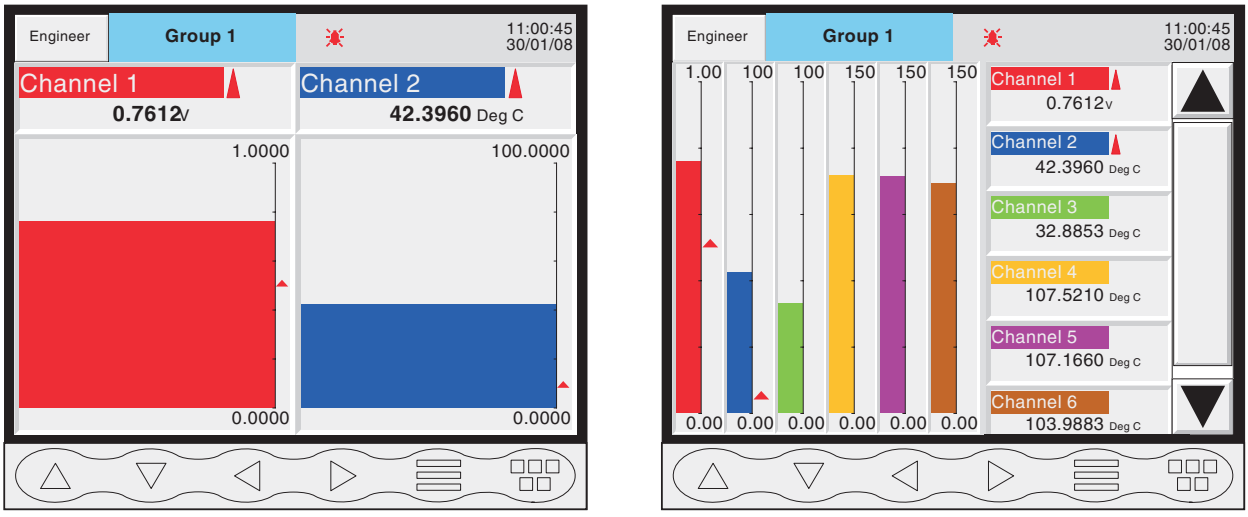
Entered from Horizontal Trend mode by means of the down arrow key, or selected from the Root Menu 'Goto View' key, this display mode shows the Process Variable (PV) values as vertical bars with faceplates containing digital values and alarm data. For one or two channels, the faceplates appear above the bars. For more channels, the faceplates appear at the right hand edge of the display

Operation of the option key calls the Option menu display for this display page, allowing faceplates to be selected on or off. This feature is available for vertical trend and vertical bargraph displays only.

To call the horizontal bargraph display mode, use the down arrow key. Alternatively, a display mode can be selected using the Root Menu, 'Goto View' key.

Trend history mode is not available from this display mode.

As the number of PVs increases, the bars get narrower. As the bars get narrower, so the scale values become truncated as shown in figure 3.4.3. The bars have a set minimum width, and if the total number of points in the group cannot be displayed within the width of the screen, a horizontal scroll bar appears, allowing 'hidden' bars to be viewed. Similarly, the faceplates reduce in height to a minimum readable height. If there are more point faceplates than can be accommodated within the height of the screen, a vertical scroll bar appears, as shown in the figure, allowing hidden faceplates to be displayed as required.



Faceplates above (one or two points)

Faceplates to the side (three or more points)

Figure 3.4.3 Vertical bargraph displays

3.4.4 Horizontal bargraph

Entered from Vertical bargraph by means of the down arrow key, or selected using the Root Menu 'Goto View' key, this display mode shows the Process Variable (PV) values as horizontal bars with digital values and alarm data displayed, as shown in figure 3.4.4

Note The maximum number of points that can be displayed is 6. If more than six points are enabled scroll bar appears allowing currently hidden channels to be accessed.

Trend history mode is not available from this display mode.

To call numeric display mode, use the down arrow key. Alternatively, the display mode can be selected using the Root Menu, 'Goto View' key.

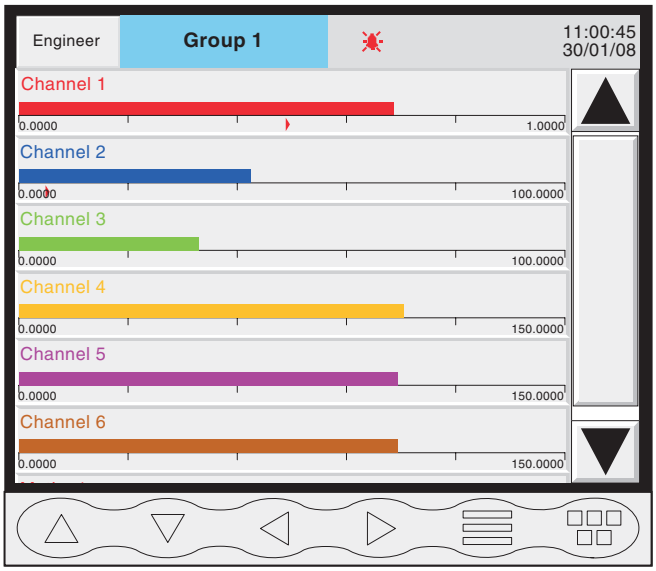


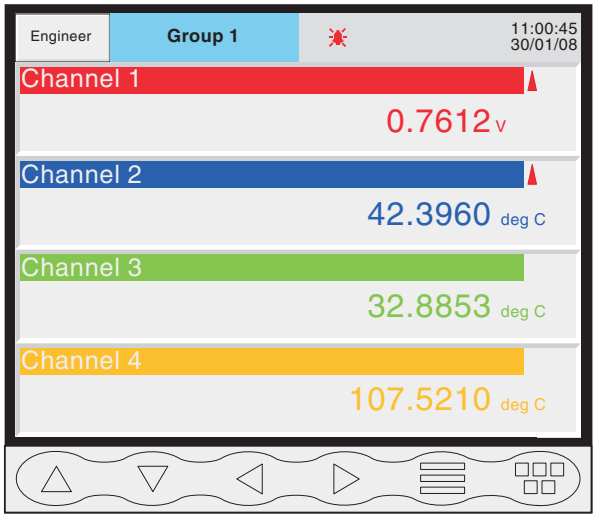
Figure 3.4.4 Horizontal bargraph displays

3.4.5 Numeric display

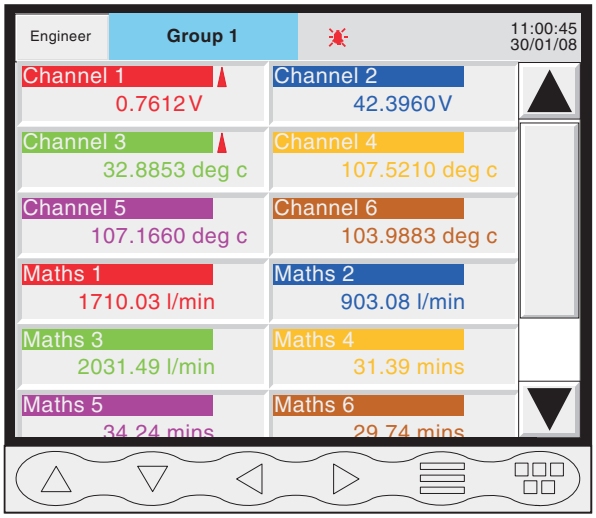
Entered from Horizontal bargraph mode by means of the down arrow key, or selected using the Root Menu 'Goto View' key, this display mode shows the Process Variable (PV) values as digital values. The format (which is automatically selected) is based on the number of channels in the display group. Figure 3.4.5 shows typical examples of the one and two column versions of this display mode respectively. Within each version, the process variable display areas expand or contract to fill the screen. The display for 5 to 10 points is similar to that shown for 'More than 10 points', below, but without the scroll bar.

Trend history mode is not available from this display mode.

Operation of the down arrow key returns to the Vertical Trend Display mode described in section 3.4.1 above. Alternatively, a display mode can be selected using the Root Menu, 'Goto View' key.



One to four points



More than 10 points

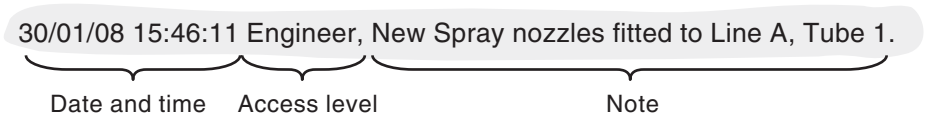
Figure 3.4.5 Numeric display mode examples

3.5 OPERATOR NOTES

Note: Operator notes should not be confused with similar messages, (described in section 4.3.6), which appear as a result of job action.

It is possible for the user to enter a note, of up to 120 characters, at any time, from any display page (not from configuration pages). Each note is associated with the current display group and becomes a part of that group's history. The notes appear on vertical and horizontal trend displays only, although they can be entered in any display mode.

The note appears on the chart and in the Message Log, preceded by the date, time and login level, as shown in the first example below.



To enter a Note:

1. Press the Option key, then the 'Note' key
2. Touch the note area of the resulting pop-up display (see note below).
3. Enter the required text of up to 120 characters (spaces are also counted as characters). Press Ok when finished.
4. View the note and
   a. press the Ok button to enter the note OR
   b. re-touch the text area to edit the note OR
   c. press the Cancel key to quit note entry.

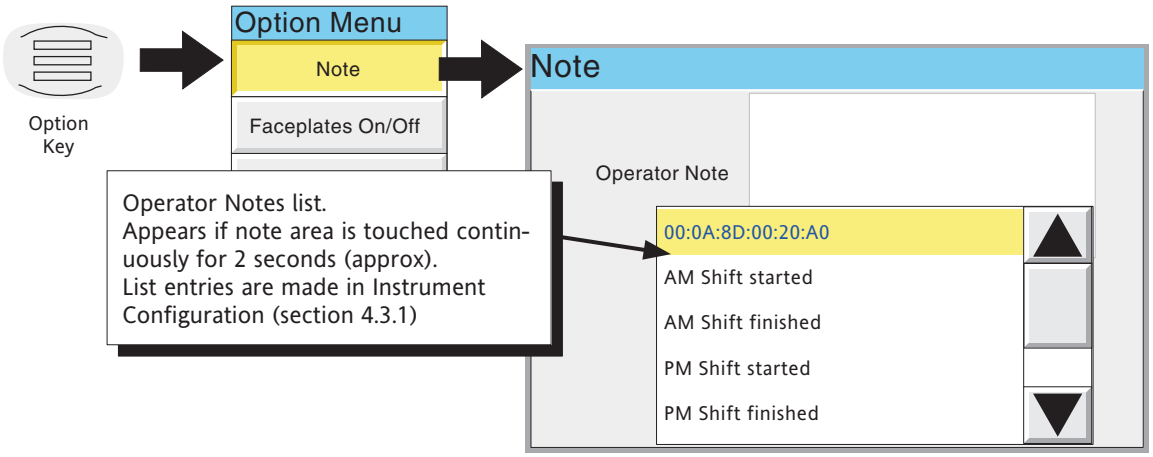


Figure 3.5 Access to Note entry page

Note: Touching the note area continuously for two seconds or more, causes a list of pre-defined messages to appear. Touching one of these messages selects it as the operator note, which can then be edited in the normal way (if required) before the OK key is operated. There are a maximum of 13 pre-defined messages, 12 of which are user editable in the Configuration/instrument menu (section 4.3.1), the 13th being the non-editable MAC address of the recorder.

4 SETTING UP THE RECORDER

As described in the 'Access to Configuration' (section 3.3.1) above, the setting-up of the recorder is divided into the following areas:

Archive	Section 4.1 - Allows manual archiving of data to a memory device or to a remote host (FTP transfer).
Save/R..	Section 4.2 - Allows new configurations to be created and saved, and saved configurations to be 'restored'. Save/Restore also allows the importing and exporting of User Linearisation Tables and, if the relevant options are fitted, User Screens and Printer Drivers.
Config	Section 4.3 - This is the major channel/alarm option etc. area of configuration.
Security	Section 4.4 - Allows the user to log in.
Network	Section 4.5 - This area sets up the IP address/host names etc. used in FTP transfer, Bridge and SNTP applications.
System	Section 4.6 - Allows a) Time and date to be set (Clock). b) Language, date/time format, time zone, and daylight saving start and finish dates to be set (Locale). c) Software upgrades to be carried out (Upgrade). d) Input channels to be adjusted for errors in transducer inputs (Input Adjust). e) A Network diagnostics page to be displayed (Ethernet diagnostics). f) Configuration items (e.g. input channels) to be copied, to speed up configuration (Copy). g) Search criteria to be entered to allow the user to locate trigger sources for a specific job (Job search). hj) Details of the hardware and software associated with the recorder to be displayed (About).

Note: In all the following descriptions, if a change is made to a menu item, then the item text changes to red, until it is 'applied'

4.1 ARCHIVE

Note: The archiving functions described below can also be initiated by job action - see section 4.7.11.

4.1.1 Local Archive

Caution

Removal of the memory device whilst archiving is in progress causes irreparable damage to the filing structure on the device, rendering it unusable. For this reason, archiving should be suspended before the device is removed. It is strongly recommended that the 'Remove Media' facility described in section 3.1.4 (Summary menu) be used to ensure that it is safe to remove the memory device.

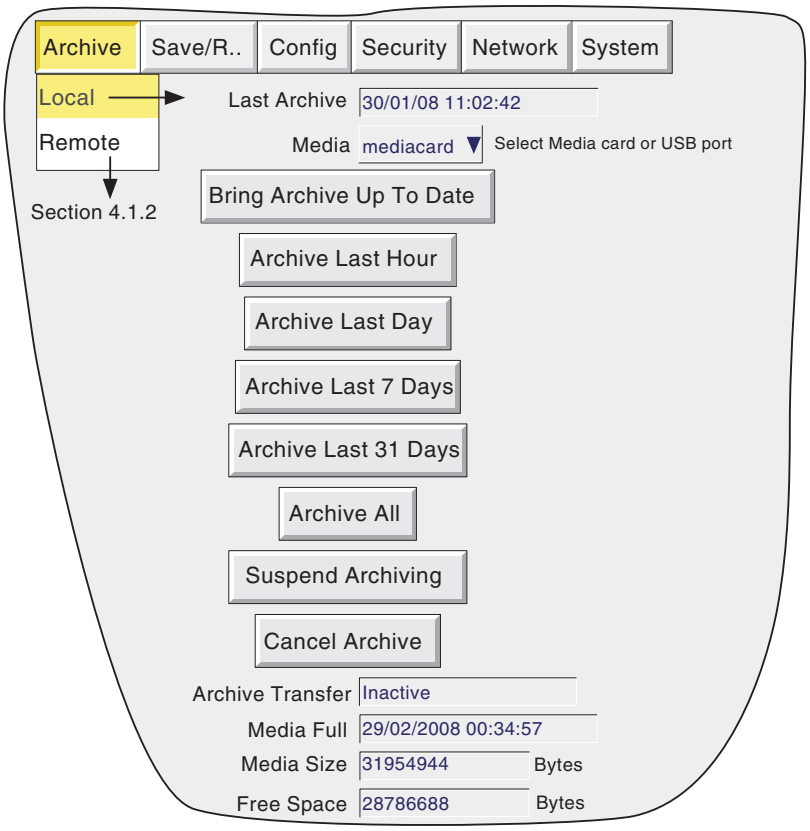


Figure 4.1.1 Local archive configuration

Local archive allows the user to initiate data transfer to the device defined in the 'Media' picklist if 'Archive to Media' is enabled (Group configuration - section 4.3.2). Archiving is initiated by touching the relevant archive period key (e.g. Last Day'). The memory device can be selected as 'mediacard' (the integral Compact Flash or SD card), or a USB port can be selected if, for example, a memory stick is to be the destination device. USB-front is located behind the flap below the screen. USB 1 and USB 2 ports are not available for this recorder model.

Archiving starts as soon as the selection is made, and cannot be stopped until completed, unless the Cancel Archive key is operated, in which case the archive will be stopped after a confirmatory message has been responded to. The Cancel/Suspend key is active only for 'Engineer level logins.

4.1.1 LOCAL ARCHIVE (Cont.)

BRING ARCHIVE UP TO DATE

This causes the recorder to archive all history files created since the last manual or automatic (section 4.3.4) archive.

ARCHIVE ALL

This causes the recorder to archive all its history files.

If the memory device becomes full before archiving is complete, archiving pauses and a pop-up request appears, asking for a replacement. If this request is not responded to within 10 minutes of its appearance, archiving is aborted.

Unattended archiving can be paused by the user (e.g. to change media without losing data) by operating the 'Suspend Archiving' / 'Resume Archiving' button. Any archiving in progress is allowed to complete before the 'Suspend Archiving' request takes effect. Transfer activity is indicated in the 'Archive transfer' window.

Below the selection buttons are a number of status windows relating to the selected memory device. 'Media Full' is an estimate, based on the current configuration, of when the memory device will become full. The meanings of the 'Media Size' and 'Free Space' values are self evident.

If automatic archiving is active (section 4.3.4), then automatic and manual archives will operate on a first come-first served basis. Some files will be saved twice in such a circumstance, the later archive's files over-writing any earlier archive's files which have the same name.

4.1.2 Remote archiving (FTP transfer)

This allows archiving of recorder files, if 'Archive via FTP' is enabled, to a remote computer, connected (using the RJ45 telephone type connector at the rear of the recorder) either directly, or via a network . 'Archive via FTP' is enabled/disabled as part of Group configuration - section 4.3.2.

In order to carry out a successful transfer, details of the remote host must be entered in the Archive section of the 'Config' menu (section 4.3.4).

Note: An FTP server must be running on the remote host.

Figure 4.1.2 shows the menu for remote archiving. The Archive last hour/day etc. keys allow the user to determine which files are to be archived. Selection of 'Bring Archive Up To Date' causes the recorder to select whichever of the Last Hour/Last Day etc. categories is appropriate in order to bring the archive up to date. The 'Last Archive' window shows the time and date of the previous archive. The Archive Transfer window shows archive status as 'Active' or 'Inactive'.

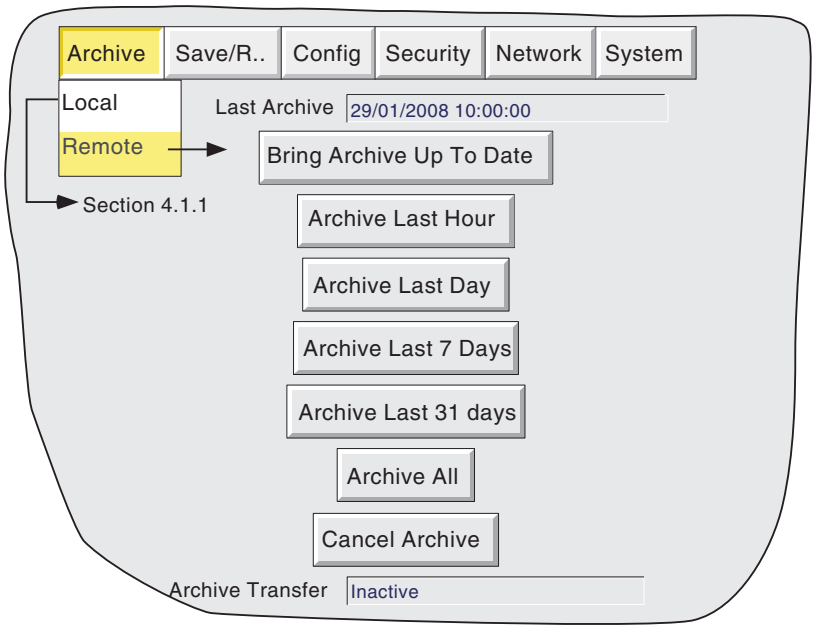


Figure 4.1.2 Remote archive strategy configuration

When connecting, the User Name is 'Engineer'. the password is 100. The IP address is found by looking in the Network/Address area (section 4.5.1), and the instrument identifier is to be found in the Config,,,/Instrument area (section 4.3.1).

Notes:

1. When accessing files using Microsoft® Internet Explorer, the address (URL) field can be in one of two forms:
   a ftp://<instrument IP address>. This allows the user to log in as the anonymous user (if the instrument has any account with 'Remote user name' set to 'Anonymous' and a blank password).
   b ftp://<user name>:<password>@<instrument IP address> to log in as a specific user.
2. For IE5 users only: Microsoft® Internet Explorer displays, by default, history files only. To exit the history folder, either uncheck the Tools/Internet Options/Advanced/Browsing/"Enable folder view for FTP sites" option, or check the Tools/Internet Options/Advanced/Browsing/"Use Web based FTP" option.

4.2 SAVE / RESTORE

As shown in figure 4.2a, touching the 'Save/R..' key calls the picklist: Save, Restore, New and Text.

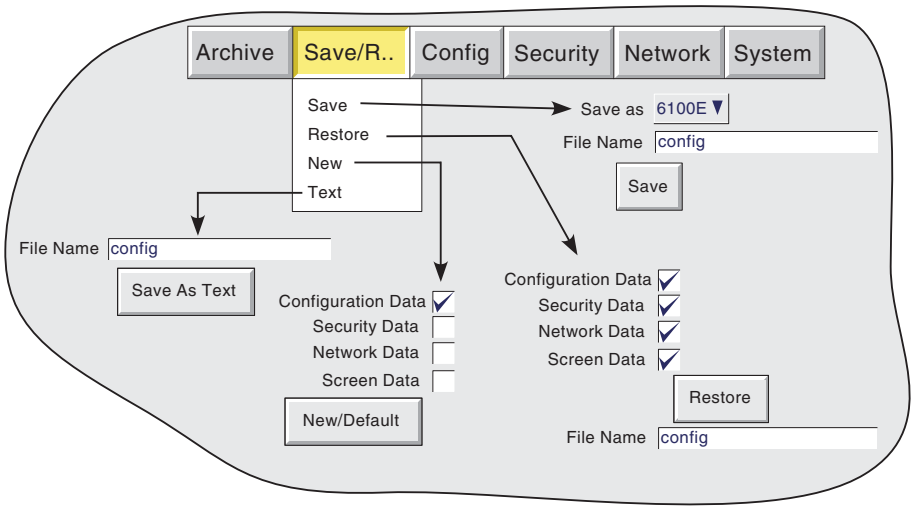


Figure 4.2a Save/Restore menu

Where a file name is required, then, if the displayed file name is suitable, operation of the 'Save' or 'Restore', key will initiate the action. If, instead, a file name has to be entered, this is carried out as follows:

Touching the filename window causes a pop-up menu to appear, giving a list of 'Volumes' in the Flash memory or on the memory device (if inserted). Figure 4.2b shows an imaginary Volume contents list, displayed by touching the name 'user', then operating the down arrow or 'open folder' key. (See section 5, below for more details). Once the correct folder is open, either select an existing file, or enter a new filename, by touching the FileName window and entering the name using the pop-up keyboard(s) as described in section 3.3.1 above. Operation of the Save/Restore key initiates the action.

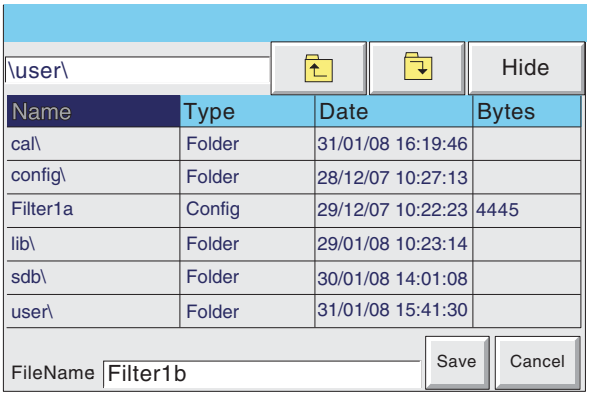


Figure 4.2b Typical volume contents page

4.2.1 Save

Touching this item allows the current configuration to be saved in the recorder's memory. Files saved in this way are not in a 'readable' format and are used only for archive /security purposes or for transfer to another, similar, recorder.

SAVE AS

This selection box allows a configuration to be saved, if required, in a format suitable for importing into previous recorder models. The default is always the current instrument.

4.2.2 Restore

Touching this item allows the user to select or type-in a previously saved configuration file name, which will then be used as the current configuration. Touching the 'Restore' key completes the operation. Check boxes allow one or both of Configuration Data, and Network data to be chosen for the restore function. Security data and Screen data are not applicable to this recorder model.

Note
If archiving is in progress when a 'Restore' is requested, the Restore operation will be delayed until the archive is complete (maybe several minutes). If required, the 'Cancel Archive' key (section 4.1 above) can be used to speed up the Restore process, at the cost of losing the archive data.

4.2.3 New

Touching this item causes the factory entered default configuration to be loaded for use, or for editing. Operation of the New/Default key completes the operation. Tick boxes allow one or both of Configuration Data, and Network data to be chosen for the restore default function; only those items which are ticked are replaced by default values. Security data and Screen data are not applicable to this recorder model.

4.2.4 Text

This is identical to the 'Save' function described above, but the configuration is saved in ASCII format, and can be transferred to a computer and read, printed etc. as required. It is not possible, using this means, to modify the configuration and then re-load it.

4.3 CONFIG KEY

Touching this key calls the top level configuration pick list:

Instrument,
Groups,
Channels,
Archive,
Events,
Messages,
Maths,
Totalisers,
Counters,
Timers.

Notes:

1. Figure 4.3b gives an overview of the configuration menus.
2. If an option is not fitted, it does not appear in the above list.

When making changes to the configuration the name of each changed parameter is displayed in red (instead of the normal black) until the 'Apply/Discard' key has been operated. For example, in channel configuration, if a thermocouple were to be changed from Type J to Type K, 'Lin Type' would appear in red, until the Apply key is operated.

Should an attempt be made to leave configuration with unsaved changes, a warning message appears, (Figure 4.3a) allowing the user to apply the changes, to discard the changes or to return to configuration (Cancel).

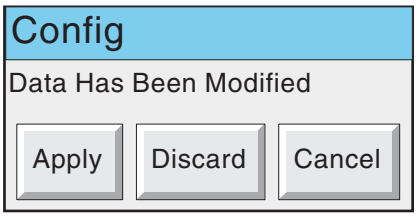


Figure 4.3a 'Data modified' warning

4.3 CONFIG KEY (Cont.)

Figure 4.3b Configuration menu overview sheet 1

4.3 CONFIG KEY (Cont.)

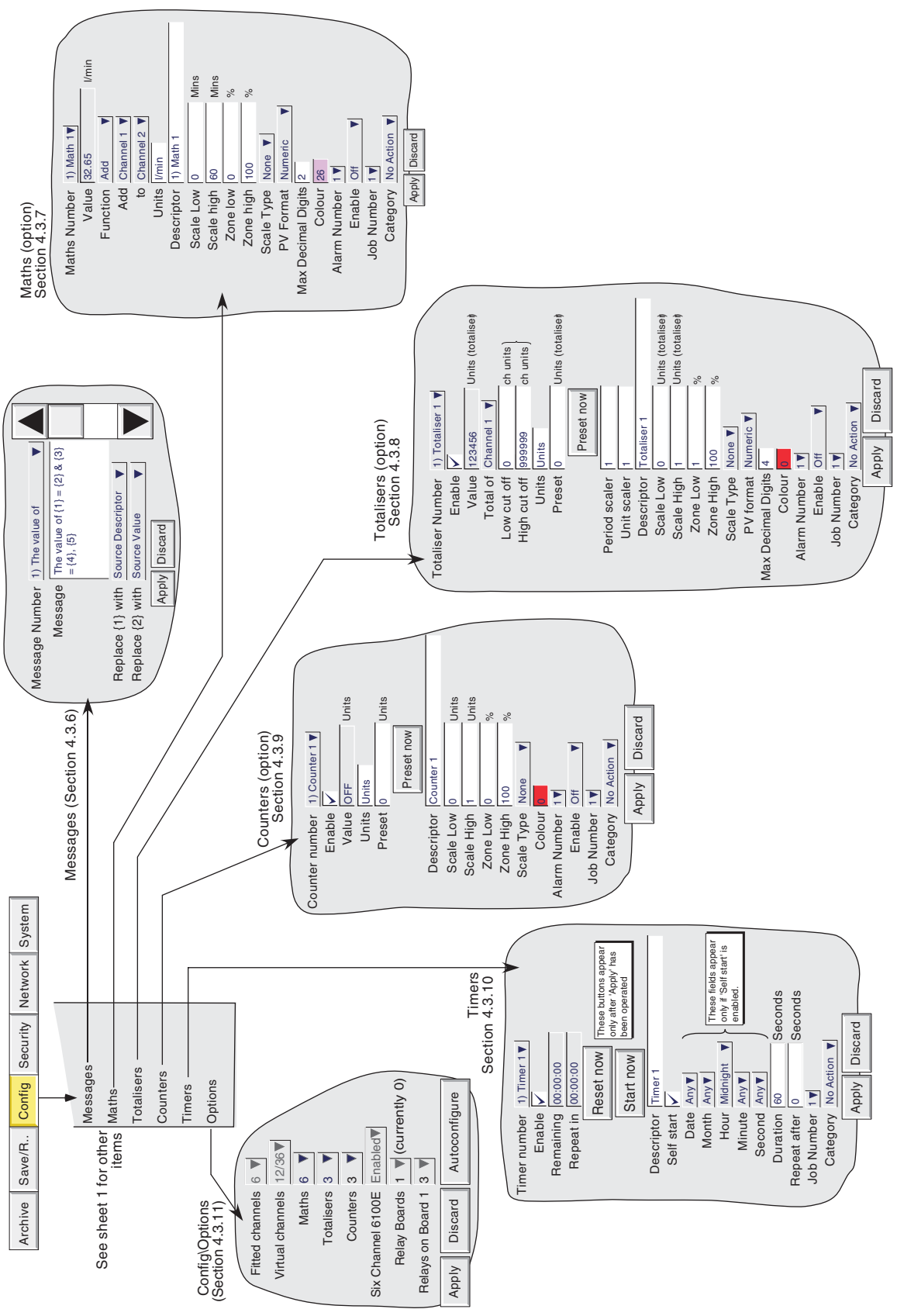


Figure 4.3b Configuration menu overview sheet 2

4.3.1 Instrument configuration

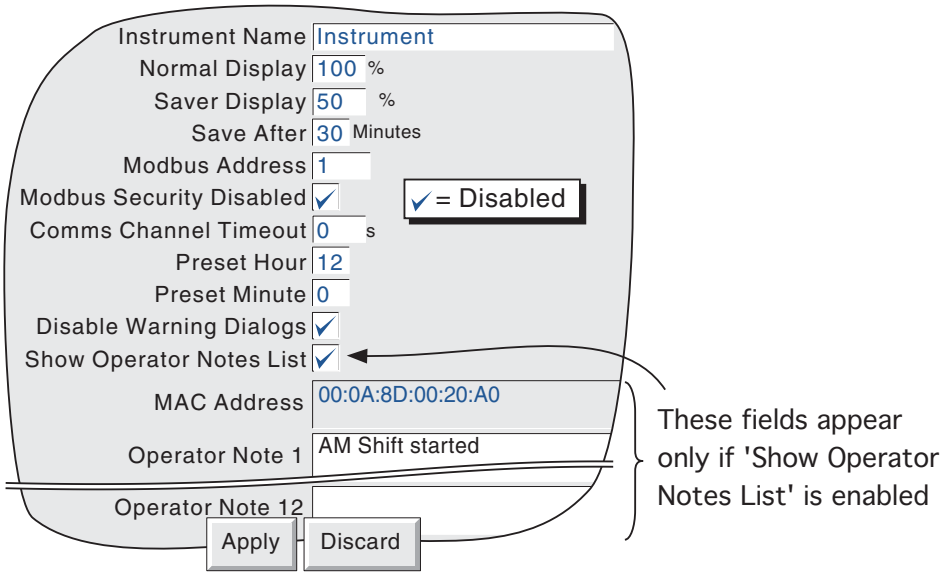


Figure 4.3.1 Instrument Configuration menu

INSTRUMENT NAME

Allows the entry of an alphanumeric name for the recorder, up to 20 characters long. See section 3.3.1 for text entry techniques.

NORMAL/SAVER DISPLAY

Allows normal and ‘saver’ display brightnesses to be defined. Defaults are Normal = 100%; Saver = 50%

SAVE AFTER

The number of minutes (between 1 and 99 inclusive), which are to elapse after a screen operation, before the screen brightness changes from ‘normal’ to ‘saver’. Default is 30 minutes.

MODBUS ADDRESS

Allows a Modbus address between 1 and 247 to be set up, for use when the instrument is acting as a Modbus slave.

MODBUS SECURITY DISABLED

When using MODBUS, it is possible, by ‘checking’ this field to allow a host computer to access the recorder without its first having to supply a valid User name and Password. This box must be checked if this unit is acting as a Modbus slave in order for the unit to be detected. Once communications have been established, Modbus security can be enabled, providing that the Slave’s Remote user name and password have been entered at the Master. See also section 6.2.4.

COMMS CHANNEL TIMEOUT

Allows a number of seconds (between 1 and 999) to be entered. If none of the channels set to ‘Comms’ is communicated with, within this period, an event source (Comms channel timeout) is set, and remains set until the next communication. An entry of 0 disables the time out.

4.3.1 INSTRUMENT CONFIGURATION (Cont.)

PRESET HOUR

Enter an hours number between 0 and 23 for use with Clock Job - Preset clock.

PRESET MINUTE

Enter a minutes number between 0 and 59 for use with Clock Job - Preset clock.

Note: See section 4.7 for a description of recorder jobs, and section 4.5.1 for further details of time synchronisation.

DISABLE WARNING DIALOGS

Checking this box prevents instrument alarm messages from appearing on the screen.

SHOW OPERATOR NOTES LIST

Enabling this field produces a list of 13 entries which can be used in Operator Notes. The first entry is the MAC address of the recorder and is not editable. The remaining 12 entries (of up to 60 characters each) are freely editable.

Any one of these predefined notes can be selected (as described in section 3.5) by touching the Operator Note area continuously for two seconds, then touching the required note from the picklist which appears. Once selected the predefined note can be edited before use, like a normal Operator Note. Such editing does not affect the original note entered here in Instrument Configuration.

4.3.2 Group configuration

Group configuration allows the user to define the following:

a Group trend speed/interval
b Group recording speed/interval
c Group descriptor
d Group content
e Chart grid divisions

The production of alarm messages and the saving of group data to Flash memory, to removable memory device and/or to remote computer (FTP transfer) can also be enabled / disabled from this menu.

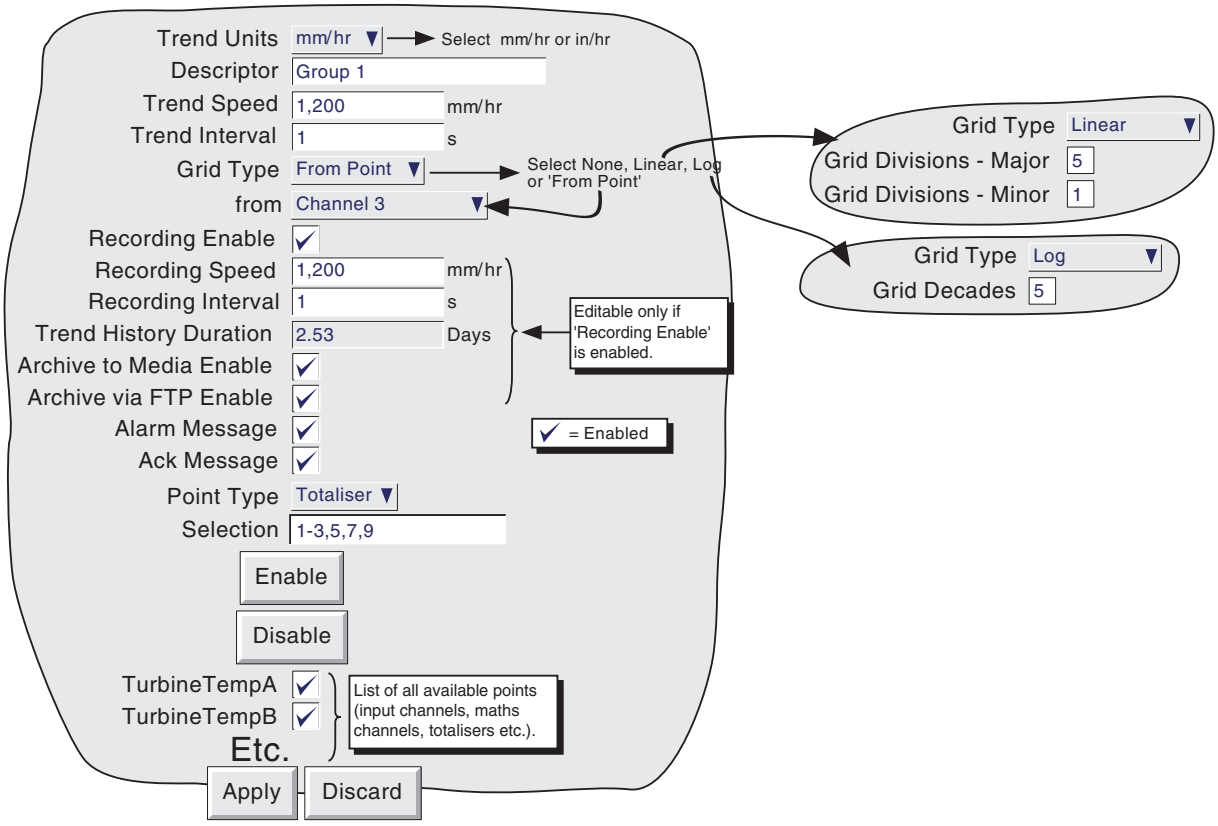


Figure 4.3.2a Group configuration menu

TREND UNITS

Allows mm/hr or inches per hour to be selected for the 'chart' speed. Automatically converts the trend speed field below.

DESCRIPTOR

Allows the group name to be edited. See section 3.3.1 for text entry techniques.

TREND SPEED/TREND INTERVAL

Allows the 'chart' speed to be selected either as mm or in per hour, or as an interval. Entering a value in one field automatically converts the value in the other field. A trend interval of N seconds is equivalent to 1200/N mm/hr chart speed; a chart speed of P mm/hr is equivalent to a trend interval of 1200/P seconds.

4.3.2 GROUP CONFIGURATION (Cont.)

GRID TYPE

Grid type allows the chart grid type to be defined for the group being configured. This is not necessarily related to channel scale (section 4.3.3), unless 'From point' is selected, when the grid matches the scale of the selected point.

NONE

No chart grid is traced.

LINEAR

The chart grid is linear, with the major and minor divisions defined by the fields Grid Divisions - Major and Minor, which appear if 'Linear' is selected as grid type. Figure 4.3.2b below, defines major and minor divisions.

LOG

The chart grid is logarithmic, with the number of decades being selected in the 'Grid Decades' field which appears if 'Log' is selected as Grid Type. Figure 4.3.2b gives an example.

Note: Minor divisions within each decade are shown only if 'Number of decades' ≤ 5.

FROM POINT

This allows the chart grid to be aligned with the scale of a particular 'point', selected in the 'from' field which appears if 'From Point' is selected as 'Grid Type'

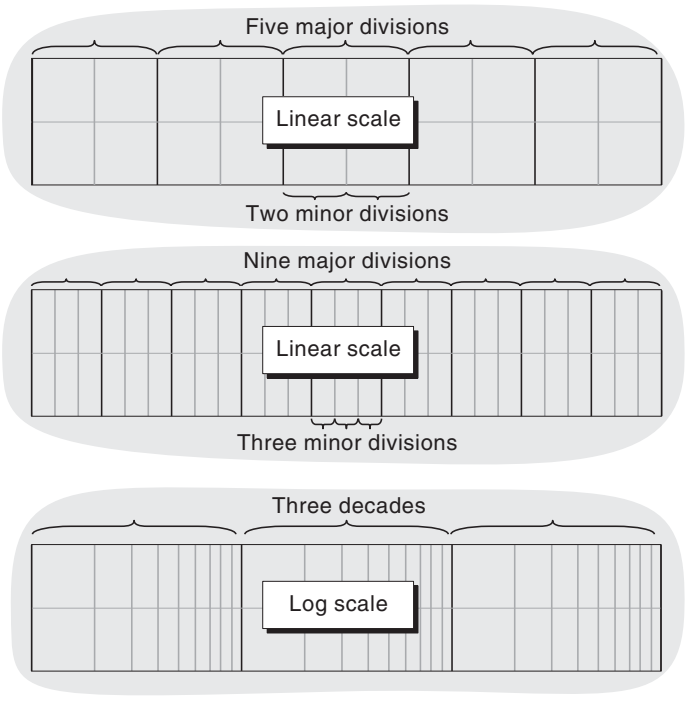


Figure 4.3.2b Typical chart grid definitions

4.3.2 GROUP CONFIGURATION (Cont.)

RECORDING ENABLE

This tick box allows the logging of the group's data to the flash memory to be enabled/disabled. When disabled:

a The recording speed/interval fields are not editable, and Trend History duration is set to zero.

b Display trends are present on the chart, but are not preserved when changing 'Views'.

c It is not possible to enter trace history if 'Recording Enable' is not selected.

Notes

1 A blue line is drawn across the chart, when recording is re-enabled to indicate a time change in the trace.

2 If a 'Recording enable' job (section 4.7.9) is set to act on a particular group, then the group will be recorded only whilst the job is active, and only if Recording is enabled for the group.

RECORDING SPEED/RECORDING INTERVAL

If recording is enabled, these fields are as for trend speed/interval but define the rate at which data is saved to Flash memory. This value also affects how much trace history appears per screen in trend history mode (section 3.4.1). If recording is not enabled, these fields are 'greyed' and not editable.

Note: If a large number of points is configured in the group, the total amount of data generated per iteration may exceed the amount that can be written to the internal FLASH memory in the time available. Such a situation may also arise if many messages are being generated. The recorder responds by reducing the recording speed, and a message 'Recording failed - internal overflow. Slowing recording interval of fastest group(s)' appears, to draw the user's attention to the situation.

TREND HISTORY DURATION

Gives an estimated time to fill the group's trend history area of the Flash memory. The calculation is based on the archive rate, the compression ratio, the flash size and on the exact nature of the data. (Rapidly changing values use more space than static/slowly changing values.)

If the group is 'empty', or if Recording is not enabled, the Trend History Duration is displayed as '0' Days.

ARCHIVE TO MEDIA ENABLE/ARCHIVE VIA FTP ENABLE

If recording is enabled, these tick boxes allow the archiving of this group's data to removable mass storage media and/or to a remote host (FTP) to be enabled or disabled. If recording is disabled, these fields cannot be edited.

ALARM MESSAGE

This box allows the printing of alarm on and off messages on the 'chart' to be enabled or disabled as required. Alarm messages appear on the trend display and in 'Review' in the form HH:MM:SS Alarm ON n/m and HH:MM:SS Alarm OFF n/m, where 'n' is the relevant channel number and 'm' is the alarm number (1 or 2).

ACK MESSAGE

This tick box allows the printing of alarm acknowledgement messages on the 'chart' to be enabled or disabled as required. Acknowledge messages appear on the trend display and in PC Review in the form HH:MM:SS.

ALARM ACKNOWLEDGE

Alarms are acknowledged as described in section 3.1.4.

4.3.2 GROUP CONFIGURATION (Cont.)

POINT TYPE/SELECTION

The 'Point Type' box, together with the 'Selection' box immediately below, offers a quick way of editing the contents of the group, as follows:

1. Select the type of point (Channel, Maths, Totaliser or Counter) to be edited from the Point Type drop down menu.
2. Enter the numbers of all the points of the selected type to be added or deleted, in the 'Selection' box. See notes below for further details.
3. Click on 'Enable' to add the selected points to the group contents, or on 'Disable' to remove them.
4. Repeat for other point types, as required.

Notes:

1. The status of all points not included in the selection box, remains unchanged.
2. Point numbers are entered individually, or as one or more ranges, separated by commas (if applicable). For example, an entry of '1-3,6,9-11' would cause points 1, 2, 3, 6, 9, 10 and 11 to be added or removed from the group contents. Only numeric characters, commas and hyphens (minus signs) are accepted. If any other character (including space(s)) is included in the list, the edit will fail, with a message 'Invalid Selection' appearing when the 'Enable' or 'Disable' key is operated..
3. Ranges must be complete: '1-' is not acceptable.
4. The group may contain any or all points.
5. If a point number is entered which is greater than the number of that point type fitted, then the selection is ignored. For example, if totalisers 1-3 are selected for deletion, and only 2 are enabled, then the range will be accepted, and totalisers 1 to 2 deleted from the group's contents.

Alternatively, the group's contents can be edited using the tick-boxes, to include the ticked items in, or to exclude non-ticked items from, the group, as required.

4.3.3 Channel/Alarm configuration

Figure 4.3.3a below, shows a typical configuration menu for an input channel. (For maths channels see section 4.3.7.) The actual fields that appear depend on what input type is selected, what linearisation type is selected, and so on.

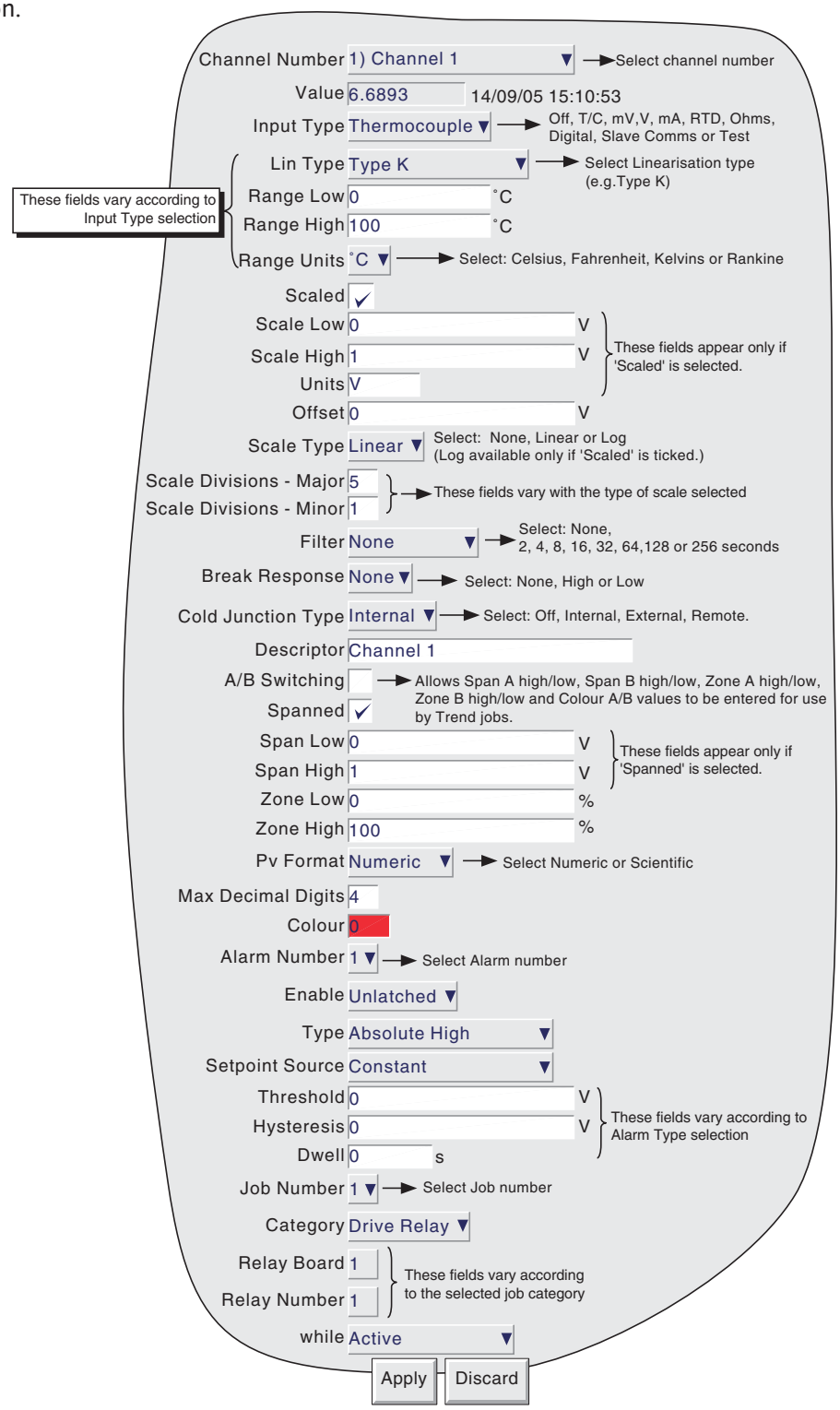


Figure 4.3.3a Channel/alarm configuration menu (typical)

Notes
1. Numeric values (e.g. 'input low') can be up to 10 characters including decimal point.
2. Refer to section 3.3.1 for numeric and text entry techniques.

4.3.3 CHANNEL/ALARM CONFIGURATION (Cont.)

Example: A type J thermocouple is used to measure a temperature range of 100 to 200 degrees Celsius. This thermocouple output is transmitted to the recorder by a 4 to 20 mA transmitter, for display as an efficiency value between 0 and 100%. In such a case, the following values would be set up:

Input type = milliamp
Input low = 4.0
Input high = 20.0
Shunt = 250 Ohms
Lin Type = Type J
Range Low = 100
Range High = 200
Range Units = °C
Scaled = ☑
Scale low = 0.0
Scale high = 100
Scale units = %

Note: The following description shows all possible fields. The recorder itself edits the list and shows only those fields appropriate to the setup so far. For example, the 'Shunt' field appears only for mA input type.

CHANNEL NUMBER

The current channel and its descriptor are displayed. Touching the window area allows another channel to be selected for configuration. Alternatively, the right and left arrow keys at the bottom of the screen can be used to increment and decrement, respectively, the channel number.

VALUE

Shows the current value of the channel, together with either 'Unadjusted' or the date and time of channel adjustment (section 4.6.4).

INPUT TYPE

Select thermocouple, millivolt, Volt, milliamp, RTD, Ohms, Digital (not channel 1, 7 etc.), Slave Comms or Test as input type. Slave Comms must be selected if the channel is to be written-to via Modbus. Master Comms must be selected if this channel is to read from another instrument.

LIN TYPE

The following linearisation tables are available as standard:

Linear, square root, $x^{3/2}$, $x^{5/2}$,
Thermocouple types B, C, D, E, G2, J, K, L, N, R, S, T, U, NiMo/NiCo, Platinel, Ni/NiMo, Pt20%Rh/Pt40%Rh
Resistance thermometer (RTD) types Cu10, Pt_{100}, Pt_{100}A, JPT_{100}, Pt_{1000}, Ni_{100},Ni_{120}, Cu_{53}.

For input ranges, accuracies etc. associated with the above thermocouple/RTD tables, see Annex A.

INPUT LOW

Enter the lowest value to be applied to the input terminals (e.g. 4.00).

INPUT HIGH

Enter the highest value to be applied across the input terminals (e.g. 20.00).

4.3.3 CHANNEL/ALARM CONFIGURATION (Cont.)

SHUNT

Allows a shunt resistor value to be entered for input type = mA. Commonly used values are 100 ohms and 250 ohms. Note that shunt resistors are connected to the input connector. The recorder cannot detect whether a shunt is fitted, or if one is, what value it has. Therefore it is the responsibility of the user to ensure that the ohmic value of any shunt fitted matches the shunt value entered in this field.

RANGE LOW

Enter the lowest value of the required linearisation range (e.g. 100)

RANGE HIGH

Enter the highest value of the required linearisation range (e.g. 200)

RANGE UNITS

Selectable from degrees Celsius, degrees Fahrenheit, Kelvin or Rankine.

SCALED

This box allows the user to select low and high values and units for a scale. This box must be ticked if logarithmic scales are to be used.

SCALE LOW

Enter the scale value to correspond with input range low (e.g. 0).

SCALE HIGH

Enter the scale value to correspond with input range high (e.g. 100).

SCALE UNITS

Enter up to five characters of unit descriptor (e.g.%).

OFFSET

Allows a fixed value to be added to or subtracted from the process variable. Recorder accuracy figures no longer apply if an offset is included.

4.3.3 CHANNEL/ALARM CONFIGURATION (Cont.)

SCALE TYPE

This field allows 'None', 'Linear' or 'Log' to be selected as scale type. For linear scales, the number of major/ minor scale divisions can be selected. This does not affect the 'chart' grid divisions, which is set up as a part of Group configuration (section 4.3.2). Figures 4.3.3b1 and 4.3.3b2 show various examples.

NONE

Channels with Scale Type selected to 'None', appear with no scale information in any display mode.

LINEAR

Channels with Scale Type = Linear, appear with scale information in all display modes (except numeric). The number of major and minor divisions can be selected from subsequent fields. Examples are shown in figure 4.3.3b1.

SCALE DIVISIONS - MAJOR

Appears for Linear Scale types only. Setting major divisions to 1, means that the scale consists only of 'zero' and full scale. Setting Major divisions to 2, means that the scale has divisions at zero, 50% and full scale, and so on. Intermediate scale values appear at major divisions if there is sufficient space. Default = 10 for large frame recorders or 5 for small frame units.

SCALE DIVISIONS - MINOR

Appears for Linear Scale types only. With minor divisions set to 1 (default), the scale major divisions are not divided i.e. no minor division tick marks appear . Setting Minor divisions to 2, means that each major scale division is divided into two, and so on. See figure 4.3.3b1 for an example showing five minor divisions.

LOG

For some input type selections, this appears only if 'Scaled' is ticked.

Channels with Scale Type = Log, appear with logarithmic scales. These scales have major divisions at each decade boundary, and (space permitting), minor divisions for mantissa values 2 to 9. Examples are shown in figure 4.3.3b1. Because of the nature of logarithms, neither negative values nor the value 0 can be used as scale 'zero'. Linear inputs are traced as exponental curves (figure 4.3.3b2).

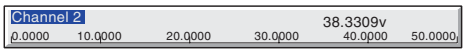
LOG/LINEAR

For some input type selections, this appears only if 'Scaled' is ticked.

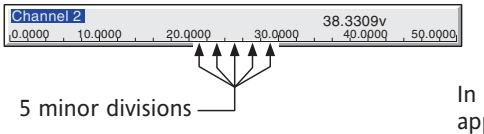
Channels with Scale Type = Log/Linear, appear with logarithmic scales. These scales have major divisions at each decade boundary, and (space permitting), minor divisions for mantissa values 2 to 9. Examples are shown in figure 4.3.3b1. Because of the nature of logarithms, neither negative values nor the value 0 can be used as scale 'zero'. Linear inputs are traced as straight lines (figure 4.3.3b2).

4.3.3 CHANNEL/ALARM CONFIGURATION (Cont.)

Scale = Linear:
Major divisions = 5; Minor divisions = 1

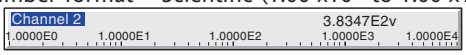


Scale = Linear:
Major divisions = 5; Minor divisions = 5



In all cases, intermediate scale values appear only if space allows

Scale = Log
Number format = Scientific (1.00 x10^{0} to 1.00 x10^{5})



Scale = Log
Number format = Numeric (1.0000 to 10,000)

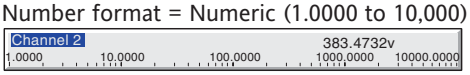


Figure 4.3.3b1 Scale type examples

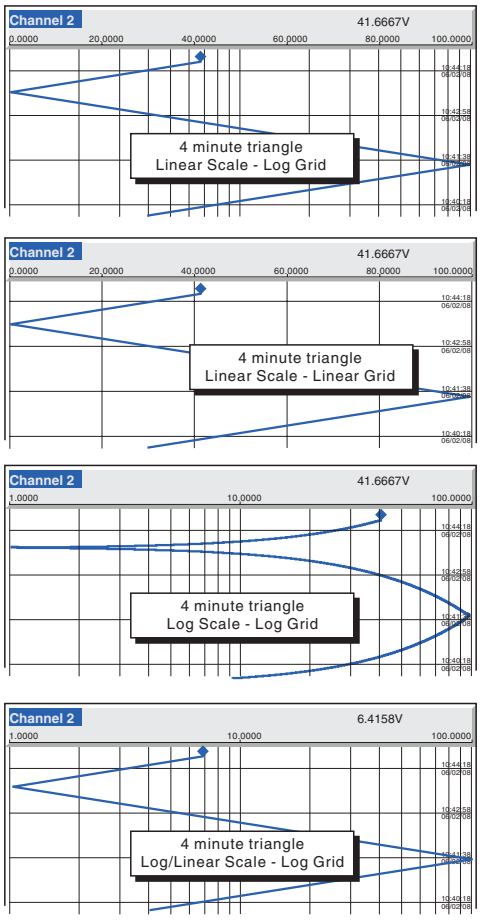


Figure 4.3.3b2 Trace examples for different scale types)

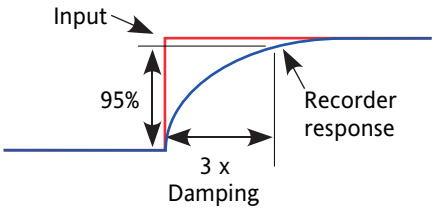
Note: Grid type is selected in Group configuration.

4.3.3 CHANNEL/ALARM CONFIGURATION (Cont.)

FILTER

For 'noisy' slowly changing signals, damping can be used to filter noise so that the underlying trend can be seen more clearly. None, 2, 4, 8, 16, 32, 64, 128 or 256 seconds can be selected.

It is not recommended that damping be used on quickly changing signals.



Effect of damping on step change in input signal

BREAK RESPONSE

For thermocouples and other low level inputs (i.e. input voltages less than 150 mV), the recorder can be made to respond in one of the following ways, if a break in the input circuit is detected.

None	trace drifts with the input wiring acting as an aerial.
High	trace placed at full scale.
Low	trace placed at scale 'zero'.

COLD JUNCTION COMPENSATION (CJC)

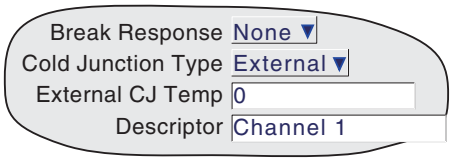
For input type = thermocouple, None, Internal, External or Remote can be selected for cold junction compensation.

INTERNAL

Internal CJC is by means of an RTD connected across pins 11 and 12 of the input board connector.

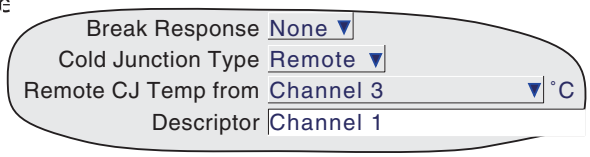
EXTERNAL

If the cold junction is maintained (by the user) at a known, fixed temperature, 'external' should be selected. An extra numeric entry box appears to allow the user to enter the temperature at which the cold junction is maintained.



REMOTE

'Remote' is selected if the cold junction temperature is to be measured by an external device connected to the instrument. An extra picklist appears which allows the user to select any input or maths channel to act as the cold junction temperature source channel. The temperature units displayed here, are those of the channel being configured, not those of the CJ source channel. The CJ source channel must be configured appropriately for the external device, and must provide a value which is consistent with the configured channel's units.



DESCRIPTOR

Allows a text string of up to 30 characters (including spaces) to be entered for the channel descriptor (e.g. 'Turbine 2 tempA').

4.3.3 CHANNEL/ALARM CONFIGURATION (Cont.)

SPANNED

This box, when selected, allows span low and high values to be entered. For example, in an input range of 0 to 600 deg C, it may be that the temperature range between 500 and 600 degrees is of most interest. In such a case, setting span low to 500 and span high to 600 will cause the recorder to display only that part of the input range, and this will fill the zone width which is selected next, effectively magnifying the area of interest.

ZONE

This allows the portion of the chart which the channel occupies to be defined in terms of percent, where the left edge of the chart is 0% and the right hand edge is 100%. For example, setting a low value of 50 and a high value of 100 causes the channel trace to be confined to the right hand half of the chart.

PV FORMAT

This allows the PV value, alarm setpoints, hysteresis values etc. to be displayed as normal numeric values (Numeric) or in 'Scientific' format (Scientific). When 'Scientific' is selected, values are displayed and entered as a decimal number between 1 and 10† (the mantissa), followed by a multiplier (the exponent). E.G. to enter a value of 1244.5678, the value entered would be 1.2445678E3, where 3 represents the number of places that the decimal point has been shifted to the left in order to convert the value to a number between 1 and 10†. To enter a value of 0.0004196, the entry would be 4.196E-4.

† Notes

1. Strictly this is a number less than 10, as 10 would be 1.0E1.
2. There must be at least one number after the decimal point.

MAXIMUM DECIMAL DIGITS

This defines the number of decimal places in the process value. Settable between zero and nine. Leading and trailing zeros are not displayed. Values too long for the available displaying width are truncated as described in section 3.

COLOUR

Allows the trace colour to be selected from a colour chart. Each of the 56 available colours is displayed with a number, and it is this number which is entered. The background colour to the selection box changes to the selected colour.

ALARM NUMBER

Allows an alarm to be selected for configuration.

4.3.3 CHANNEL/ALARM CONFIGURATION (Cont.)

ENABLE

Allows the alarm to be defined as Off, Unlatched, Latched or Trigger.

Off	Alarm is disabled and the remainder of the alarm configuration is hidden.
Unlatched	Unlatched alarms become active when the trigger source becomes active and remain active until the source returns to a non-active state. The indicator is on (flashing before acknowledgment - steady after acknowledgement) until the alarm clears. Alarm messages are printed if enabled in group configuration.
Latched	Latched alarms become active when the trigger source becomes active and remain active until the alarm is acknowledged AND the trigger source has returned to a non-active state. The indicator is on (flashing before acknowledgment - steady after acknowledgement) until the alarm has been acknowledged AND the trigger source has returned to a non-active state. Alarm messages are printed if enabled in group configuration. Continuous jobs remain active only whilst the alarm trigger source is active. I.E. the job finishes when the alarm clears, whether acknowledged or not.
Trigger	When triggered all associated jobs are initiated, and continuous jobs remain active until the alarm clears. There is no alarm indication, and no messages are printed.

TYPE

This field appears only when the alarm Enable is not selected Off. Each alarm can be defined as absolute high, absolute low, deviation-in, deviation-out, rate-of-change rise or rate-of-change fall.

Absolute High	As shown in figure 4.3.3d, an absolute high alarm becomes active when the channel value exceeds the threshold value. The alarm remains active until the channel value falls below (Threshold minus hysteresis). If a dwell value is defined, the alarm does not become effective until this dwell time has been exceeded.
Absolute Low	As shown in figure 4.3.3d, an absolute low alarm becomes active when the channel value falls below the threshold value. The alarm remains active until the channel value exceeds (Threshold + hysteresis). If a dwell value is defined, the alarm does not become effective until this dwell time has been exceeded.
Deviation in	As shown in figure 4.3.3e, a deviation-in alarm becomes active whenever the channel value enters the band: Reference ± Deviation. It remains active until the channel value leaves the band: Reference ± (Deviation+ Hysteresis). If a dwell value is defined, the alarm does not become effective until this dwell time has been exceeded.
Deviation out	As shown in figure 4.3.3e, a deviation-out alarm is active whenever the channel value leaves the band Reference ± Deviation. It remains active until the channel value enters the band: Reference ± (Deviation - Hysteresis). If a dwell value is defined, the alarm does not become effective until this dwell time has been exceeded.
Rate of change	As shown in figure 4.3.3f, rate of change alarms become active whenever the signal value changes by more than a specified amount within a specified period. If a dwell value is defined, the alarm does not become effective until this dwell time has been exceeded. An averaging period can be set to remove the effects of sudden, but short-lived changes, such as noise spikes on the signal.

Note: Alarm icons appear at the display, as described in section 3.

SETPOINT SOURCE

Allows the user to choose either a fixed, user-defined value (constant) or the value of another point (input channel, maths channel, totaliser etc.) to be chosen as the trigger point. In the latter it is possible, for example, to trigger an alarm, when one channel's value rises above, falls below etc. the value of a second channel.

4.3.3 CHANNEL/ALARM CONFIGURATION (Cont.)

PARAMETERS

Figures 4.3.3d, e and f illustrate the following terms for the different alarm types.

Threshold	For Absolute alarms, this defines the value (in engineering units) at which an alarm is triggered. The alarm also returns to its non-active state at this value (unless a hysteresis value has been set). If a dwell value is set, the alarm does not become active until this dwell time has elapsed.
Hysteresis	Defines a 'deadband' (in engineering units) to eliminate spurious triggering if the signal value is hovering around the trigger point. The deadband lies: Below Absolute High thresholds Above Absolute Low thresholds Outside the deviation band for Deviation-in alarms Inside the deviation band for Deviation-out alarms.
Dwell	Allows a dwell period to be entered in seconds. The alarm does not take effect until this period has expired. If an alarm clears before the dwell period has expired, the alarm is ignored.
Reference	For Deviation alarms, this is the central value of the deviation band.
Deviation	For Deviation alarms, this value defines the width of the deviation band, each side of the reference value. I.E. the total width of the deviation band is 2 x Deviation value.
Amount	For Rate-of-change alarms, this value defines the minimum amount by which the signal value would have to change, within the 'Change Time' period (below), in order for the alarm to become active.
Change Time	For Rate-of-change alarms, this selects the time period (Per second, Per minute, Per hour) within which the change in signal value must exceed the Amount value (entered in the preceding field) in order for the alarm to become active. See Rate-of-Change example below for more details.
Average time	For rate-of-change alarms, this allows an average period to be entered for signal smoothing.

HYSTERESIS EXAMPLE

Threshold = 100 units; Hysteresis = 5 units

With the above settings, an absolute high alarm would become active if its input were to rise above 100 and would remain active until its value fell to below 95 units. An absolute low alarm would become active if its input fell below 100 units, and would remain active until its input rose above 105 units. Deviation alarms behave in a similar manner.

RATE-OF CHANGE ALARM EXAMPLE

Rate-of-change alarms allow the user to enter an 'amount' (say 3 degrees) and a time period (say 1 minute), and if the process value changes by the specified amount or more, within the specified time period (more than 3 degrees in a minute in this example), then the alarm becomes active.

The recorder uses its iteration rate of 125 msec (1/8th second) as the time base for it calculations. For our example, 3 degrees per minute equates to 3/60 degrees per second or 3/(60 x 8) = 0.00625 degrees per iteration. If a change greater than this is detected, then the alarm becomes active.

In order to reduce sensitivity, an averaging period can be configured. This means that an average of all the 1/8th second samples is taken over the specified period, and the alarm becomes active only if the average value exceeds the specified rate of change.

Configuring a dwell time can also reduce 'jitter' because, if during the specified dwell time, any one sample is non active, then the elapsed dwell time is reset to zero. The alarm becomes active only after the dwell time has elapsed i.e. only if the rate of change has been exceeded for every software cycle throughout the specified dwell time.

4.3.3 CHANNEL/ALARM CONFIGURATION (Cont.)

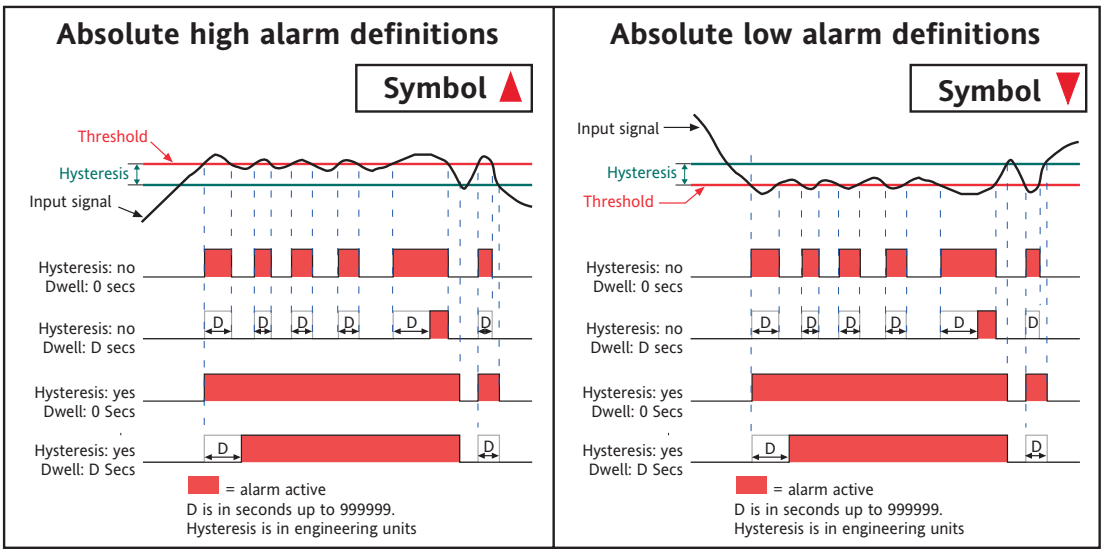


Figure 4.3.3d Absolute alarm definitions

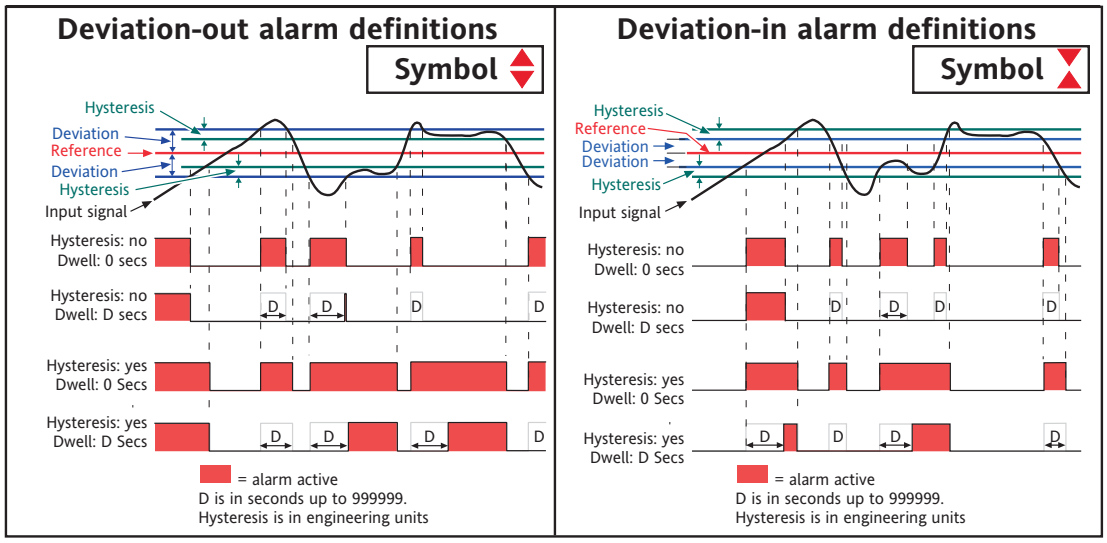


Figure 4.3.3e Deviation alarm definitions

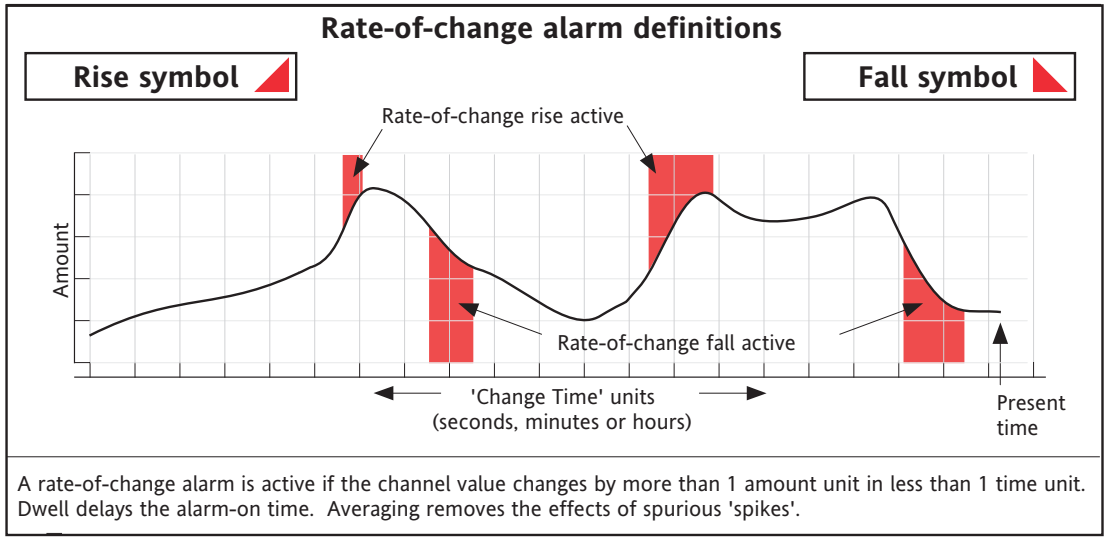


Figure 4.3.3f Rate-of-change alarm definitions

4.3.3 CHANNEL/ALARM CONFIGURATION (Cont.)

JOB NUMBER

Select the required job number.

CATEGORY

Select the required job to be carried out when the channel is in alarm (e.g. Drive relay) See section 4.7 for a description of job categories.

WHILE/ON

Allows the action of the alarm job to be chosen as

a. while active, while inactive or while unacknowledged for continuous jobs (e.g. drive relay), or,

b. on going active, on going inactive or on acknowledgement for 'one-shot' jobs (e.g. increment counter).

Figure 4.3.3g, below, shows the various actions graphically. For 'While unacknowledged' and 'on acknowledgement' settings, two cases are shown, one where the alarm goes inactive before acknowledgement; the other where the alarm is acknowledged whilst the alarm is still active. The coloured (shaded) areas show the duration for which continuous jobs run; the down arrows show trigger points for 'one-shot' jobs. See section 3.1.4 for details on how to acknowledge alarms.

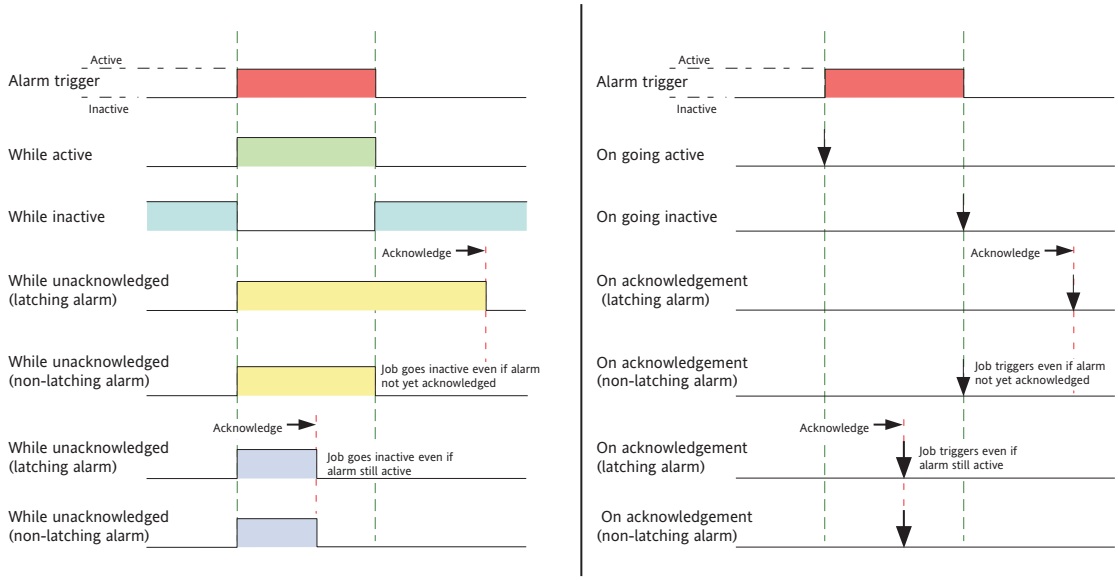


Figure 4.3.3g Graphical representation of job actions

ALARM MESSAGES

Alarm on/off and alarm acknowledge message printing on the chart can be enabled/disabled as a part of 'Group configuration' described in section 4.3.2.

See section 3.1.4 for details on how to acknowledge alarms.

4.3.4 Archive configuration

Notes:

1. For the sake of brevity, the phrase ‘memory device’ is used for whatever mass-storage medium is fitted to the recorder (integral or via a USB port).
2. CSV format files are not as secure as Packed Binary format files.

This allows an archive strategy to be set up for saving data to a local memory device or to a remote PC. The local strategy includes archive period, memory device full operation, compression factor and an estimate of the maximum-time-to-next-archive to avoid data being overwritten in memory (Duration).

The recorder uses a dedicated area of its Flash memory as an archive data buffer, which means that data is written to the memory device or remote PC only when required, rather than continuously.

In order to carry out a successful remote archive, details of the remote host must be entered both in this Archive section of the ‘Config’ menu, and in Network configuration (section 4.5).

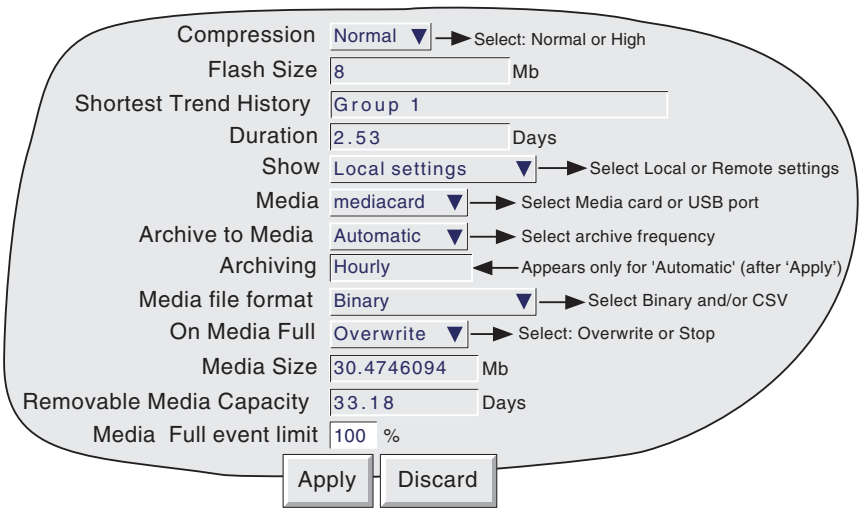


Figure 4.3.4a Archive configuration menu (Local settings)

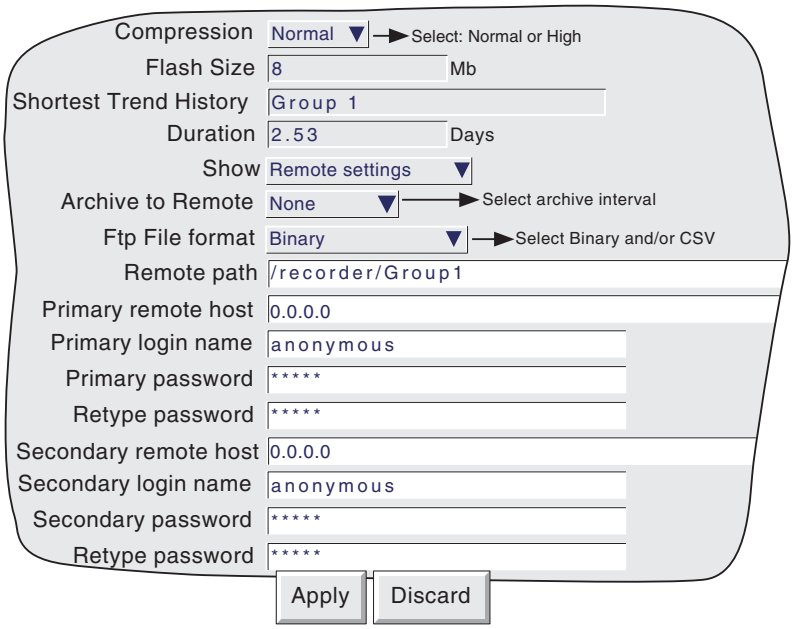


Figure 4.3.4b Archive configuration menu (Remote settings)

4.3.4 ARCHIVE CONFIGURATION (Cont.)

COMPRESSION

Select Normal or High compression. 'Normal' compresses the data but still provides an exact copy. 'High' compresses more, but channel values are saved only to 1 part in 10^8 resolution. This field does not appear if 'CSV' is selected as file format (see below).

FLASH SIZE

Allows the size of the internal flash memory to be viewed by the user.

SHORTEST TREND HISTORY / DURATION

Providing the archive period is less than the value displayed in the Duration window, no data will be lost from the group. If the archive period is greater than this value, then some data will have been overwritten and therefore lost.

Note: Trend history duration depends on many factors, as described in Group Configuration (section 4.3.2) above.

CSV CHECK BOXES, DATE/TIME FORMAT

These appear only if the 'Media File Format' or 'FTP file format' are set to either 'CSV' or 'Binary and CSV'. Refer to 'CSV Files' at the end of this subsection (4.3.4).

SHOW

This allows the fields which are to appear below 'Show' to be applicable to the local memory device (Local Settings), or to the setting up of a remote host path for archiving purposes (Remote settings). The following descriptions contain all the fields which may appear in either menu.

MEDIA

For 'Local' setting only

This allows 'mediacard or 'usbfront'' to be selected as the local archive destination. (usb1 and usb2 are not available with this recorder model). The USB port supports both floppy disk drives and 'memory sticks'.

ARCHIVE TO MEDIA

For 'Local' setting only:

None	Archive must be initiated by the operator (section 4.1)
Hourly	Archive occurs on the hour every hour
Daily	Archive occurs at 00:00* hrs each day
Weekly	Archive occurs at 00:00* hrs every Monday
Monthly	Archive occurs at 00:00* hrs on the 1st of each month
Automatic	The recorder selects the least frequent archive period (Hourly, Daily, Weekly, Monthly), which is guaranteed not to lose data as a result of either the internal Flash, or the local memory device, running out of space (calculated assuming that the memory device is initially 'empty'). When Automatic is selected, a further, non-editable menu item appears, showing which of the archive frequencies has been selected.

If the recorder has been powered down prior to archive time, the archive takes place the next time the unit is powered up.

*Note: Archive times are not adjusted for Daylight Saving hour changes. Thus if the archive is set to 'daily', 'weekly' or ' monthly' then, during 'Summer Time', the archive will occur an hour late (i.e. at 01:00 hrs. instead of midnight).

MEDIA FILE FORMAT/FTP FILE FORMAT

Allows ‘Binary’ (.uhh) files, ‘CSV’ (.csv) files or ‘Binary and CSV’ to be chosen for FTP transfer. For further details of CVS archiving, see description at the end of this subsection (4.3.4).

ON MEDIA FULL

For ‘Local’ setting only:

Overwrite	Oldest data is replaced with latest data when storage medium is full.
Stop	Archiving stops when the storage medium is full.

Note: When in ‘Overwrite’ mode, the recorder will overwrite only those files which it has itself created. Thus, if a storage medium is inserted which contains history files from another recorder, these cannot be overwritten. The file names are of the form ‘UUU….UUUIIIIIIFFGGSSSSSS’, where ‘IIIIII’ represent the lowest three bytes of MAC address of the recorder which created the file (see section 4.5.1). It is not possible for the user to delete files created by another instrument (i.e. one with a different MAC address).S

MEDIA SIZE

For ‘Local’ setting only, this displays the capacity of the memory device.

REMOVABLE MEDIA CAPACITY

For ‘Local’ setting only, this gives an estimated time to fill the archive medium, based on the archive rate, the compression ratio, the storage medium size and on the exact nature of the data. (Rapidly changing values use more space than static/slowly changing values.) When archiving to Floppy disks (via USB port), this field remains empty until after the first archive has taken place.

MEDIA FULL EVENT LIMIT

For ‘Local’ setting only, this allows the user to specify a percentage-full value for the storage medium, at which the event source ‘Archive media % full’ is triggered. The event remains active until the storage medium is replaced, or has data removed from it to make more room available.

ARCHIVE TO REMOTE

For ‘Remote’ setting only:

None	Archive to host is initiated by the operator (section 4.1.2)
Hourly	Archive to host occurs on the hour every hour
Daily	Archive to host occurs at 00:00* hrs each day
Weekly	Archive to host occurs at 00:00* hrs every Monday
Monthly	Archive to host occurs at 00:00* hrs on the 1st of each month
Automatic	The recorder selects the slowest out of ‘Hourly’, Daily, Weekly or Monthly, which is guaranteed not to lose data (depends on the size of the Trend History Buffer).

*Note: Archive times are not adjusted for Daylight Saving hour changes. Thus if the archive is set to ‘daily’, ‘weekly’ or ‘ monthly’ then, during ‘Summer Time’, the archive will occur an hour late (i.e. at 01:00 hrs. instead of midnight).

REMOTE PATH

For Remote setting only, this specifies the route to a folder or directory on the remote host, set up as a part of that host’s FTP configuration. The path name may be up to 103 characters in length.

4.3.4 ARCHIVE CONFIGURATION (Cont.)

PRIMARY REMOTE HOST

For 'Remote' setting only:
If a Domain Name Server (DNS) is specified in the Network key 'Name' page (figure 4.5.2), then the Primary Remote Host is the server name. If DNS is not selected, then the Primary Remote Host is the IP address of the remote host, set up in the host's Control Panel\Network.

PRIMARY LOGIN NAME/PASSWORD

For 'Remote' setting only:
Login name and password of the remote host account assigned either by the Network administrator, or in the Guest account of the remote host's FTP Server or User Manager configuration. The password, which must be of between eight and 20 characters, must be entered twice to ensure integrity.

SECONDARY REMOTE HOST/LOGIN/PASSWORD

For 'Remote' setting only:
As for primary versions, but for a secondary host. The secondary route is used only if the primary route fails.

CSV FILES

This allows archive files to be transferred in comma-separated-values (CSV) format, to a memory device or, via FTP, to a remote host computer.

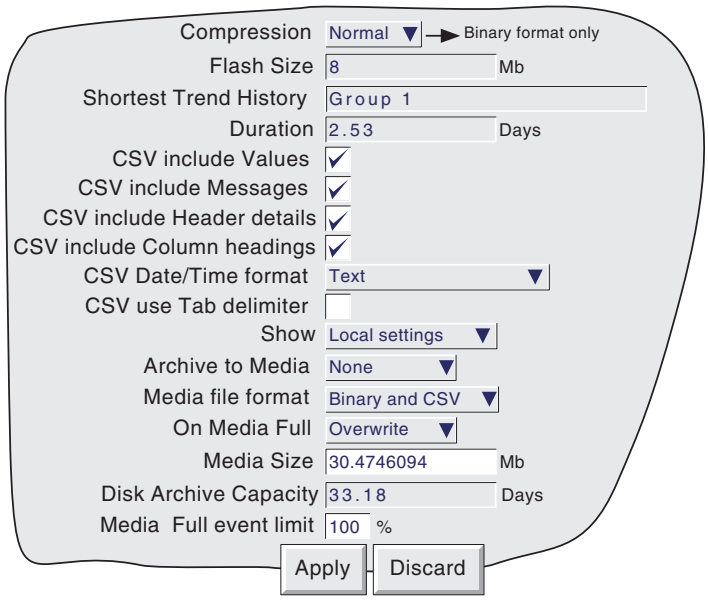


Figure 4.3.4c CSV archive menu items

MEDIA FILE FORMAT

For Local Settings only, this allows 'Binary', 'CSV' or both to be selected for file type when archiving. 'Binary' is the proprietary format used by the instrument and it requires other software (e.g. Review Software) to interpret the data, before it can be presented in spreadsheets, shown as if on a chart etc. Binary files have the extension '.uhh'.

CSV format is a standard open-file format for numeric data. A simple ASCII-based format, it is readable by a wide range of PC applications as well as being suitable for direct import into many commercial databases. CSV files have the extension '.csv'.

Note: CSV is ASCII based, and cannot interpret Unicode characters. Some characters available to the user will therefore be displayed incorrectly in CSV files.

4.3.4 ARCHIVE CONFIGURATION (Cont.)

MEDIA FILE FORMAT (CONT.)

If ‘CSV’ or ‘Binary and CSV’ is selected, a number of extra check boxes appear. Figure 4.3.4c above, shows a typical menu page. Figure 4.3.4d below, shows the effects of enabling the CSV check boxes, with the exception of ‘CSV use Tab delimiter’ the use of which is as follows:

CSV USE TAB DELIMITER

Despite its name, CSV does not always use commas as separators.

For example, in some countries, the decimal point is represented by a full stop (period), whilst in other areas, a comma is used. In order to avoid confusion between the comma as a decimal point and the comma as a separator, a different separator is used, usually the semicolon.

The instrument automatically chooses a separator suitable for use with the ‘Locale’ selected in System Configuration (section 4.6.2). ‘CSV Use Tab delimiter’ allows the user to override this choice, and force the instrument to use tabs as separators. This can be particularly useful when moving the data from one locale to another.

CSV DATE/TIME FORMAT

Allows ‘Text’ or Spreadsheet numeric to be selected. Text causes a time/date to appear in the spreadsheet. Spreadsheet numeric displays the number of days since December 30th 1899. The decimal part of the value represents the latest 6 hours, so DDD---DDD.25 represents 0600 hrs, DDD---DDD.5 represents noon etc. Numeric format is more easily interpretable by some spreadsheets than Text format is.

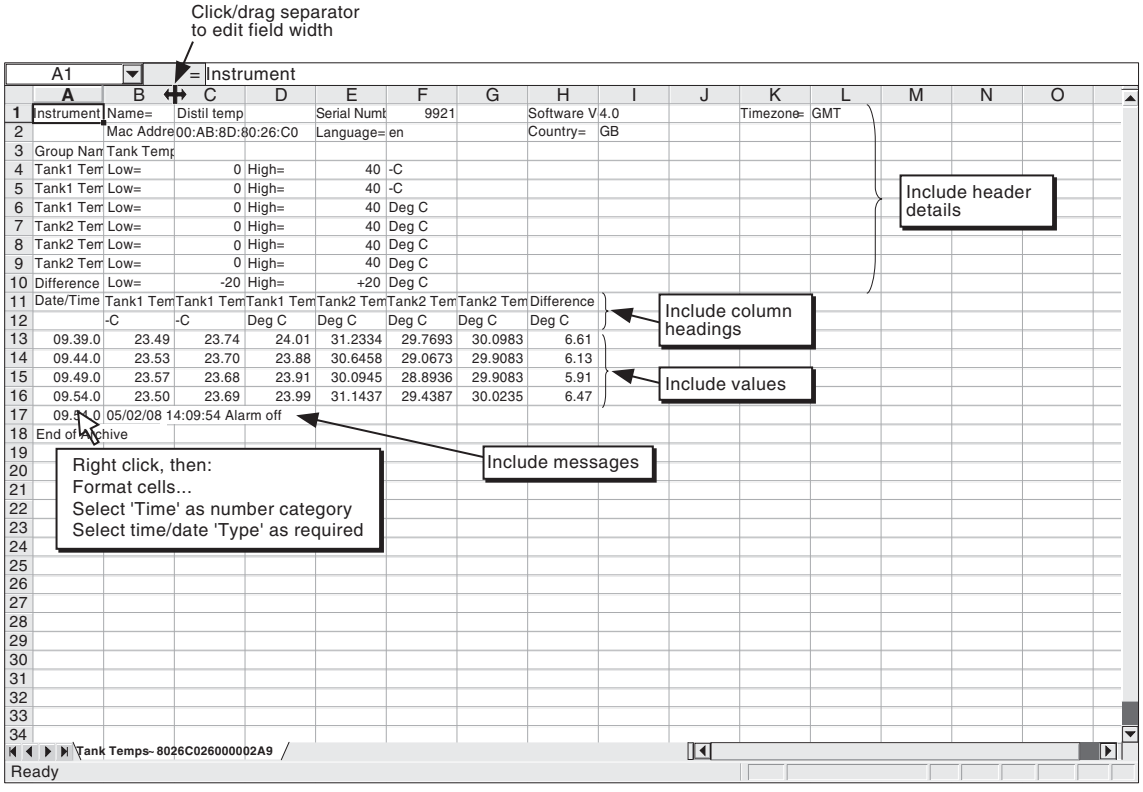


Figure 4.3.4d CSV data example

FTP FILE FORMAT

The above description for ‘Media file format’ also applies to ‘Remote’ setting.

4.3.5 Event configuration

A number of internal triggers are available for use in initiating Events which then run job lists. Events can have up to two sources each, but can themselves be used as sources allowing a large number of inputs to be used. Input sources can be logically combined, and can be inverted if required.

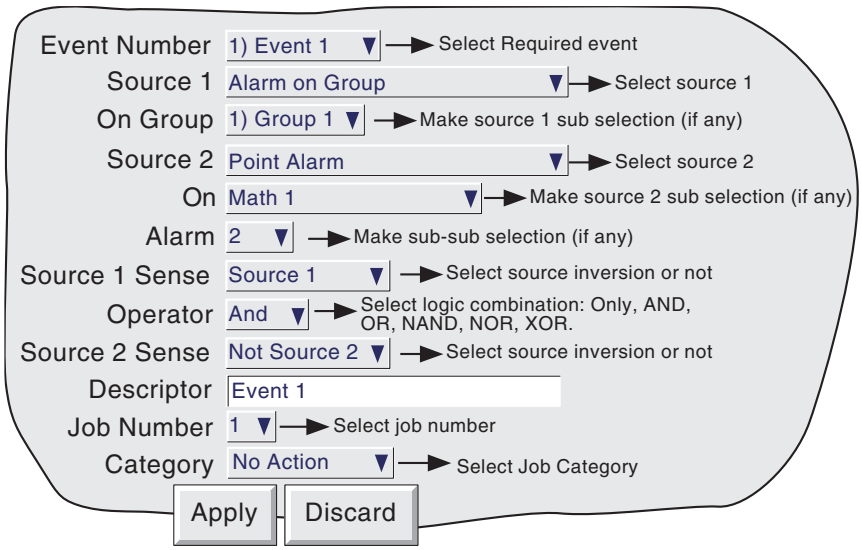


Figure 4.3.5 Event configuration menu layout (typical)

EVENT NUMBER

Allows the required event to be selected for configuration.

SOURCE TYPES

Off	The event is disabled
Global alarm	The event is active whilst any one or more alarms is active.
Global Unack'd alarm	The event is active as long as there is an unacknowledged alarm present.
Comms channel timeout	The event is set if no communication has been made with 'Comms' channels within the Comms channel timeout period set in Instrument configuration (section 4.3.1). The source is reset when the next communication occurs.
Timer active	The event is triggered when a specified timer (section 4.3.10) becomes active.
Event	Allows another event to be specified as a source.
Point alarm	Triggered by the specified alarm on the specified point.
Unack'd point alarm	Triggered by the specified alarm on the specified point. Remains active until the alarm is acknowledged (section 3.1.4).
Alarm on Group	Triggered if any alarm in the specified group becomes active.
Unack'd Alarm on Group	Triggered if any alarm in the specified group becomes active. The event remains active until the alarm is acknowledged.
Instrument alarm	This source triggers an event if any of the following becomes active: Any, Input channel failure, Removable media failure, Removable media full, No removable media fitted, FTP primary server failure, FTP secondary server failure, Maths channel failure, Clock failure, Unrecognised PCCard, Recording failure - overflow, Network not found, SNTP server failure, Time synchronisation failure, Battery backed RAM cleared. See section 3.1.3 for Instrument alarm details. The event remains active until the instrument alarm clears.
Power up	A transient event is triggered at power up.

(Continued)

4.3.5 EVENT CONFIGURATION (Cont.)

EVENT SOURCES (CONT.)

Maths channel partial failure
: For recorders fitted with Maths channels (section 4.3.7), this event is set if, say, one of the inputs to a group averaging function becomes invalid. In such a case, the average will be calculated on the remaining input values, but the result may not be as accurate as expected.

Battery Low
: This event is set when the battery is reaching the end of its useful life. The event remains active until the battery is replaced (see Annex B for details).

Archive media % full
: Triggered when the archive medium has reached the % fullness defined in Archive configuration (section 4.3.4).

Invalid Password Entry
: Transient event at the point of an invalid password entry attempt

User Logged In
: This event becomes active whenever a user with the specified Event Permission logs in. The event remains active until all local and remote users have logged out. .

SOURCE 1 SENSE

Allows source 1 to be used in its normal sense (Select 'Source 1') or inverted (Select 'Not Source 1').

Example: Source 1 is alarm 1 on channel 3
With Source 1 Sense = Source 1, the event is active whenever channel 3 alarm 1 is active.
With Source 1 Sense = Not Source 1, the event is active whenever the alarm is not active

OPERATOR

This allows a logical combination of input sources to be used to trigger an event. The selections and their definitions are shown in table 4.3.5, below.

Operator	Event active when:	Event not active when:
Only	S1 Active	S1 not active
AND	S1 and S2 both active	S1 and/or S2 not active
OR	S1 and/or S2 active	S1 and S2 both not active
NAND	S1 and/or S2 not active	S1 and S2 both active
NOR	S1 and S2 both not active	S1 and/or S2 both active
XOR	S1 or S2 active	S1 and S2 both active or both not active
S1 = Source 1; S2 = Source 2		

Table 4.3.5 Logical operators for event sources

SOURCE 2 SENSE

Allows source 2 to be used in its normal sense (Select 'Source 2') or inverted (Select 'Not Source 2').

Example: Source 2 is Global Unack'd alarm
With Source 2 Sense = Source 2, the event is active whilst there is any unacknowledged alarm. With Source 2 Sense = Not Source 2, the event is active only if there are no unacknowledged alarms.

4.3.5 EVENT CONFIGURATION (Cont.)

DESCRIPTOR

Allows a text string to be entered as the event title. See section 3.3.1 for text entry techniques.

JOB NUMBER

Select the required job number for this event.

CATEGORY

Select the required job to be carried out when the channel is in alarm (e.g. Drive relay) See section 4.7 for a description of job categories.

WHILE/ON

Allows the action of the alarm job to be chosen as

a. while active, while inactive or while unacknowledged for continuous jobs (e.g. drive relay), or,
b. on going active, on going inactive or on acknowledgement for 'one-shot' jobs (e.g. increment counter).

See also figure 4.3.3g and associated text.

EVENT EXAMPLE

An event is to be active whenever Channel 1 Alarm 1 is active whilst Channel 3 alarm 2 is not active.

Source 1 = Point alarm (On = Channel 1; Alarm = 1)
Source 2 = Point alarm (On = Channel 3; Alarm = 2)
Source 1 Sense = Source 1
Operator = And
Source 2 Sense = Not Source 2

It is possible to achieve the same result by inverting both Source senses and using the Nor operator.

4.3.6 Messages

This feature allows messages to be sent, by job action (section 4.7), to the display or to the group. The messages are of the form: Date, Time, Message. The message can be just text (up to 80 characters), or it can include up to nine embedded items which are typed into the message as {1} to {9}. The embedded values represented by {1} to {9} are selected from picklists.

If a Group-destination message contains more characters than can be displayed on the screen, the right-hand part of the message is invisible to the user. The message appears in full in the message log (section 3.1.4) and when Review Software is used. Display-destination messages are always fully visible.

MESSAGE ENTRY

The message configuration page is shown below in figure 4.3.6 The page is accessed from the Root menu/Operator/Config menu.

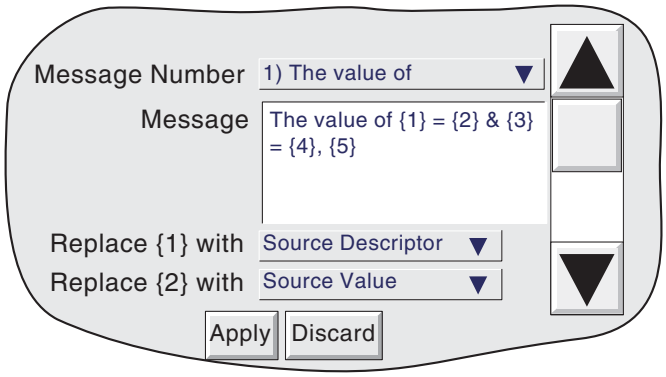


Figure 4.3.6 Message entry configuration page.

CONFIGURABLE PARAMETERS

Message Number — Select the required message from the picklist.

Message — Enter the message by using the pop-up keyboards (section 3.3.1)

Replace {n} with — A picklist allowing the user to select data to be embedded in the message:
Source Descriptor: The descriptor of the source which triggers the job message.
Source Value: The instantaneous value of the source at trigger time.
Source Alarm Data: Details (see table 4.3.6) of the source alarm at message trigger time.
Specified Descriptor, Specified Value, Specified Alarm data: Produces a further field '{n} source', described below.
Instrument Name: Allows the Instrument Name (as entered in Configuration/Instrument - section 4.3.1) to be included in the message.
Instrument Number: Causes the instrument number (Network/Address - Section 4.5.1) to be embedded.
Config Revision: Embeds the Config File Version number (System/About - section 4.6.8) in the message
Local User: Embeds the currently logged-in user (e.g. 'Engineer', Richardne' etc.

Alarm Type	Embedded details
Absolute	Enable, Type (high or low), Threshold, Status
Deviation	Enable, Type (in or out), Reference, Deviation, Status
Rate of change	Enable, Type (rise or fall), Amount, Change time, Status

Table 4.3.6 Alarm details versus alarm type

Note: If any of 'Source Descriptor', 'Source Value' or 'Source Alarm Data' are embedded in a message which is triggered by a job which cannot be associated with a specific source (e.g. event, timer), then the embedded value is: ?????.

4.3.6 MESSAGES (Cont.)

{n} source — This field appears only if the previous field (Replace {n} with) is selected as 'Specified Descriptor', 'Specified Value' or 'Specified alarm data'. The associated picklist(s) allow a specific point, and a specific alarm (if appropriate) to be selected. It is thus possible to configure, say alarm 1 on channel 2, to produce a message giving the descriptor and/or value of, say, totaliser 1.

Notes:

1. n = 1 to 9
2. The example below is intended to clarify message entry techniques.

EXAMPLE

To configure Message 2 to read "The value of Chan two = (Value channel 2) & Tot one = (Value totaliser 1)"

Before configuring the message:

In channel configuration:

Set channel 2 descriptor to: Chan two
Set Channel 2 alarm job to:
Category: Message
Send message(s) to: All Groups
First message: 2) Message 2
Last Message: 2) Message 2
On: Active

In Totaliser configuration:

Set Totaliser 1 descriptor to: Tot one

In Messages configuration:

1. Select Message 2.
2. Access the Symbols keyboard (section 3.3.1) and enter, without spaces, `{}={}&{}={}`
3. Access the Numeric keyboard and insert 1, 2, 3, 4 within the braces to give: `{1}={2}&{3}={4}`
4. Access the Alphabet keyboard, and insert text and spaces: `The value of {1} = {2} & {3} = {4}`
5. Set 'Replace {1}' to "Source Descriptor'
6. Set 'Replace {2}' to 'Source Value'
7. Set 'Replace {3}' to 'Specified Descriptor'
8. Set '{3} source' to Tot one
9. Set 'Replace {4}' to 'Specified Value'
10. Set '{4} source' to 'Tot one'

The result of this is that, should the channel 2 alarm go active, the following message would be sent to all groups, appear on the 'chart' and become part of all groups' histories:

```
06/02/08 14:30:21  The value of Chan two = 6.0˚C & Tot one = 3383.8073 Units
```

Note: If necessary, the message can be shortened (e.g. use 'Ch2' instead of 'Chan two'), or it can be viewed in full, either in Message log, (section 3.1.4) or by using Review Software, if available.

4.3.7 Maths configuration

CONFIGURATION

This feature allows a range of mathematical functions to be performed. Figure 4.3.7a shows a typical configuration page - the selected maths function determines which configuration fields actually appear.

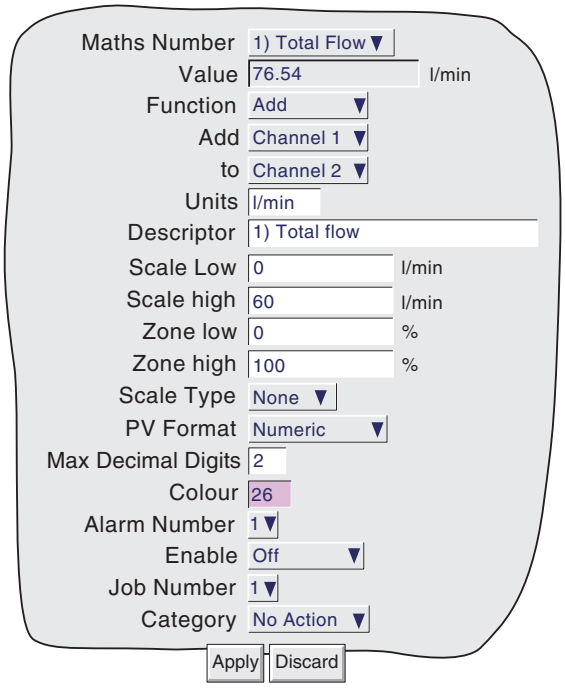


Figure 4.3.7a Maths configuration menu (typical - varies from function to function)

Maths number

Allows the user to select the required maths channel for configuration. The maximum number of maths channels is selected in the Virtual channels section of the Configuration/Options display, described in section 4.3.11.

Value

This field shows the current value of the selected maths channel. If the channel has not yet been configured, the value reads 'Off'.

Reset Now

This button appears only after a resettable function has been selected. Operation of the button sets the maths value to zero.

4.3.7 MATHS CONFIGURATION (Cont.)

Function

This picklist allows the relevant maths function to be selected. In the following description, the word 'channel' is used as an umbrella term for input channels, maths channels, totalisers etc.

Off	Allows the function to be disabled. Once 'Apply' has been actioned, all configuration for this Maths number is lost.
Constant	Allows a maths channel to be set to a constant value.
Add	Allows any channel or a constant value to be added to any other.
Subtract	Allows any channel or a constant value to be subtracted from any other.
Multiply	Allows any channel or a constant value to be multiplied by any other.
Divide	Allows any channel or a constant value to be divided by any other. Should the value of the divisor pass through zero, 'Maths Channel N error' and 'Maths Channel Failure' messages appear.
Group average*	The instantaneous value of all the channels in the source group added together and divided by the number of channels in the group. For example, in a group of four channels whose instantaneous values are 4, 8, 2 and 6, the group average is (4 + 8 + 2 + 6) / 4 = 5. The relevant source group is selected by picklist. Should a channel return a non-valid value, it is excluded from the calculation, and the result of the function is the average of the remaining channels.
Group minimum*	The lowest value of any of the channels in the source group. For example, in a group of four channels whose instantaneous values are 4, 8, 2 and 6, the group minimum is 2. The required source group is selected by picklist. Should a channel return a non-valid value, it is excluded from the calculation, and the result of the function is the minimum of the remaining channels.
Group maximum*	The highest value of any of the channels in the source group. For example, in a group of four channels whose instantaneous values are 4, 8, 2 and 6, the group maximum is 8. The required source group is selected by picklist. Should a channel return a non-valid value, it is excluded from the calculation, and the result of the function is the maximum of the remaining channels.

*Note: If a maths channel with a Group function is contained within its own source group, then it will act on itself as well as on the other group contents, thus changing the calculation.

For example, if the Group were to contain channel 1, channel 2 and maths channel 1, where maths channel 1 had the function 'Group Maximum' for Group 1, then the Group Maximum would become a latching function, showing the highest value ever reached by channel 1, channel 2 or maths channel 1 since the group was configured.

Slave Comms	Allows a process value for the maths channel to be communicated over the Modbus link
Rolling Average	This takes the average value of a single channel over a specified number of readings taken at a specified interval. The function value is retained during power off.
Channel Maximum	Maths function value is the minimum value the input point has reached since last reset. When reset, the value is reset to the current input value.
Channel Minimum	Maths function value is the minimum value the input point has reached since last reset. When reset, the value is reset to the current input value.
Channel Average	Takes the average value of the selected channel over a specified time period. The time period must be a multiple of 125 msecs. For example, a period of 0.2 seconds would be rejected, but a period of 0.25 seconds would be accepted.

Scale Low / Scale High

The 'zero' and full scale values for the maths function, as displayed.

4.3.7 MATHS CONFIGURATION (Cont.)

PV FORMAT

Numeric	Provides a decimal value for the maths channel.
Elapsed time	Shows the maths channel value in HH:MM:SS (hours minutes, seconds) format. Normally used only for time functions. For other functions, elapsed time counts in milliseconds e.g. a PV of 10000 would be displayed as 00:00:10; a PV of 60000 would be displayed as 00:01:00
Scientific	Values are displayed and entered as a decimal number between 1.0 and 10† (the mantissa), followed by a multiplier (the exponent). E.G. to enter a value of 1244.5678, the value entered would be 1.2445678E3, where 3 represents the number of places that the decimal point must be shifted to the left in order to convert the value to a number between 1 and 10†. To enter a value of 0.0004196, the entry would be 4.196E-4.
Time/date	For timestamp functions, displays the timestamp as time or date as selected, instead of a number of milliseconds, as would be displayed in numeric format.

† Notes

1. Strictly this is a number less than 10, as 10 would be 1.0E1.
2. There must be at least one number after the decimal point.

REMAINING CONFIGURATION ITEMS

The remaining configuration items are identical with the relevant items in Input Channel configuration (section 4.3.3).

4.3.7 MATHS CONFIGURATION (Cont.)

GROUP MINIMUM FUNCTION DETAILS

The following description assumes a group name of 'Furnace 1', which contains four channels with descriptors 'Temp 1', 'Temp 2', 'Temp 3' and 'Temp 4'

The output of the Group Minimum function is the current lowest value of any of the points in the source group. The required source group is selected by picklist. Should a point return a non-valid value, it is excluded from the calculation, and the result of the function is the minimum of the remaining points.

DESCRIPTORS

As a part of the Group Minimum function configuration, it is possible to select one of two types of descriptor: 'User Defined' and 'Minimum Channel'. Figure 4.3.7b, below shows the relevant area of the configuration page.

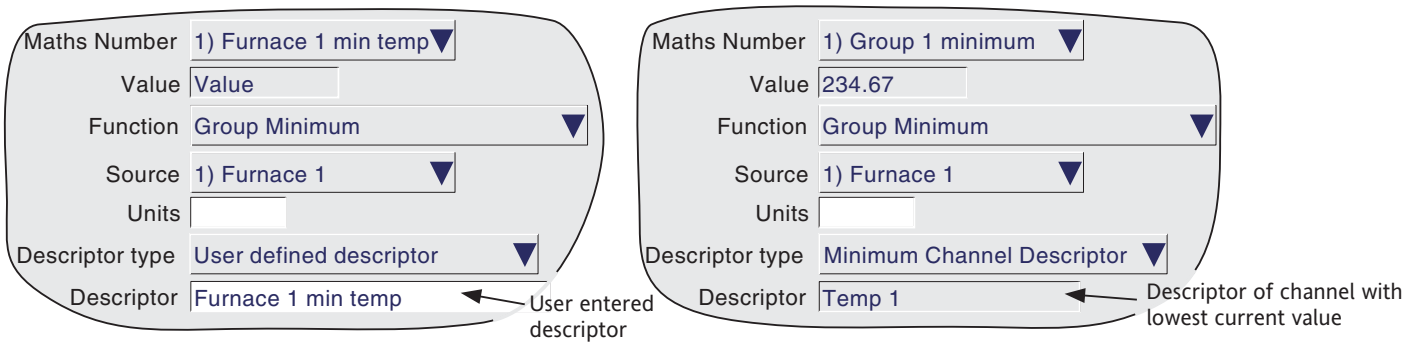


Figure 4.3.7b Group minimum configuration page

User Defined Descriptor.

This allows a descriptor to be entered in the normal way. For example 'Furnace 1 min temp'. This descriptor is copied to the Maths Number field at the top of the display page.

Minimum Channel Descriptor

This selection causes the descriptor of the point with the instantaneous current lowest value in the group, to become the (non-editable) maths channel descriptor. For example if the four channels in the group (Temp 1 to Temp 4) have the instantaneous values 800, 950, 790 and 873 respectively, then the Descriptor will be 'Temp 3' . Should Temp 3 rise above 800, whilst all the others remain static, then the Descriptor would become 'Temp 1'.

The 'Maths Number' field which normally copies the maths channel descriptor, contains instead the text: '1) Group 1 minimum'.

A typical application of the 'Minimum channel descriptor' would be to include the descriptor in a message sent to the chart on a regular basis by a Timer function. Section 4.3.6 describes the entry of the messages, and section 4.3.10 describes the setting up of timers.

(Continued)

4.3.7 MATHS CONFIGURATION (Cont.)

GROUP MINIMUM FUNCTION DETAILS (CONT.)

A typical message entry would be:

Message:	Lowest temperature is {1} at chan {2}
Replace {1} with:	Specified Value
{1} source:	Group 1 minimum
Replace {2} with:	Specified Descriptor
{2} source:	Group 1 Minimum

resulting in a message such as:

05/02/08 13:37:06 Lowest temperature is 790.00 Units at chan Temp 3.

where 'Units' is the text entered in the Group Minimum maths channel configuration, not that for the input channel, although typically, they would be the same.

Note: The Group configuration checkboxes for maths channels with 'Minimum Channel Descriptor' selected, are 'greyed' thus preventing such channels from being used as inputs to their own source group. See section 4.3.2 for Group configuration details.

ROLLING AVERAGE FUNCTION DETAILS

This calculates the average value of the last R samples of a channel, taken at N second intervals, where R and N can be defined by the user. At initiation, up to the time of the first sample reading, the displayed value is the average of the channel sampled every iteration (i.e. at 8 Hz.).

The number of readings over which the average can be taken is limited by the amount of free RAM instantaneously available, and is thus dependent on the overall configuration of the recorder. An instrument alarm is generated if there is insufficient free RAM available - see section 3.1.3 for details.

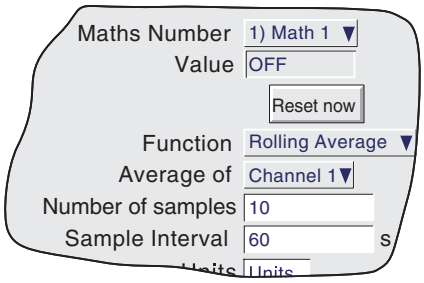


Figure 4.3.7c Rolling average menu

4.3.7 MATHS CONFIGURATION (Cont.)

MODBUS ADDRESSING

For units fitted with the Modbus TCP comms option, the following table gives hex addresses for maths channel 1.
Generally: Maths channel N parameter address = maths channel 1 parameter address + 162 (N-1) (decimal).
For full details of the Modbus TCP implementation, see section 6.

MATHS CHANNEL CONFIGURATION DATA

CHANNEL 1

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec)	Register Length
Ch1 Span high	Upper span value (display full scale)	Scaled	Read only	2FF1 (12273)	1
Ch1 Span low	Lower span value (display 'zero')	Scaled	Read only	2FF2 (12274)	1
Ch1 Zone high	Zone high value (two decimal places)	Scaled	Read only	2FF3 (12275)	1
Ch1 Zone low	Zone low value (two decimal places)	Scaled	Read only	2FF4 (12276)	1
Ch1 PV type	Input type 1 = Analogue input 3 = Totaliser 2 = Maths 4 = Counter	Enum	Read only	2FF5 (12277)	1
Ch1 Decimal places	Number of decimal places (0 to 9) (used by all scaled parameters except where stated)	Uint16	Read only	2FF6 (12278)	1
Ch1 Colour	Channel colour (0 to 55) (See Annex B for RGB definitions)	Enum	Read only	2FF7 (12279)	1
Ch1 Units	Units string (up to five characters)	String_5	Read only	2FF8 (12280)	3
Spare				2FFB (12283)	2
Ch1 Open string	Open Digital Input string (up to eight characters)	String_8	Read only	2FFD (12285)	4
Spare				3001 (12289)	4
Ch1 Close string	Closed Digital Input string (up to eight characters)	String_8	Read only	3005 (12293)	4
Spare				3009 (12297)	4
Ch1 Descriptor	Channel descriptor (up to 20 characters)	String_20	Read only	300D (12301)	10
Spare				3017 (12311)	10
Ch1 No of alarms	Number of alarms on this channel	Uint16	Read only	3021 (12321)	1
Ch1 PV format	0 = Numeric 1 = Digital strings	Enum	Read only	3022 (12322)	1
Spare				3023 (12323)	60
Ch1 Alarm 1 enable	Alarm 1 enable 0 = Off 2 = Latched 1 = Unlatched 3 = Trigger	Enum	Read only	305F (12383)	1
Ch1 Alarm 1 type	Alarm 1 type 0 = Absolute low 1 = Absolute high 2 = Deviation in 3 = Deviation out 4 = Rate of change rise 5 = Rate of change fall	Enum	Read only	3060 (12384)	1
Ch1 Alarm 1 setpoint	Trigger setpoint (see note)	Scaled	Read/Write	3061 (12385)	1
Spare				3062 (12386)	10
Ch1 Alarm 2 enable	Alarm 2 enable (As alarm 1 enable above)	Enum	Read only	306C (12396)	1
Ch1 Alarm 2 type	Alarm 2 type (As alarm 1 type above)	Enum	Read only	306D (12397)	1
Ch1 Alarm 2 setpoint	Trigger setpoint (see note)	Scaled	Read/Write	306E (12398)	1
Spare				306F (12399)	10
Ch1 Alarm 3 enable	Alarm 3 enable (As alarm 1 enable above)	Enum	Read only	3079 (12409)	1
Ch1 Alarm 3 type	Alarm 3 type (As alarm 1 type above)	Enum	Read only	307A (12410)	1
Ch1 Alarm 3 setpoint	Trigger setpoint (see note)	Scaled	Read/Write	307B (12411)	1
Spare				307C (12412)	10
Ch1 Alarm 4 enable	Alarm 4 enable (As alarm 1 enable above)	Enum	Read only	3086 (12422)	1
Ch1 Alarm 4 type	Alarm 4 type (As alarm 1 type above)	Enum	Read only	3087 (12423)	1
Ch1 Alarm 4 setpoint	Trigger setpoint (see note)	Scaled	Read/Write	3088 (12424)	1
Spare				3089 (12425)	10

Note: If the setpoint source (section 4.3.3) is set to anything other than 'Constant' the value returned will be the previously configured constant value.

4.3.7 MATHS CONFIGURATION (Cont.)

MATHS CHANNEL RUN-TIME DATA

This table show addresses for maths channel 1 run-time data.

Generally: channel N address = channel 1 address + 3(N-1) (decimal)

CHANNEL 1

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec)	Register Length
Ch1 value	Current process value (PV)	Scaled	Read/Write	A2BA (41658)	1
Ch1 status	Channel status 0 = Good PV 5 = Ranging error 1 = Channel off 6 = Overflow 2 = Over range 7 = Bad PV 3 = Under range 8 = No data 4 = Hardware error	Enum	Read only	A2BB (41659)	1
Ch1 Alarms	Alarm information	Uint16	-	A2BC (41660)	1
	Bit 0: 0 = Alarm 1 inactive; 1 = Alarm 1 active		Read only		
	Bit 1: 0 = No alarm 1 Ack. required; 1 = Ack. required		Read only		
	Bit 2: 1 = Acknowledge alarm 1		Read/Write		
	Bit 3: Spare				
	Bit 4: 0 = Alarm 2 inactive; 1 = Alarm 2 active		Read only		
	Bit 5: 0 = No Alarm 2 Ack. required; 1 = Ack. required		Read only		
	Bit 6: 1 = Acknowledge alarm 2		Read/Write		
	Bit 7: Spare				
	Bit 8: 0 = Alarm 3 inactive; 1 = Alarm 3 active		Read only		
	Bit 9: 0 = No alarm 3 Ack. required; 1 = Ack. required		Read only		
	Bit 10: 1 = Acknowledge alarm 3		Read/Write		
	Bit 11: Spare				
	Bit 12: 0 = Alarm 4 inactive; 1 = Alarm 4 active		Read only		
	Bit 13: 0 = No Alarm 4 Ack. required; 1 = Ack. required		Read only		
	Bit 14: 1 = Acknowledge alarm 4		Read/Write		
	Bit 15: Spare				

IEEE 32-BIT CHANNEL CONFIGURATION DATA

The following table shows addresses for the specified 32-bit floating-point values, for Maths channel 1. Generally, Parameter address for channel N = Parameter address for channel 1 + 36(N-1) (decimal).

CHANNEL 1

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec)	Register Length
Ch1 span high	Upper span value (Display full scale)	Float	Read only	DF73 (57203)	2
Ch1 span low	Lower span value (display 'zero')	Float	Read only	DF75 (57205)	2
Ch1 Zone high	Zone upper value (% of 'chart' width)	Float	Read only	DF77 (57207)	2
Ch1 Zone low	Zone lower value (% of 'chart' width)	Float	Read only	DF79 (57209)	2
Ch1 Alarm 1 setpoint	Trigger setpoint for alarm 1 (see note)	Float	Read/Write	DF7B (57211)	2
Ch1 Alarm 2 setpoint	Trigger setpoint for alarm 2 (see note)	Float	Read/Write	DF7D (57213)	2
Ch 1 Alarm 3 setpoint	Trigger setpoint for alarm 3 (see note)	Float	Read/Write	DF7F (57215)	2
Ch 1 Alarm 4 setpoint	Trigger setpoint for alarm 4 (see note)	Float	Read/Write	DF81 (57217)	2
Spare				DF83 (57219)	20

4.3.7 MATHS OPTION (Cont.)

IEEE Area Maths Channel run-time data

The following table gives addresses for the specified 32-bit floating-point values, for maths channel 1. Generally, Parameter address for channel N = Parameter address for channel 1 + 4(N-1) (decimal).

CHANNEL 1

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec)	Register Length
Channel 1 value	Current process value (PV)	Float	Read/Write	F9EF (63983)	2
Channel 1 status	Channel status 0 = Good PV 5 = Ranging error 1 = Channel off 6 = Overflow 2 = Over range 7 = Bad PV 3 = Under range 8 = No data 4 = Hardware error	Enum	Read only	F9F1 (63985)	1
Channel 1 Alarms	Alarm information Bit 0: 0 = Alarm 1 inactive; 1 = Alarm 1 active Bit 1: 0 = No alarm 1 Ack. required; 1 = Ack. required Bit 2: 1 = Acknowledge alarm 1 Bit 3: Spare Bit 4: 0 = Alarm 2 inactive; 1 = Alarm 2 active Bit 5: 0 = No Alarm 2 Ack. required; 1 = Ack. required Bit 6: 1 = Acknowledge alarm 2 Bit 7: Spare Bit 8: 0 = Alarm 3 inactive; 1 = Alarm 3 active Bit 9: 0 = No alarm 3 Ack. required; 1 = Ack. required Bit 10: 1 = Acknowledge alarm 3 Bit 11: Spare Bit 12: 0 = Alarm 4 inactive; 1 = Alarm 4 active Bit 13: 0= No Alarm 4 Ack. required; 1 = Ack. required Bit 14: 1 = Acknowledge alarm 4 Bit 15: Spare	Uint16	- Read only Read only Read/Write Read only Read only Read/Write Read only Read only Read/Write Read only Read only Read/Write	F9F2 (63986)	1

4.3.8 Totalisers

INTRODUCTION

Each totaliser allows the user to maintain a running total of any input channel, or of any maths channel. Using the maths functions, it is possible to totalise combinations of input channels, so the value of two channels added together, or the difference between two channels could be totalised if required. The totaliser equation is :

$$tot_t = tot_{t-1} + \frac{ma_t}{PSF \times USF}$$

where tot_t = totaliser value this sample*
tot_{t-1} = totaliser value last sample*
ma_t = value of totalised channel this sample*
PSF = Period Scaling Factor (See Period scaler description below)
USF = Units Scaling Factor (See Unit scaler description below)

*Note: Time between samples = Recording interval set in Group configuration.
See 'Update information' in Annex A for details.

CONFIGURATION

Figure 4.3.8, below, shows a typical (enabled) totaliser configuration page

Totaliser Number	Allows any of the available totalisers to be selected from the picklist, for configuration.
Enable	Allows the user to enable/disable the totaliser.
Value	Shows the (dynamic) current value of the selected totaliser.
Total of	Allows an input channel or a maths channel to be selected as the source to be totalised.
Low Cutoff	The value of the source channel (in engineering units) below which it is not to be totalised.
High Cutoff	The value of the source channel (in engineering units) above which it is not to be totalised.
Units	The totalised units (e.g. m^3)
Preset	Allows the entry of a 10-character positive, or nine-character negative value from which the totaliser is to start counting. Direction of counting is defined by the sign of the Unit scaler viz: + = increment; - = decrement.
Preset now	Operation of this key initiates the totaliser preset.

4.3.8 TOTALISER CONFIGURATION (Cont.)

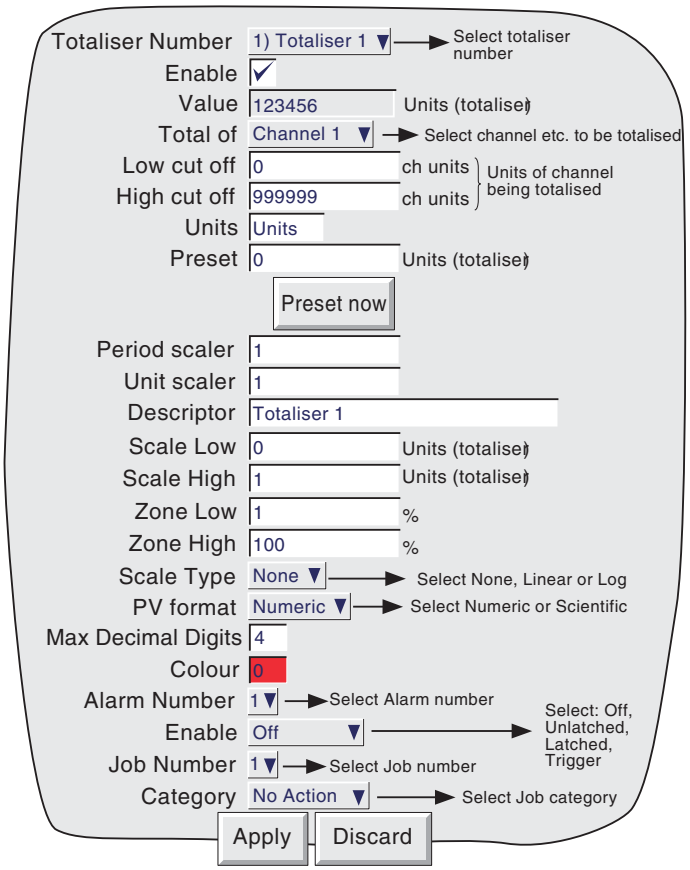


Figure 4.3.8 Totaliser configuration menu

Period Scaler — The totaliser equation works in seconds. If the totalised channel units are other than 'per second' a period scaler other than the default (1) must be entered. For example, if the input channel is in litres per hour, then the period scaler would have to be the number of seconds in an hour (3600).

Unit Scaler — If, for example, the input channel is in litres per hour, the totalised value will be in litres, unless the unit scaler is set to a value other than 1. If it is more convenient, the totalised value can be in thousands of litres by setting the unit scaler to 1000. Setting the unit scaler negative causes the totaliser to decrement rather than increment.

Scale Low/High — The 'zero' and full scale values for the totaliser, as traced on the screen.

The remaining configuration items are identical with the corresponding items in Input Channel configuration (section 4.3.3), except that Log/Linear scale type is not available. For job information, see section 4.7.

4.3.8 (Cont.) TOTALISER MODBUS ADDRESSING

For units fitted with the Modbus TCP comms option, the following table gives addresses for totaliser 1 configuration data

Generally: Totaliser N parameter address = totaliser 1 parameter address + 162 (N-1) (decimal).

For full details of the Modbus TCP implementation, see section 6.

TOTALISER CONFIGURATION DATA

TOTALISER 1

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec)	Register Length
Span high	Upper span value (display full scale)	Scaled	Read only	6F39 (28473)	1
Span low	Lower span value (display 'zero')	Scaled	Read only	6F3A (28474)	1
Zone high	Zone high value (two decimal places)	Scaled	Read only	6F3B (28475)	1
Zone low	Zone low value (two decimal places)	Scaled	Read only	6F3C (28476)	1
PV type	Input type 1 = Analogue input 3 = Totaliser 2 = Maths 4 = Counter	Enum	Read only	6F3D (28477)	1
Decimal places	Number of decimal places (0 to 9) (used by all scaled parameters except where stated)	Uint16	Read only	6F3E (28478)	1
Colour	Channel colour (0 to 55) (See Annex B for RGB definitions)	Enum	Read only	6F3F (28479)	1
Units	Units string (up to five characters)	String_5	Read only	6F40 (28480)	3
Spare				6F43 (28483)	2
Open string	Open Digital Input string (up to eight characters)	String_8	Read only	6F45 (28485)	4
Spare				6F49 (28489)	4
Close string	Closed Digital Input string (up to eight characters)	String_8	Read only	6F4D (28493)	4
Spare				6F51 (28497)	4
Descriptor	Channel descriptor (up to 20 characters)	String_20	Read only	6F55 (28501)	10
Spare				6F5F (28511)	10
No of alarms	Number of alarms on this channel	Uint16	Read only	6F69 (28521)	1
PV format	0 = Numeric 1 = Digital strings	Enum	Read only	6F6A (28522)	1
Spare				6F6B (28523)	60
Alarm 1 enable	Alarm 1 enable 0 = Off 2 = Latched 1 = Unlatched 3 = Trigger	Enum	Read only	6FA7 (28583)	1
Alarm 1 type	Alarm 1 type 0 = Absolute low 1 = Absolute high 2 = Deviation in 3 = Deviation out 4 = Rate of change rise 5 = Rate of change fall	Enum	Read only	6FA8 (28584)	1
Alarm 1 setpoint	Trigger setpoint (see note)	Scaled	Read/Write	6FA9 (28585)	1
Spare				6FAA (28586)	10
Alarm 2 enable	Alarm 2 enable (As alarm 1 enable above)	Enum	Read only	6FB4 (28596)	1
Alarm 2 type	Alarm 2 type (As alarm 1 type above)	Enum	Read only	6FB5 (28597)	1
Alarm 2 setpoint	Trigger setpoint (see note)	Scaled	Read/Write	6FB6 (28598)	1
Spare				6FB7 (28599)	10
Alarm 3 enable	Alarm 3 enable (As alarm 1 enable above)	Enum	Read only	6FC1 (28609)	1
Alarm 3 type	Alarm 3 type (As alarm 1 type above)	Enum	Read only	6FC2 (28610)	1
Alarm 3 setpoint	Trigger setpoint (see note)	Scaled	Read/Write	6FC3 (28611)	1
Spare				6FC4 (28612)	10
Alarm 4 enable	Alarm 4 enable (As alarm 1 enable above)	Enum	Read only	6FCE (28622)	1
Alarm 4 type	Alarm 4 type (As alarm 1 type above)	Enum	Read only	6FCF (28623)	1
Alarm 4 setpoint	Trigger setpoint (see note)	Scaled	Read/Write	6FD0 (28624)	1
Spare				6FD1 (28625)	10

Note: If the setpoint source (section 4.3.3) is set to anything other than 'Constant' the value returned will be the previously configured constant value.

4.3.8 (Cont.) TOTALISER MODBUS ADDRESSING

RUN-TIME DATA

This table shows addresses for totaliser 1.
Generally: totaliser N address = totaliser 1 address + 3(N-1) (decimal)

TOTALISER 1

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec)	Register Length
Value	Current process value (PV)	Scaled	Read/Write	A3E6 (41958)	1
Status	Channel status	Enum	Read only	A3E7 (41959)	1
	0 = Good PV 5 = Ranging error				
	1 = Channel off 6 = Overflow				
	2 = Over range 7 = Bad PV				
	3 = Under range 8 = No data				
	4 = Hardware error				
Alarms	Alarm information	Uint16	-	A3E8 (41960)	1
	Bit 0: 0 = Alarm 1 inactive; 1 = Alarm 1 active		Read only		
	Bit 1: 0 = No alarm 1 Ack. required; 1 = Ack. required		Read only		
	Bit 2: 1 = Acknowledge alarm 1		Read/Write		
	Bit 3: Spare				
	Bit 4: 0 = Alarm 2 inactive; 1 = Alarm 2 active		Read only		
	Bit 5: 0 = No Alarm 2 Ack. required; 1 = Ack. required		Read only		
	Bit 6: 1 = Acknowledge alarm 2		Read/Write		
	Bit 7: Spare				
	Bit 8: 0 = Alarm 3 inactive; 1 = Alarm 3 active		Read only		
	Bit 9: 0 = No alarm 3 Ack. required; 1 = Ack. required		Read only		
	Bit 10: 1 = Acknowledge alarm 3		Read/Write		
	Bit 11: Spare				
	Bit 12: 0 = Alarm 4 inactive; 1 = Alarm 4 active		Read only		
	Bit 13: 0 = No Alarm 4 Ack. required; 1 = Ack. required		Read only		
	Bit 14: 1 = Acknowledge alarm 4		Read/Write		
	Bit 15: Spare				

IEEE 32-BIT CONFIGURATION DATA

The following table gives addresses for the specified 32-bit floating-point values, for Totaliser 1. Generally, Parameter address for totaliser N = Parameter address for totaliser 1 + 36(N-1) (decimal).

TOTALISER 1

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec)	Register Length
Span high	Upper span value (Display full scale)	Float	Read only	ED83 (60803)	2
Span low	Lower span value (display 'zero')	Float	Read only	ED85 (60805)	2
Zone high	Zone upper value (% of 'chart' width)	Float	Read only	ED87 (60807)	2
Zone low	Zone lower value (% of 'chart' width)	Float	Read only	ED89 (60809)	2
Alarm 1 setpoint	Trigger setpoint for alarm 1 (see note)	Float	Read/Write	ED8B (60811)	2
Alarm 2 setpoint	Trigger setpoint for alarm 2 (see note)	Float	Read/Write	ED8D (60813)	2
Alarm 3 setpoint	Trigger setpoint for alarm 3 (see note)	Float	Read/Write	ED8F (60815)	2
Alarm 4 setpoint	Trigger setpoint for alarm 4 (see note)	Float	Read/Write	ED91 (60817)	2
Spare				ED93 (60819)	20

Note: If the setpoint source (section 4.3.3) is set to anything other than 'Constant' the value returned will be the previously configured constant value.

4.3.8 (Cont.) TOTALISER MODBUS ADDRESSING

IEEE AREA TOTALISER RUN-TIME DATA

The following table gives addresses for the specified 32-bit floating-point values, for totaliser 1. Generally, Parameter address for totaliser N = Parameter address for totaliser 1 + 4(N-1) (decimal).

TOTALISER 1

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec)	Register Length
Totaliser 1 value	Current process value (PV)	Float	Read/Write	FB7F (64383)	2
Totaliser 1 status	Channel status 0 = Good PV 5 = Ranging error 1 = Channel off 6 = Overflow 2 = Over range 7 = Bad PV 3 = Under range 8 = No data 4 = Hardware error	Enum	Read only	FB81 (64385)	1
Totaliser 1 Alarms	Alarm information	Uint16	-	FB82 (64386)	1
	Bit 0: 0 = Alarm 1 inactive; 1 = Alarm 1 active		Read only		
	Bit 1: 0 = No alarm 1 Ack. required; 1 = Ack. required		Read only		
	Bit 2: 1 = Acknowledge alarm 1		Read/Write		
	Bit 3: Spare				
	Bit 4: 0 = Alarm 2 inactive; 1 = Alarm 2 active		Read only		
	Bit 5: 0 = No Alarm 2 Ack. required; 1 = Ack. required		Read only		
	Bit 6: 1 = Acknowledge alarm 2		Read/Write		
	Bit 7: Spare				
	Bit 8: 0 = Alarm 3 inactive; 1 = Alarm 3 active		Read only		
	Bit 9: 0 = No alarm 3 Ack. required; 1 = Ack. required		Read only		
	Bit 10: 1 = Acknowledge alarm 3		Read/Write		
	Bit 11: Spare				
	Bit 12: 0 = Alarm 4 inactive; 1 = Alarm 4 active		Read only		
	Bit 13: 0 = No Alarm 4 Ack. required; 1 = Ack. required		Read only		
	Bit 14: 1 = Acknowledge alarm 4		Read/Write		
	Bit 15: Spare				

4.3.9 Counters

INTRODUCTION

The virtual channels option introduces a user-configurable number of counters, which can be preset, disabled, incremented or decremented by Job action. If access is permitted, the user can preset the counter to a selected value, as and when required, from the configuration page. See section 4.7 for Job details and section 4.3.11 for a description of virtual channels.

CONFIGURATION

Figure 4.3.9 shows a typical (enabled) counter configuration page. The page is accessed from the Root menu/ Operator/Config menu.

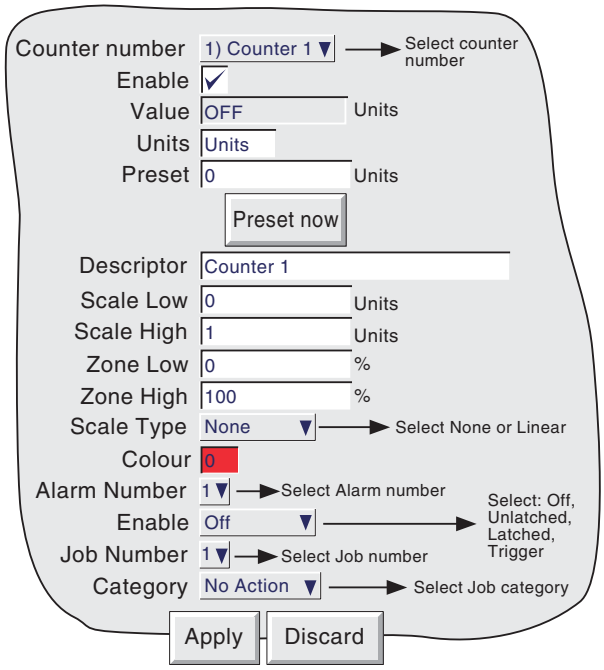


Figure 4.3.9 Typical Counter configuration menu

CONFIGURABLE PARAMETERS

Counter number	Allows any of the available counters to be selected for configuration
Enable	Allows the user to start/stop counting by enabling/disabling the counter.
Value	Shows the current dynamic value of the counter
Units	Allows a text string of up to 5 characters to be entered as a units description
Preset	Allows a counter value to be entered for manual or job action preset.
Scale low/high	The values to appear at the scale end points.

The remaining configuration items are as described for input channels in section 4.3.3, except that Log/Linear scales are not available.

Note: An absolute high alarm (for example) with a threshold of 10, will not be triggered until the value exceeds 10 (i.e. counter value = 11). In order to trip the alarm at 10, a threshold lower than 10 must be entered (e.g. threshold = 9.5). A similar situation exists for absolute low and deviation alarms.

4.3.9 COUNTERS (Cont.)

COUNTER MODBUS ADDRESSING

For units fitted with the Modbus TCP comms option, the table below gives addresses for counter 1 configuration data.
Generally: Counter N parameter address = counter 1 parameter address + 162 (N-1) (decimal).
For full details of the Modbus implementation, see section 6.

COUNTER CONFIGURATION DATA

COUNTER 1

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec)	Register Length
Span high	Upper span value (display full scale)	Scaled	Read only	8EDD (36573)	1
Span low	Lower span value (display 'zero')	Scaled	Read only	8EDE (36574)	1
Zone high	Zone high value (two decimal places)	Scaled	Read only	8EDF (36575)	1
Zone low	Zone low value (two decimal places)	Scaled	Read only	8EE0 (36576)	1
PV type	Input type 1 = Analogue input 3 = Totaliser 2 = Maths 4 = Counter	Enum	Read only	8EE1 (36577)	1
Decimal places	Number of decimal places (0 to 9) (used by all scaled parameters except where stated)	Uint16	Read only	8EE2 (36578)	1
Colour	Channel colour (0 to 55) (See Annex B for RGB definitions)	Enum	Read only	8EE3 (36579)	1
Units	Units string (up to five characters)	String_5	Read only	8EE4 (36580)	3
Spare				8EE7 (36583)	2
Open string	Open Digital Input string (up to eight characters)	String_8	Read only	8EE9 (36585)	4
Spare				8EED (36589)	4
Close string	Closed Digital Input string (up to eight characters)	String_8	Read only	8EF1(36593)	4
Spare				8EF5 (36597)	4
Descriptor	Channel descriptor (up to 20 characters)	String_20	Read only	8EF9 (36601)	10
Spare				8F03 (36611)	10
No of alarms	Number of alarms on this channel	Uint16	Read only	8F0D (36621)	1
PV format	0 = Numeric 1 = Digital strings	Enum	Read only	8F0E (36622)	1
Spare				8F0F (36623)	60
Alarm 1 enable	Alarm 1 enable 0 = Off 2 = Latched 1 = Unlatched 3 = Trigger	Enum	Read only	8F4B (36683)	1
Alarm 1 type	Alarm 1 type 0 = Absolute low 1 = Absolute high 2 = Deviation in 3 = Deviation out 4 = Rate of change rise 5 = Rate of change fall	Enum	Read only	8F4C (36684)	1
Alarm 1 setpoint	Trigger setpoint (see note)	Scaled	Read/Write	8F4D (36685)	1
Spare				8F4E (36686)	10
Alarm 2 enable	Alarm 2 enable (As alarm 1 enable above)	Enum	Read only	8F58 (36696)	1
Alarm 2 type	Alarm 2 type (As alarm 1 type above)	Enum	Read only	8F59 (36697)	1
Alarm 2 setpoint	Trigger setpoint (see note)	Scaled	Read/Write	8F5A (36698)	1
Spare				8F5B (36699)	10
Alarm 3 enable	Alarm 3 enable (As alarm 1 enable above)	Enum	Read only	8F65 (36709)	1
Alarm 3 type	Alarm 3 type (As alarm 1 type above)	Enum	Read only	8F66 (36710)	1
Alarm 3 setpoint	Trigger setpoint (see note)	Scaled	Read/Write	8F67 (36711)	1
Spare				8F68 (36712)	10
Alarm 4 enable	Alarm 4 enable (As alarm 1 enable above)	Enum	Read only	8F72 (36722)	1
Alarm 4 type	Alarm 4 type (As alarm 1 type above)	Enum	Read only	8F73 (36723)	1
Alarm 4 setpoint	Trigger setpoint (see note)	Scaled	Read/Write	8F74 (36724)	1
Spare				8F75 (36725)	10

4.3.9 COUNTERS (Cont.)

RUN-TIME DATA

This table shows addresses for counter 1.
Generally: Counter N address = counter 1 address + 3(N-1) (decimal)

COUNTER 1

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec)	Register Length
Value	Current process value (PV)	Scaled	Read only	A47C (42108)	1
Status	Channel status	Enum	Read only	A47D (42109)	1
	0 = Good PV 5 = Ranging error				
	1 = Channel off 6 = Overflow				
	2 = Over range 7 = Bad PV				
	3 = Under range 8 = No data				
	4 = Hardware error				
Alarms	Alarm information	Uint16	-	A47E (42110)	1
	Bit 0: 0 = Alarm 1 inactive; 1 = Alarm 1 active		Read only		
	Bit 1: 0 = No alarm 1 Ack. required; 1 = Ack. required		Read only		
	Bit 2: 1 = Acknowledge alarm 1		Read/Write		
	Bit 3: Spare				
	Bit 4: 0 = Alarm 2 inactive; 1 = Alarm 2 active		Read only		
	Bit 5: 0 = No Alarm 2 Ack. required; 1 = Ack. required		Read only		
	Bit 6: 1 = Acknowledge alarm 2		Read/Write		
	Bit 7: Spare				
	Bit 8: 0 = Alarm 3 inactive; 1 = Alarm 3 active		Read only		
	Bit 9: 0 = No alarm 3 Ack. required; 1 = Ack. required		Read only		
	Bit 10: 1 = Acknowledge alarm 3		Read/Write		
	Bit 11: Spare				
	Bit 12: 0 = Alarm 4 inactive; 1 = Alarm 4 active		Read only		
	Bit 13: 0 = No Alarm 4 Ack. required; 1 = Ack. required		Read only		
	Bit 14: 1 = Acknowledge alarm 4		Read/Write		
	Bit 15: Spare				

IEEE 32-BIT CONFIGURATION DATA

The following table gives addresses for the specified 32-bit floating-point values, for Counter 1. Generally, Parameter address for counter N = Parameter address for counter 1 + 36(N-1) (decimal).

COUNTER 1

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec)	Register Length
Span high	Upper span value (Display full scale)	Float	Read only	F48B (62603)	2
Span low	Lower span value (display 'zero')	Float	Read only	F48D (62605)	2
Zone high	Zone upper value (% of 'chart' width)	Float	Read only	F48F (62607)	2
Zone low	Zone lower value (% of 'chart' width)	Float	Read only	F491 (62609)	2
Alarm 1 setpoint	Trigger setpoint for alarm 1 (see note)	Float	Read/Write	F493 (62611)	2
Alarm 2 setpoint	Trigger setpoint for alarm 2 (see note)	Float	Read/Write	F495 (62613)	2
Alarm 3 setpoint	Trigger setpoint for alarm 3 (see note)	Float	Read/Write	F497 (62615)	2
Alarm 4 setpoint	Trigger setpoint for alarm 4 (see note)	Float	Read/Write	F499 (62617)	2
Spare				F49B (62619)	20

Note: If the setpoint source (section 4.3.3) is set to anything other than 'Constant' the value returned will be the previously configured constant value.

4.3.9 COUNTERS (Cont.)

IEEE AREA COUNTER RUN-TIME DATA

The following table gives addresses for the specified 32-bit floating-point values, for counter 1. Generally, Parameter address for counter N = Parameter address for counter 1 + 4(N-1) (decimal).

COUNTER 1

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec)	Register Length
Counter 1 value	Current process value (PV)	Float	Read only	FC47 (64583)	2
Counter 1 status	Channel status 0 = Good PV 5 = Ranging error 1 = Channel off 6 = Overflow 2 = Over range 7 = Bad PV 3 = Under range 8 = No data 4 = Hardware error	Enum	Read only	FC49 (64585)	1
Counter 1 Alarms	Alarm information	Uint16	-	FC4A (64586)	1
	Bit 0: 0 = Alarm 1 inactive; 1 = Alarm 1 active		Read only		
	Bit 1: 0 = No alarm 1 Ack. required; 1 = Ack. required		Read only		
	Bit 2: 1 = Acknowledge alarm 1		Read/Write		
	Bit 3: Spare				
	Bit 4: 0 = Alarm 2 inactive; 1 = Alarm 2 active		Read only		
	Bit 5: 0 = No Alarm 2 Ack. required; 1 = Ack. required		Read only		
	Bit 6: 1 = Acknowledge alarm 2		Read/Write		
	Bit 7: Spare				
	Bit 8: 0 = Alarm 3 inactive; 1 = Alarm 3 active		Read only		
	Bit 9: 0 = No alarm 3 Ack. required; 1 = Ack. required		Read only		
	Bit 10: 1 = Acknowledge alarm 3		Read/Write		
	Bit 11: Spare				
	Bit 12: 0 = Alarm 4 inactive; 1 = Alarm 4 active		Read only		
	Bit 13: 0 = No Alarm 4 Ack. required; 1 = Ack. required		Read only		
	Bit 14: 1 = Acknowledge alarm 4		Read/Write		
	Bit 15: Spare				

4.3.10 Timers

INTRODUCTION

This feature supplies 6 count-down timers which can be used for general timing purposes. The timers can be either one-shot or repeating, and can be initiated in the following ways:

1. directly by the operator from the configuration page,
2. by job action (see section 4.7),
3. at a predefined time/date,
4. every 'time period', where the 'time period' can be configured to be anything from 1 second to 1 year. For example, setting seconds to '30' and leaving all other fields 'Any', the timer will start every minute on the half minute. Setting seconds to '30' and minutes to '0' would cause the timer to start at 30 seconds past each hour.

Note: Times are not adjusted for Daylight Saving changes. Thus if the timer is set to trigger on a daily, weekly, etc, basis, then, during 'Summer Time', the trigger will occur an hour late (i.e. at 01:00 hrs. instead of at midnight).

The full range of jobs is available as described in section 4.7. 'Timer Active' is defined as an internal event trigger (section 4.3.5).

CONFIGURATION

Figure 4.3.10 shows a typical timer configuration display. The page is accessed from the Root menu/Operator/ Config menu.

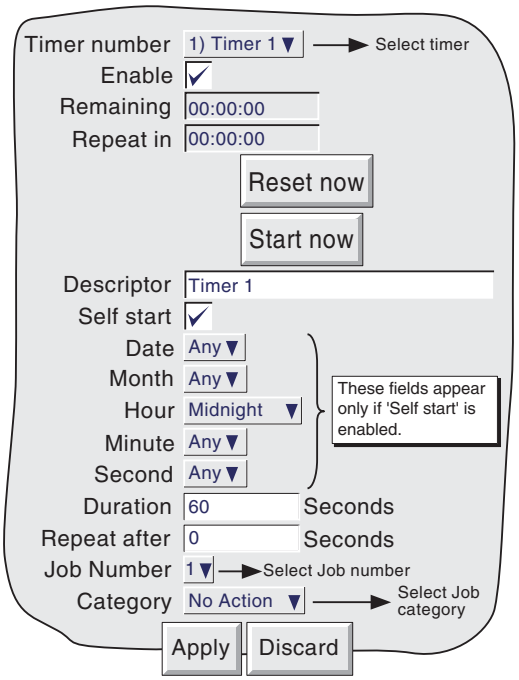


Figure 4.3.10 Typical timer configuration page

4.3.10 TIMERS (Cont.)

Configurable parameters

Timer number	Allows a specific timer to be selected for configuration
Enable	Allows the user to enable/disable the selected timer
Remaining	This is a dynamic display showing the time remaining in hours:minutes:seconds format.
Repeat in	For repeat timers, shows the time remaining before the repeat is initiated. Display is 00:00:00 whilst timer is counting down.
Reset now	Allows a running timer to be reset to 00:00:00.
Start now	Allows the operator to initiate the timer.
Descriptor	Allows a descriptor to be entered for the timer.
Self Start	If enabled, this causes date and time selection fields to appear as shown in figure 4.3.10 above.
	Date: allows a day number to be selected from a picklist of 1 to N and 'Any', where N is the maximum number of days in the selected month.
	Month: allows a month number to be entered from a picklist of 1 to 12 and 'Any'.
	Hour: allows an hour number to be selected from a picklist of 1 to 23, 'Midnight' and 'Any'.
	Minute: allows a minutes number to be entered from a picklist of 0 to 59 and 'Any'.
	Seconds: allows a seconds value to be entered from a picklist of 0 to 59 and 'Any'.
Duration	Allows the user to enter a count-down time period in seconds.
Repeat after	Allows the user to enter a repeat rate. It should be noted that the repeat value includes the duration time. For example, to time down from 50 seconds, every minute, a 'Duration' value of 50 seconds should be entered, with a 'Repeat after' value of 60 seconds (not 10 seconds).

Note: If Month = 'Any', and Day = 31, then the timer will not be triggered in February, April, June, September or November. Similarly, if Day = 30, the timer will not be triggered in February, and so on.

Job configuration is as described in section 4.7.

SELF-START EXAMPLE

To preset Totaliser number 1 to zero, daily, at midnight:

In totaliser configuration, enter 0 as the Preset value for Totaliser 1.
In timer configuration, select:

1.	Timer number	Timer 1
2.	Enable	enabled
3	Self start	enabled
4	Date	Any
5.	Month	Any
6.	Hour	Midnight
7.	Minute	0
8.	Second	0
9.	Duration	0.125
10.	Repeat after	0
11.	Job number	1
12.	Job category	Totaliser
13.	Action	Preset
14.	Totaliser	Totaliser 1
15.	On	Active

4.3.11 Options

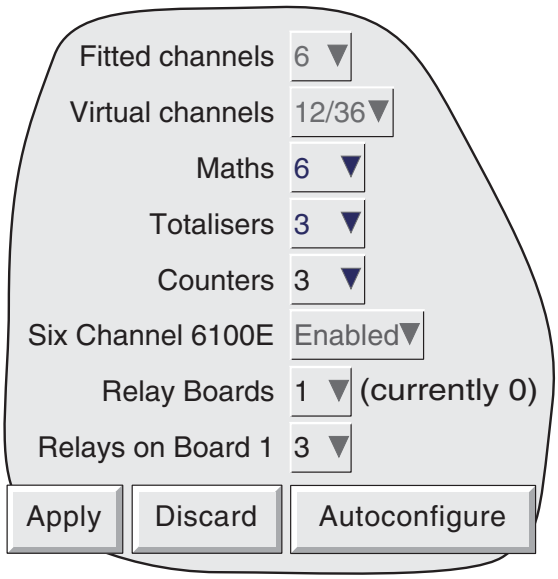


Figure 4.3.11 Options menu layout

Touching this key calls a display showing the current recorder hardware/software setup, for example the number of input channels fitted, and if an output relay boards is fitted, Subsequently, should further options be fitted this page shows the difference between the hardware actually fitted and the hardware the recorder software is configured for (currently ...). Whenever there is a difference, the 'Autoconfigure' key can be pressed to alert the recorder to the fact that extra options have been added (or taken away).

If no changes have occurred since last switch-on, then the '(currently ...)' fields and the 'Autoconfigure' key do not appear.

VIRTUAL CHANNELS

Virtual channels are Maths channels, Totalisers and Counters. The total number of virtual channels is as specified at time of order. A maximum of 128 virtual channels is possible (as a chargeable option). The user can select whatever combination of maths channels, totalisers and counters is required, so long as the total does not exceed the number of virtual channels available. If it does, a warning is given when the 'Apply' button is operated, and the edit is ignored.

Note: If more than 100 maths channels are required, it is possible to use some of the totaliser channels modbus address space, however the Modbus register addresses of totalisers and counters are affected, to make room for the additional channels.

If for example there were 105 maths channels, the value of the new maths channel 101 would be at the address normally associated with totaliser 1, in turn totaliser 1 would be found in totaliser 6, and the value of counter 1 would be found at the address normally associated with counter 6. The 5 new channels being added will increment the exisitng allocated values along by the same amount of channels being added - to a maximum of 28.

4.4 SECURITY

Touching this key allows the operator to select ‘Login’ (described in section 3.3.1)

4.5 NETWORK KEY

Note: This manual does not describe network setup in detail, as each network is different. In most cases, the help of the network administrator or supervisor will be required, for example, in the allocation of valid addresses and passwords.

Touching the Network key calls a selection box to the display, allowing ‘Address’ or ‘Name’ to be selected for configuration.

4.5.1 Address

Figure 4.5.1 shows the address menu fields.

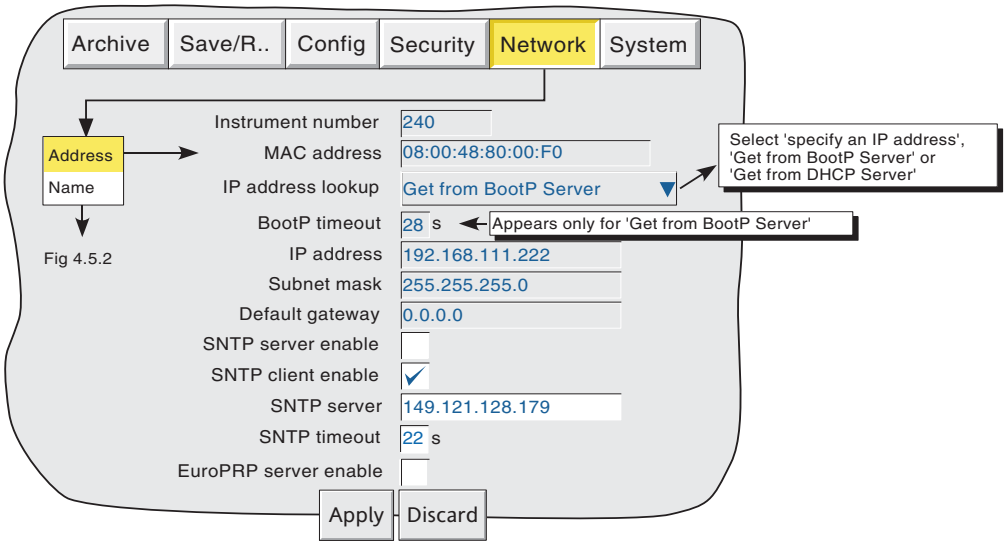


Figure 4.5.1 Network addressing

INSTRUMENT NUMBER/MAC ADDRESS

Unique numbers set up during manufacture to identify the recorder to a remote host, or to the recorder manufacturer/distributor, in case of query.

IP ADDRESS LOOKUP

This field allows an address to be entered for the recorder. This can be done either by manually entering an address (IP address field - below), or a network service BootP or DHCP can be used to assign an IP address to the recorder.

BOOTP TIMEOUT

This 28 second period is the maximum time the recorder will wait, at power-up, for a response from the BootP server. If no response is received within this time, the IP address, Subnet mask and Default gateway are all set to, or remain at 0.0.0.0

4.5.1 NETWORK ADDRESS (Cont.)

IP ADDRESS

Allows manual entry of the recorder's internet protocol (IP) address only if 'Specify an IP address' is selected in the 'IP address lookup' picklist above.

Notes:

1. DHCP attempts to connect to the network continuously, until successful. Only when successful will the network settings be updated and appear at the address page. This can take up to 13 seconds after power up.
2. It takes 2 to 3 minutes for a DHCP failure to be reported, so an instrument alarm would not be generated for 2 to 3 minutes after power up, should the connection fail to be established.

SUBNET MASK

This field is editable only if 'Specify an IP address' is selected in the 'IP address lookup' picklist above. The subnet mask is the network address plus the bits in the host address reserved for sub-network identification. By convention, all the network address bits are set to 1. The subnet mask is used to identify the subnet to which an IP address belongs by performing a bitwise AND on the mask and the IP address.

DEFAULT GATEWAY

To deliver traffic from one subnet to another, devices called 'routers' or 'gateways' are placed between segments. The default gateway address informs each network device where to send data if the target station does not reside on the same subnet as the source.

SNTP SERVER ENABLE

This tick box allows the recorder to act as an SNTP time server.

SNTP CLIENT ENABLE

This tickbox allows time synchronisation from a Simple Network Time Protocol (SNTP) server to be enabled and disabled. When enabled, the instrument time is updated every 15 minutes.

4.5.1 NETWORK ADDRESS (Cont.)

SNTP SERVER

If 'Obtain from BootP server' or 'Obtain from DHCP server' is selected as the IP address look-up (see above), then this address appears automatically. Otherwise this area allows an IP address to be entered for the SNTP server.

Notes:

1 SNTP is a protocol that allows clients on a TCP/IP network to set their times to that of a server - port number 123. The recorder can act both as a client and as a server; when acting as a server, the resolution is 1 msec.
2. SNTP time is based on elapsed seconds since 00:00 hrs on 1st January 1900. The time is not affected by time zones or daylight saving adjustments.
3. If the instrument time differs from the SNTP time by less than 2 seconds, the instrument time is updated gradually (1 msec 8 times a second) to prevent time change events being recorded. If the difference is greater than 2 seconds, this is defined as a 'time change event', the results of which are that the recorder time is immediately updated, and a green line is drawn across the chart (vertical trend/history only) to indicate the time change.
4. If more than 5 time change events occur within 24 hours, a 'Time Synchronisation failure' instrument alarm is set 24 hours after the first event. Once synchronisation is re-established, the alarm self-clears within 24 hours.
5. An 'SNTP server failure' instrument alarm is flagged if the configured server cannot be accessed, or if the year received from the server is less than 2001 or more than 2035.
6. When the instrument is acting as a server and a "Clock Failure' instrument alarm is active, the server time is set to 1/1/1900 which is ignored by clients.
7. Servers such as Microsoft 'TimeServ' cannot be used with this series of instruments because they are not SNTP servers.

SNTP TIMEOUT

This parameter allows a timeout in seconds, to be configured. The parameter defaults to 20 seconds ensuring that the system continues to behave as before for users who do not change this value.

EUROPRP SERVER ENABLE

Enabling this item causes the instruent to 'declare itself' (i.e. to become visible to a network scanning tool running on a PC), thus allowing the pc user to identify all such instruments on a network.

4.5.2 Name

Figure 4.5.2 shows the 'Name' fields

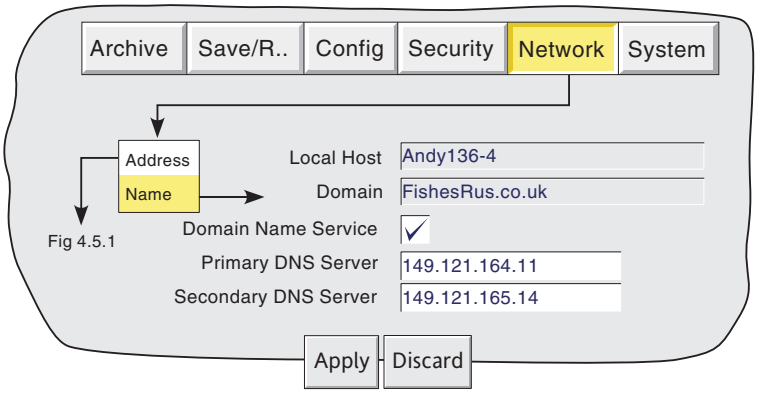


Figure 4.5.2 network name fields

LOCAL HOST

English language name for the recorder. Non-editable - assigned to the IP Address

DOMAIN

The name of the Group or area of networked units which contains the recorder. Non editable.

DOMAIN NAME SERVICE (DNS)

Enables the mapping of host names to IP addresses and vice-versa.

PRIMARY/SECONDARY DNS SERVER

IP addresses supplied by IT department or the Domain manager or Supervisor.

Notes:

1. Any one or more of the above items may be overwritten if 'IP address lookup' is set to 'Obtain from BootP Server' or 'Obtain from DHCP server' as described under 'Address' above.
2. If Domain Name Server is enabled, but either no DNS server is connected to the network or neither the DNS Primary nor secondary server can be 'found', it can take up to four minutes for the system to timeout. During this period, the recorder's user interface (touchscreen) will not respond.

4.6 SYSTEM

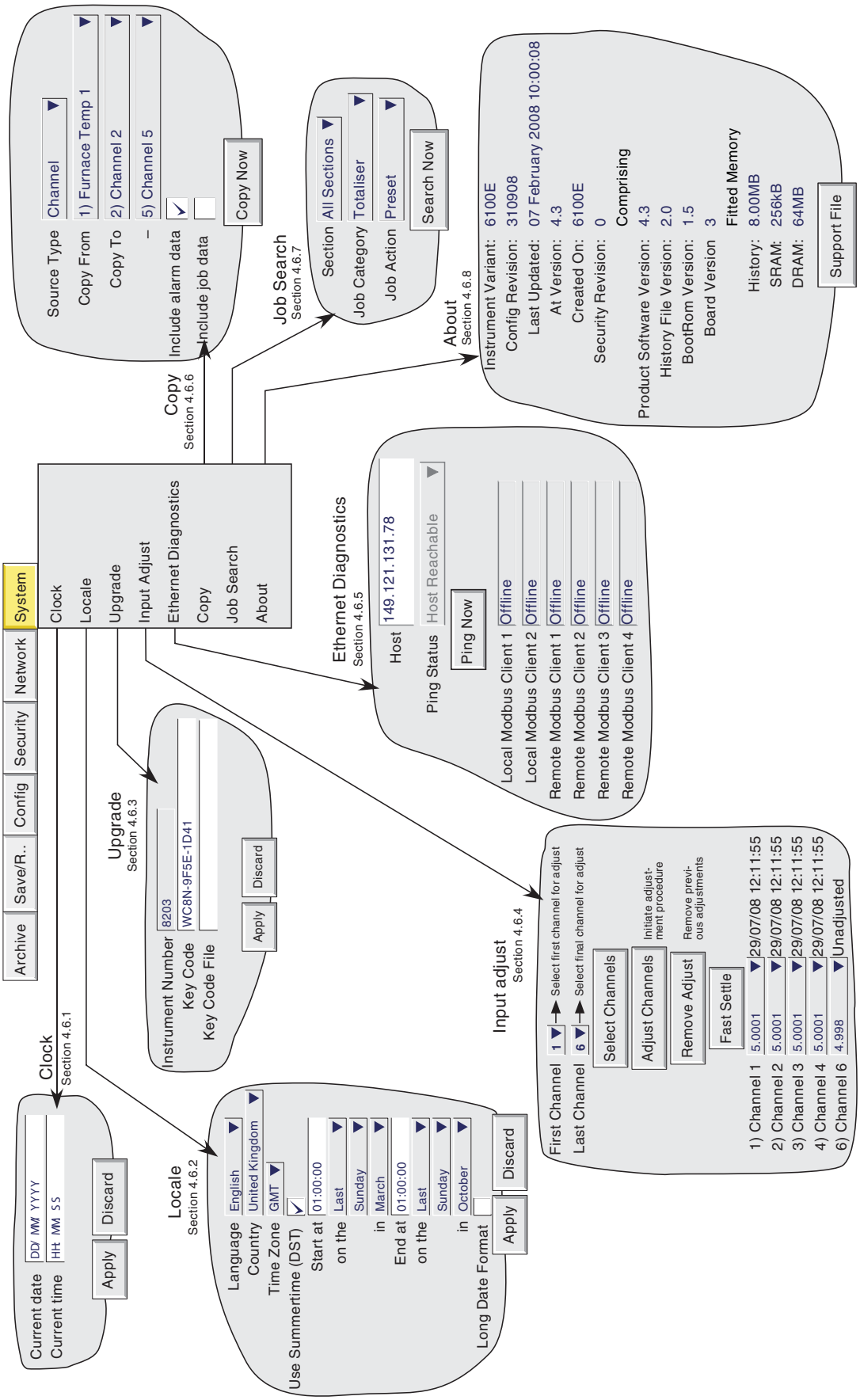


Figure 4.6a System Key menu layout

4.6 SYSTEM (Cont.)

Touching the System key calls the pick list: Clock, Locale, Upgrade, Input adjust, Ethernet diagnostics, Copy, Job search, About.
Figure 4.6a above, gives an overview of the System Menus.

4.6.1 Clock

Selecting 'clock' causes the recorder's date and time to be displayed. To edit the date, touch the current date area, to call the keyboard and enter the new numbers. The date is edited in a similar way. The settings apply as soon as the 'Apply settings' button is touched. See also SNTP details in section 4.5.1.

4.6.2 Locale

This allows the setting of the following items:

Language — Choose the required language from the picklist
Country — Displays a pick list of countries associated with the selected language
Time zone* — Select required time zone from picklist.
Use Summertime (DST)* — Select box if daylight saving is to be used, If 'Use Summertime (DST)' is selected, the times and dates for the start and end of summertime can be entered using picklists - see figure 4.6a.

Notes

1 Date format DD/MM/YY or MM/DD/YY is defined by the language and country selected. Time format (e.g. 12/24 hr. clock) is defined by the country selected.

2. For more information, see B7 (Annex B) and/or http://www.timeanddate.com

LONG DATE FORMAT

Table 4.6.2 shows some examples of the Standard and Long Format date layouts which are available according to Language and Country selections.

Country (Language)	Date display	
	Standard	Long Format
Argentina	01/05/06	01/05/2006
Australia	1/05/06	1/05/2006
Bolivia	01-05-06	01-05-2006
Canada (Eng)	01/05/06	1-May-06
Canada (Fra)	06-05-01	06-05-01
France	01/05/06	1 mai 06
Germany	01.05.06	01.05.2006
Holland	1-5-06	1-mei-06
Italy	01/05/06	1-Mag-06
Portugal	01-05-2006	1/Mai/06
South Africa	06/05/01	2006/05/01
Spain	1/05/06	01-may-06
Switzerland (Fra)	01.05.06	1 mai 06
Switzerland (Ger)	01.05.06	01.05.2006
Switzerland (Ita)	01.05.06	1-mag-06
United Kingdom	01/05/06	01-May-06
United States	5/1/06	01-May-06
Uruguay	01/05/06	01/05/2006

Table 4.6.2 Date format examples

4.6.3 Upgrade

This allows new options to be enabled by the entering of a ‘Key Code’.

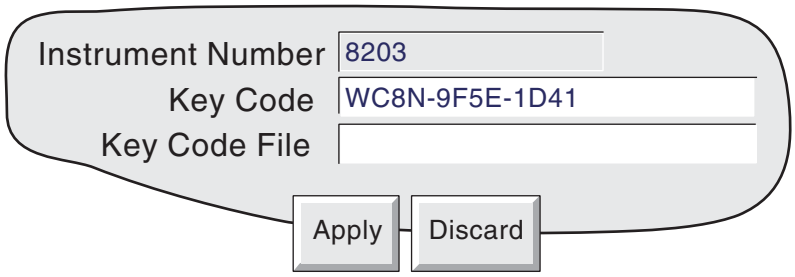


Figure 4.6.3 Upgrade menu

Instrument Number	This number must be quoted when ordering upgrades. It is unique to the instrument and is not user editable.
Key Code	If the relevant key code is known, it can be entered manually using this field
Key Code File	If Key Code File is selected, the first line of the file must be the Key Code. To select the file for reading, the Key Code File field is touched, to display the file list - if necessary, refer to section 5, below, for more details.

4.6.4 Input adjust

Notes

1. Input adjust cannot be applied to input channels with input type of 'Digital', 'Test' or 'comms'.
2. The instrument must be powered for a sufficient time (e.g. 30 mins) for it to reach thermal equilibrium before an input adjust is performed.

This facility allows the user to compensate for tolerance errors etc. The technique used is to select those channels to which adjust is to be applied, then for each channel to:

a apply a known low level signal (at or close to the low input range value) to the relevant input. When the recorder reading is steady, press 'Apply'.

b. apply a known high level signal (at, or close to, the high input range value) to the relevant input. When the recorder reading is steady, press 'Apply'.

Figure 4.6.4a shows the initial display which appears when 'Input adjust' is first selected from the SYSTEM menu. Channels 1 to 6 are selected by default.

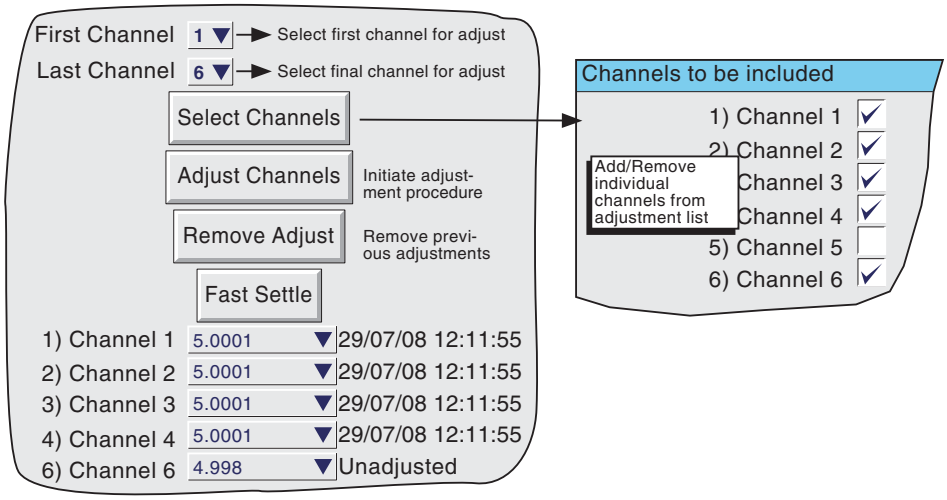


Figure 4.6.4a Input adjust status page

First channel	Allows the user to select the lowest channel number of all the channels to be adjusted.
Last channel	Allows the user to select the highest channel number of all the channels to be adjusted.
Select Channels	Presents a list of all the channels from the First channel to the Last channel inclusive, each of which can be removed from the adjustment list by 'unticking' its check box. The channels displayed in the status page reflect this selection.
Adjust channels	Initiates the adjustment procedure to all the channels from the First channel to the Last channel inclusive, unless the effectivity is modified using the Select Channels key.
Remove Adjust	Returns the selected channels to factory calibration
Fast Settle	Switches off the input filter for 1 second, to allow quicker response. Adjust channels' values are displayed as 'RANGING' for the 1 second duration.
1) Channel 1 etc.	A list of channels required to be susceptible to the adjustment procedure, together with their current values and their adjustment status (i.e. Unadjusted or, the time/date of the previous adjustment (if any)).

4.6.4 INPUT ADJUST (Cont.)

ADJUST PROCEDURE

Operation of the Adjust Channels key calls the low-end adjust page, as shown in figure 4.6.4b.

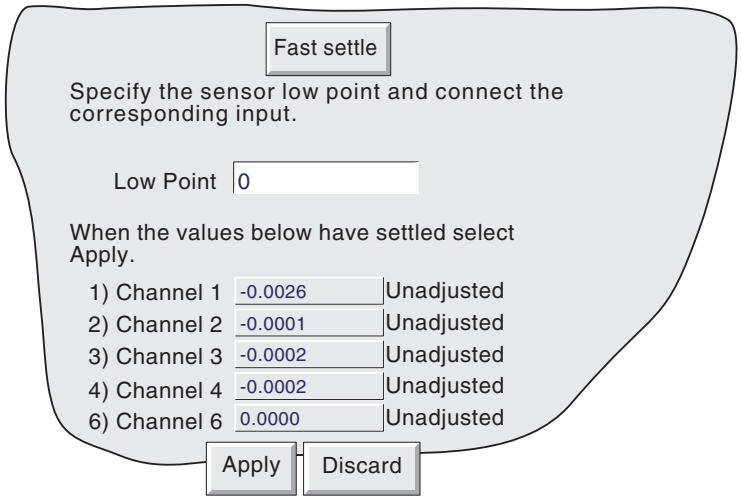


Figure 4.6.4b Typical low-end input adjust page

Fast Settle — Reduces the time taken for the readings to stabilise
Low Point — Usually 0, but a different value can be entered here, if required.

Apply the Low point value to the relevant input channels, and wait some minutes for the recorder readings to become stable. When the readings are stable, press the Apply key, to call the High-end page depicted in figure 4.6.4c, below.

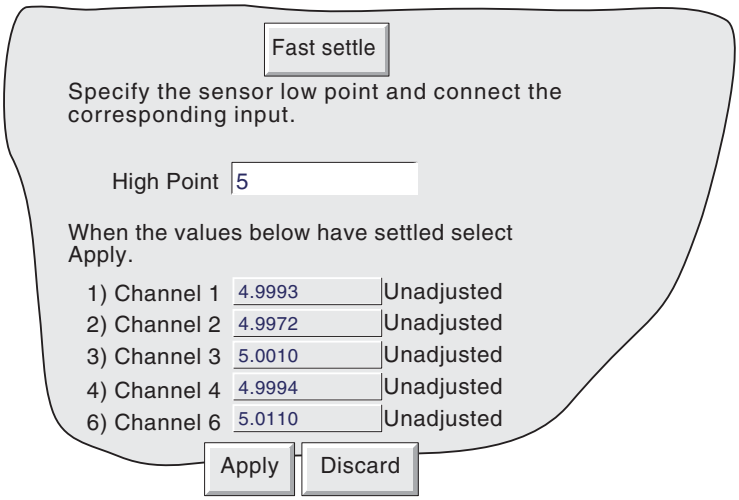


Figure 4.6.4c Typical high-end input adjust page

Fast Settle — Reduces the time taken for the readings to stabilise
High Point — Default value displayed, but a different value can be entered here, if required.

Apply the High point value to the relevant input channels, and wait some minutes for the recorder readings to become stable. When the readings are stable, press the Apply key, to return to the status page.

Note: Adjusting a channel invalidates the accuracy values given in the specification in Annex A for that channel.

4.6.5 Ethernet Diagnostics

This screen (figure 4.6.5) allows the user to test the status of the connection with a host computer, and if Modbus comms is enabled, the connections with local and remote Modbus slaves.

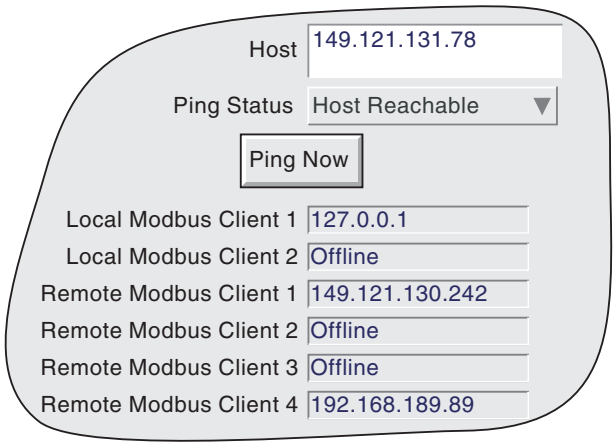


Figure 4.6.5 Ethernet Diagnostics display

Host — Allows the IP address, or DNS Name of the host to be 'Pinged'.

Ping Status — Indicates the latest status returned - see table 4.6.5, below for details.

Ping Now — Operating this button causes an Internet Control Message Protocol (ICMP) command to be sent to the host. If the host receives the message, it returns a message to the sender within a few seconds.

Local Modbus Client — Appears only if the 'Master Comms' option is enabled. Indicates that the local Modbus Master is connected.

Remote Modbus Client — Appears only if the 'Master Comms' option is enabled. Displays the IP address of connected Modbus TCP/IP clients. Otherwise 'Offline' is displayed.

Displayed Status	Interpretation
Waiting	The default status displayed on power up.
In Progress	Displayed whilst waiting for a response from the host
Host Reachable	A device was found at the specified address.
Ping (Error in value)	Host refused to allow socket connection on the defined Ping Port.
Request Timed Out	Unable to reach a host at the specified network address.
Host Unreachable	Unable to reach a host at the specified network address.
Unknown error	An unknown internal error has occurred.

Table 4.6.5 Ping Status

4.6.6 Copy

This facility allows the user to copy a point or group configuration from one point, etc. to one or more others. The user may choose whether or not to include alarm and (if applicable) job data when copying point configurations. Descriptors and colour selections are not copied.

Figure 4.6.6 shows a typical configuration page for copying the configuration of channel 1 (Furnace Temp1) to channels 2 to 5 inclusive.

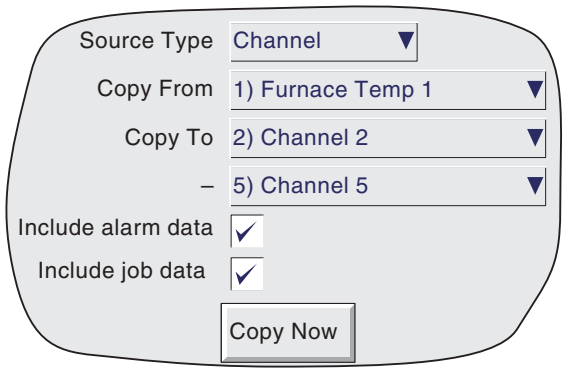
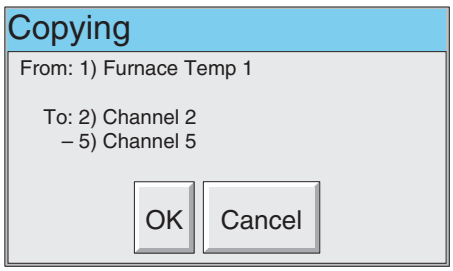


Figure 4.6.6 Copy configuration page (typical)

When 'Copy Now' is operated, a confirmatory dialogue box opens, to allow the user to check the source and destination entries.



CONFIGURABLE PARAMETERS

Source Type	Picklist allows selection of Group, Channel, Event, Message, Maths Channel, Totaliser, Counter, or Timer as the type of source to be copied.
Copy From	Allows the user to select a specific point, group etc. to be copied
Copy To	Allows the first destination point to be selected, for the source to be copied to.
–	Allows the final destination point to be selected for the source to be copied to.
Include alarm data	This field appears only for source types which support alarms. If this box is 'selected', then alarm data is included in the copy process.
Include job data	This field appears only for source types which support jobs. If this box is 'selected', then jobs data is included in the copy. For source types that support both alarms and jobs, it is not possible to include job data, without including alarm data as well.

Note: Group copy not applicable to this recorder model

4.6.6 COPY (Cont.)

Once the copy is complete, the user should enter the configuration area of the items that have been copied, and edit/apply the changes etc.

COPY RULES

1. The first channel on any input card may not be a digital input type.
2. If a destination channel was a digital input, AND the source channel is an analogue input AND 'include alarm data' is not selected, the destination channel alarm settings will be set as:

   Enable = Off; Type = Absolute high; Threshold = 0.0; Dwell = 0.0.
3. If a destination channel was an analogue input, AND the source channel is a digital input AND 'include alarm data' is not selected, the destination channel alarm settings will be set as:

   Enable = Off; Type = Digital; Threshold = Closed; Dwell = 0.0.
4. Descriptors and Colours are never copied.

4.6.7 Job search

With multiple job sources, it can sometimes be difficult to discover what the trigger for a particular job is, particularly if the recorder has been configured by more than one operator. The 'Job Search' facility allows the user to define a job type, and the recorder then produces a list of relevant triggers. Figure 4.6.7 shows a typical search page, which will produce a list of all triggers for Preset Totaliser jobs.

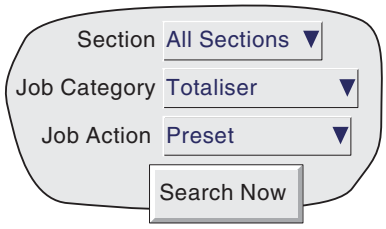


Figure 4.6.7a Job search

Section	Allows the user to select a point type for the search. For example, selecting 'Maths', causes the search to be restricted to Maths channels. 'All Sections' causes all enabled point types to be included in the search.
Job Category	Allows a job category (e.g. 'Totaliser') to be selected for the search.
Job Action	This depends on the job category. For example, for 'Totalisers', 'Preset', 'Disable', Preset Group' or 'Disable Group' to be selected. Section 4.7 gives details of all job types and their associated actions.
Search Now	Operation of this button initiates the search, after confirmation.

SEARCH RESULTS

The search results in one of two displays, one 'No Match was found' if no jobs are found which match the search criteria, or a list of triggers is produced. A typical example is given in figure 4.6.7b.

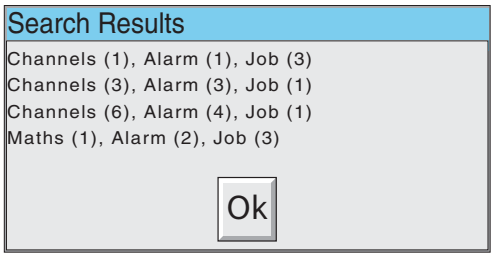


Figure 4.6.7b Search results (typical)

4.6.8 About

Selecting ‘About’ from the System key menu gives details of the version numbers of different aspects of the recorder, and details of the amount of memory fitted. Figure 4.6.8 shows a typical ‘About’ display page.

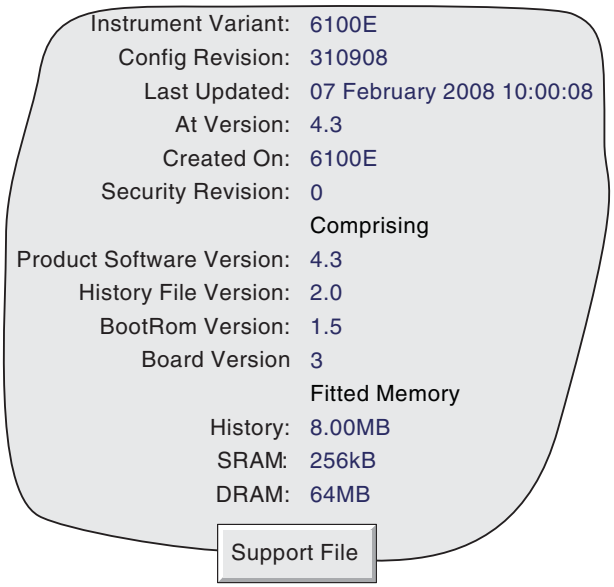


Figure 4.6.8 About display (typical).

INSTRUMENT VARIANT

Displays the instrument type.

CONFIG REVISION

Whenever a change to the Configuration of the recorder is applied the ‘Config Revision’ is incremented. For these purposes, Configuration is defined as including all items within the menu structures of the Config and Network keys, and includes User Screens. Config Revision is printed on the ‘chart’ at power up,

Notes:

1. Config Revision can be used as an input to one or more maths channels. If such a maths channel is included in one or more groups, the revision number can be determined for any time/date, when Trend History mode is invoked for the group(s) in question. See section 4.3.7 for maths function details.
2. Config Revision can be embedded in one or more messages, as described in section 4.3.6.

LAST UPDATED

The time and date at which the configuration was last edited.

AT VERSION

The version number at the time of the last configuration update.

CREATED ON

Shows the type of instrument that the configuration was created on. Normally, this is the same as ‘Instrument Variant’, and will be different only if the configuration has been downloaded from a different instrument model.

4.6.8 ABOUT (Cont.)

SUPPORT FILE

If the unit is not performing as it should (e.g. it resets itself unexpectedly), the Support File key allows the user to save 'critical system files' into a single file (SupportInfo.uhq*) which may be saved to a Compact Flash card or to a memory stick, for despatch to the manufacturer for analysis. For security reasons, this file cannot be viewed by anyone other than the manufacturer or the manufacturer's agents.

Once the save operation is complete, a 'Support' message appears on the screen giving details of where to send the file. More information is held in the file 'SupportInfo.txt' which is also saved. This file can be opened, and the information within it read, by inserting the disk/memory stick into a PC, clicking on the floppy disk icon (A drive) in 'My Computer' and then double clicking on the file icon when it appears.

* 'SupportInfo' is the default name. This name may be edited by the user before saving to disk or pc. The .uhq suffix is automatically appended to the new name.

4.7 JOBS

A number of sources (e.g. channel, event, totaliser) can be set up to trigger one or more jobs. The following description includes all possible job categories, but which jobs are available on any particular recorder depends on the options fitted to that recorder.

The type of action (continuous or 'single-shot'), available for selection, depends on the type of trigger source. Continuous actions are selected from: While active, While inactive or While unacknowledged. The available single-shot actions are: On becoming active, On becoming inactive, On acknowledgement.

4.7.1 No Action

This means that no job action is configured for the trigger source.

4.7.2 Drive relay category

Allows a specific relay to be set up to change state whilst the trigger source is active, inactive or whilst it remains unacknowledged. Relays are normally energised i.e. 'common' (c) is shorted to 'normally open' (no). When in alarm, the relay is de-energised i.e. 'common' (c) is shorted to 'normally closed' (nc). Thus, if power is removed from the recorder, all relays automatically 'fail safe' to their alarm conditions. See section 2.2.1 for details of relay output board connector location(s) and pinout.

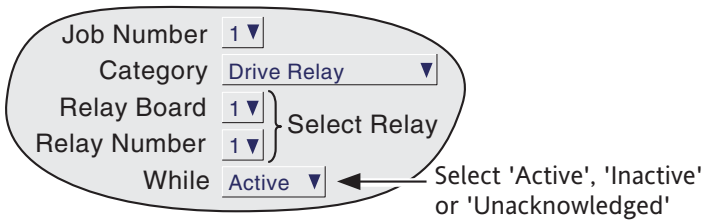


Figure 4.7.2 Relay job menu layout

4.7.3 Totaliser category

If the Totaliser option is fitted (section 4.3.8), the following jobs become available:

Preset	Loads the selected totaliser with the value set up in 'Preset' in the totaliser's configuration menu.
Preset Group	Loads all the totalisers in the group with their 'Preset' values.
Disable	Stops the specified totaliser accumulating.
Disable Group	Stops all totalisers in the group.

Note: If more than one job is set up to disable a particular totaliser, then any of these jobs going active will disable the totaliser.

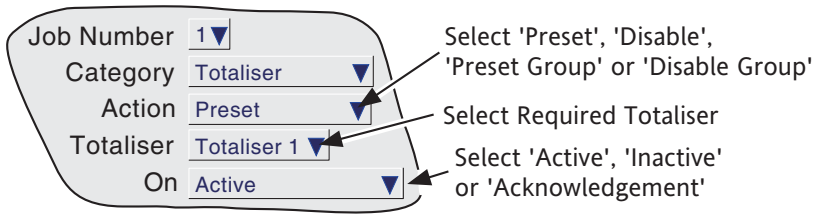


Figure 4.7.3 Totaliser job menu layout

4.7.4 Message category

One or more messages (section 4.3.6) can be directed to the display, to 'All groups' or to a 'Specified Group' (Group 1 for this recorder model). The messages must be contiguous - e.g. messages 2, 3 and 4 may be sent, but messages 1, 3 and 4 cannot be sent, without message 2 as well.

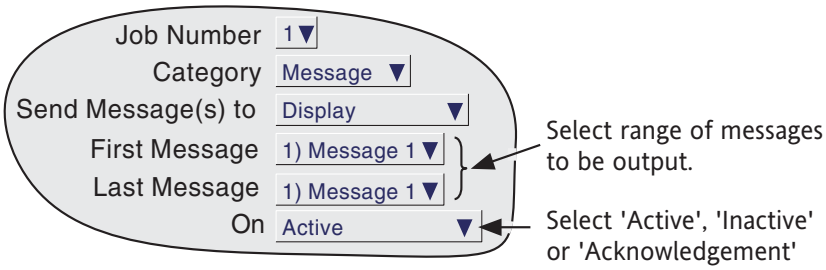


Figure 4.7.4 Message job menu layout

4.7.5 Maths category

If Maths channels (section 4.3.7) are enabled, the following jobs become available to applicable functions:

Reset	Sets the selected maths channel value to zero.
Disable	Stops historical functions such as Rolling Average from accumulating further values. When the function is subsequently re-enabled, the function re-starts from its pre-disabled value. 'Disable' has no effect on other functions.
Switch to B	Not applicable to this recorder model.
Trigger	Not applicable to this recorder model.

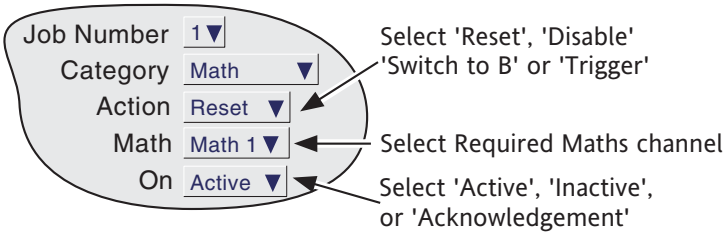


Figure 4.7.5 Maths job menu layout

4.7.6 Clock category

This job causes the System Clock to be Preset to the value entered in Instrument Configuration (Preset Hour, Preset Minute) (Section 4.3.1). This job can be used to synchronise a number of recorders as follows:

a. For each recorder, set up one input channel as

Input Type	Digital
Closed String.....	Synch (for example)
Enable	Trigger
Active when	Synch
Job 1 category....	Clock
Job 1 action	Preset
Job 1 On.....	Active

b. For each recorder, set the same preset hour and minute in Instrument Configuration.

c. For each recorder provide a simultaneous pulse or contact closure to the digital input previously set up.

The recorders will all be automatically set to the preset time on receipt of the input.

An alternative way of synchronising recorders is via an SNTP time server as described in section 4.5.1.

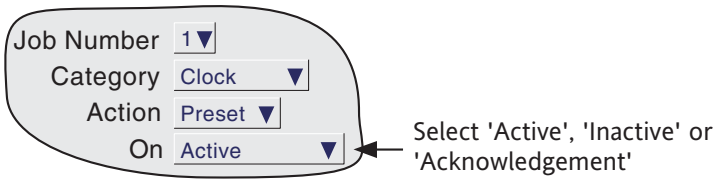


Figure 4.7.6 Clock job menu layout

Notes

1 Whenever a time change occurs, a green line is drawn across the chart in vertical trend mode.

2 The clock presets to the 'Preset Hour' value set in Config/Instrument menu. If, however, 'Use Summertime (DST)' is enabled in System/Locale configuration, then an hour is added whilst daylight saving time is in operation.

4.7.7 Counter category

If Counters (section 4.3.9) are enabled, the following jobs become available:

Preset counter Loads the selected counter with the preset value set in the configuration for that counter.
Disable counter Stops the selected counter.
Increment Adds 1 to the selected counter's value.
Decrement Subtracts 1 from the selected counter's value.
Preset group Loads all the counters in the group with their 'Preset' values.
Disable group Stops all counters in the group.

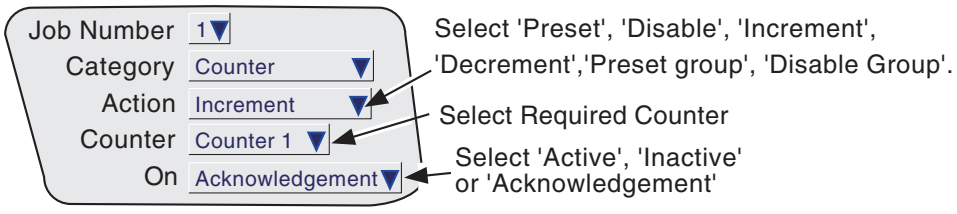


Figure 4.7.7 Counter job menu layout

4.7.8 Timer category

The following jobs are available:

1. Reset timer - sets the timer to zero
2. Start timer - causes the timer to start.
3. Disable timer - stops the timer.

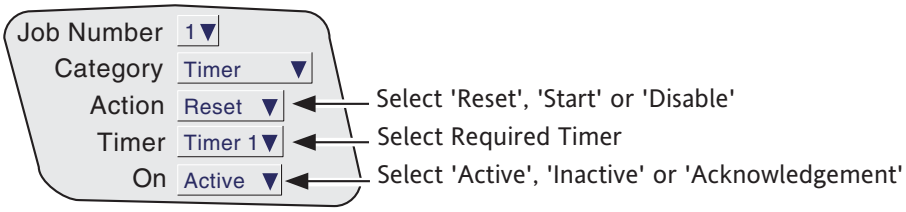


Figure 4.7.8 Timer job menu layout

4.7.9 Recording category

The following 'Recording jobs' are available:

Enable — This enables recording to the group's history file, 'while active', 'while inactive' or 'while un-acknowledged'.

Notes:

1 The group will be recorded only if Recording Enable selected in group Configuration (section 4.3.2) and the job is active.

2. A blue line is drawn across the 'chart' whenever a recording job is used to disable/enable recording.

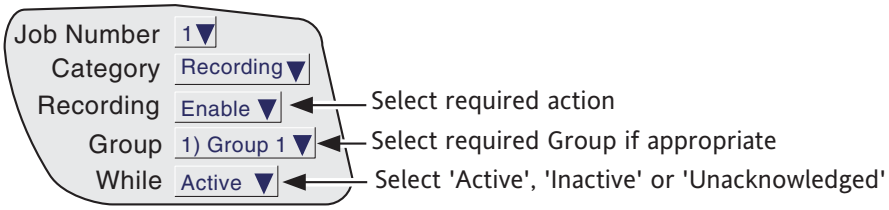


Figure 4.7.9 Recording job menu layout

4.7.10 Alarm category

This allows the user to set up a job to acknowledge or disable point alarms as follows:

Acknowledge All Alarms	Acknowledges all alarms
Acknowledge Alarms on Group	Acknowledges all alarms in the group
Acknowledge Alarms on Point	Acknowledges all alarms associated with the specified point
Acknowledge Alarm	Acknowledges specific alarm
Disable All Alarms	Disables all alarms
Disable Alarms on Group	Disables all alarms in the group
Disable Alarms on Point	Disables all alarms associated with the specified point
Disable Alarm	Disables a specific alarm

Further selection boxes allow a point number, to be defined if required.

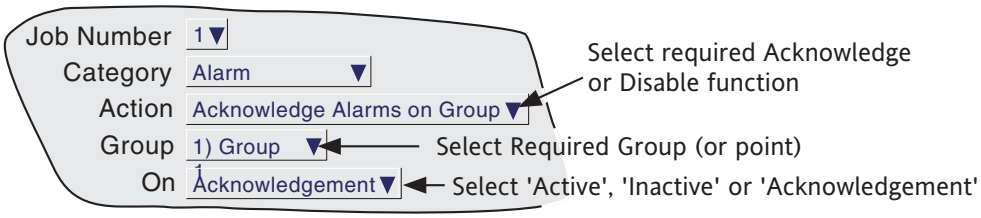


Figure 4.7.10 Alarm job menu layout

4.7.11 Archive category

Archive jobs allow a job to be used to trigger an archive to the instrument's mass storage medium or to a host computer using FTP transfer. The following jobs are available:

Archive Last Hour, Last Day, Last 7 Days or Last 31 days to FTP
Bring FTP archive up to date
Cancel Archive to FTP
Archive Last Hour, Last Day, Last 7 Days or Last 31 days to Local device
Bring Media Archive up to date
Suspend Archive to Media
Cancel Archive to Media

These jobs copy the archiving functions available from the 'Archive' key described in section 4.1 of this document. For 'FTP' items see 'Remote archiving'; for 'Media' see 'Local Archive'.

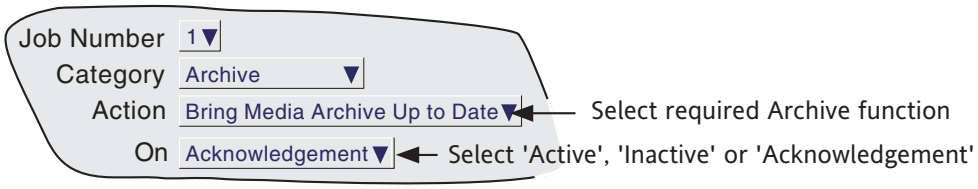


Figure 4.7.11 Archive jobs menu layout

5 FILE

Figure 5, below, gives an overview of the File Menus. The area is entered by touching the 'File' key of the root menu, and can be used to display the contents of directories stored both in the user area of flash memory and on any bulk storage device inserted or connected.

The first display page shows the 'volume' or 'device' names associated with the various areas of memory available to the user. If one of these volume names is selected (touched), and the 'open-folder' key* operated, the contents of the selected volume is displayed. This would typically consist of a list of folders. Similarly, if a folder name is selected and the 'open folder' key* is touched, the contents of the folder is displayed and so on.

To return to higher levels, the 'close-folder' key* is used.

The path name of the current window is shown at the top of the window.

*Note: The open-folder and close-folder key functions are the same as the down arrow and up arrow key functions respectively.

5.1 FILER OPTION MENU KEYS

These keys appear in a pop-up menu when the option key is pressed. This menu appears only when an actual file has been selected (i.e. it does not appear if a directory (folder) or volume is selected.) .

Cut	Removes a file from the list, ready for 'pasting' to another destination.
Copy	Copies a file from the list, ready for 'pasting' to another destination.
Delete	Removes a file from the memory.
New	Allows a new directory (folder) to be created
Paste	Places a 'cut' or 'copy' file into the new destination.
Refresh	Refreshes the display.

A key's legend is hidden if at any time its function is not applicable.

5.2 THE HIDE KEY

The Hide key at the top right corner of the display screen is used to hide (show) Type, Date and Bytes information, allowing the full filename text string to appear.

5 FILE (Cont.)

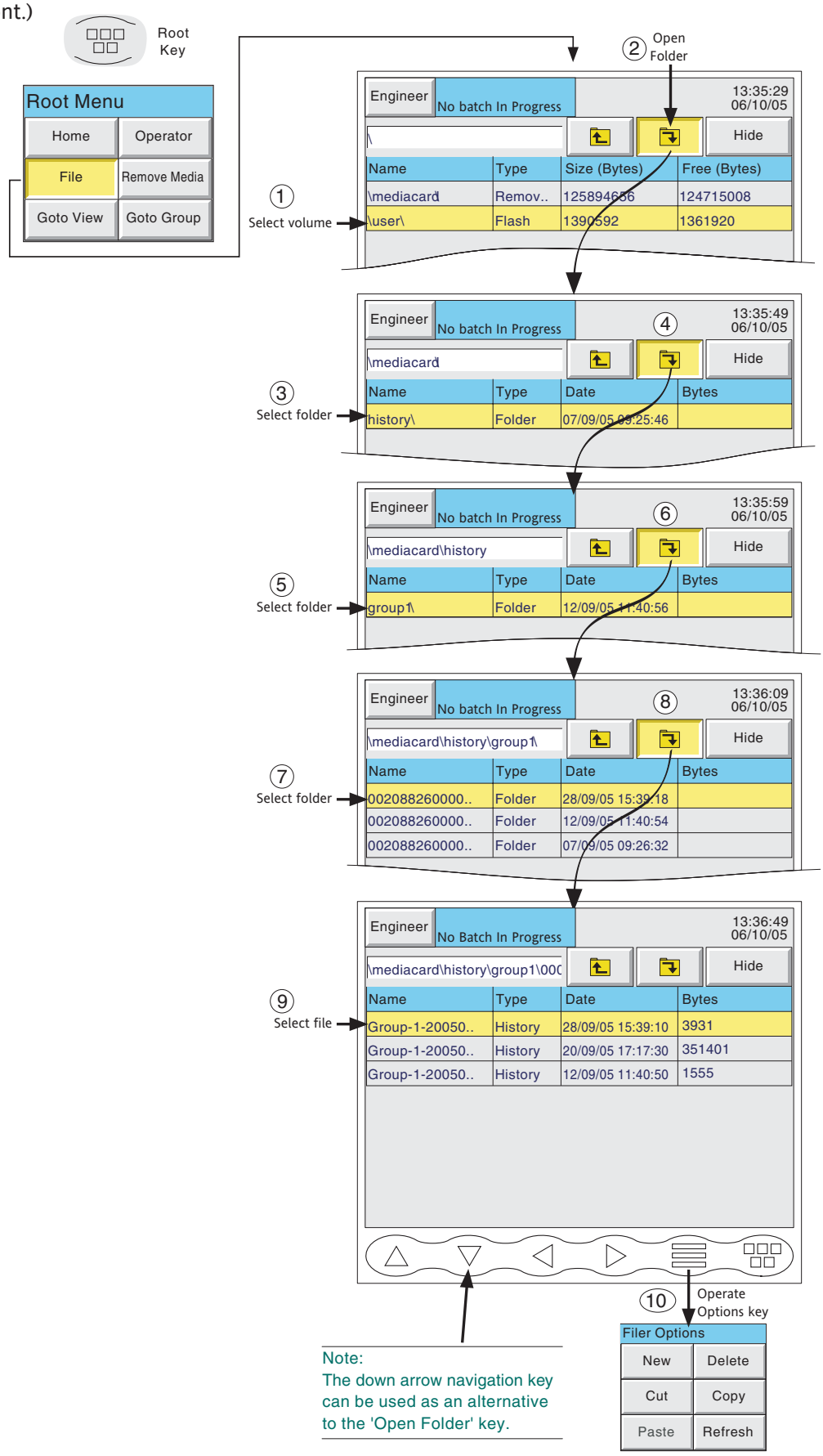


Figure 5 File system overview

5.3 FILE STRUCTURE

The file structure on the archive medium, is as depicted below in figure 5.3. Each subdirectory contains a maximum of 32 files, there being sufficient subdirectories created, to contain all the group's history files.

The subfolder names are the numerical part of the first history file that they contain.

For example if the first file name is Furnace1 Temp~20051012 80155F2601000120.uhh, then the subdirectory name will be 20051012 80155F2601000120.

If there are more than 32 files, the next subdirectory name is 20051012 80155F2601000140 (assuming the file names are contiguous).

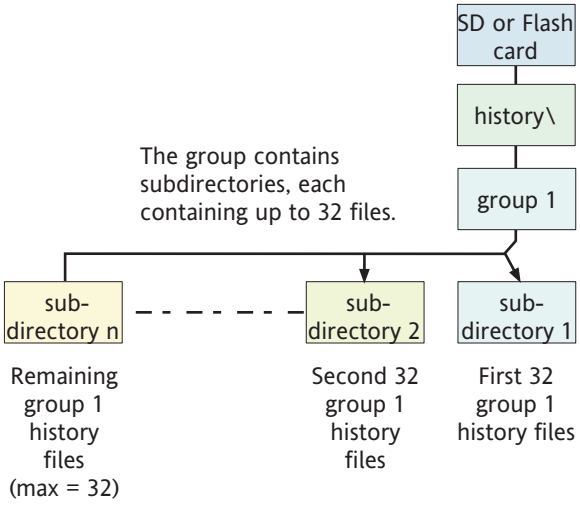


Figure 5.3 File structure (archive)

6 MODBUS TCP SLAVE COMMS

6.1 INSTALLATION

The installation of the Modbus link consists of connecting a standard Ethernet cable between the RJ45 connector at the rear of the recorder either:

1. Directly to a host computer, using a crossover cable
2. To a host computer via a network, using a 'straight through' cable.

6.2 INTRODUCTION

MODBUS TCP allows one or more recorders to act as 'slave' devices to one or more host computers connected via the RJ45 connector at the rear of the recorder. Each recorder must have a unique Internet Protocol (IP) address, set up as described in Section 4.5.

MODBUS TCP (Transmission Control Protocol) is a variant of the MODBUS family of communications protocols intended for supervision and control of automated equipment specifically covering the use of MODBUS messaging in an intranet or internet environment, using TCP/IP protocols. Much of the MODBUS detail in this manual is derived from the document openmbus.doc, available at http://www.modbus.org/default.htm The above mentioned document also includes implementation guidelines for users.

Note: The Modbus protocol allows a maximum of 255 data bytes to be read from or written to in one transaction. For this reason, the maximum number of standard (16 bit) registers that can be accessed in one transaction is 255/2 = 127 and the maximum number of IEEE (32-bit) registers is 127/2 = 63.

6.2.1 Function Codes

MODBUS function codes 3, 4, 6, 8 and 16, defined in table 6.2.1a below, are supported and are fully described in section 6.5, below.

Code	MODBUS definition	Description
03	Read holding registers	Reads the binary contents of holding registers. In this implementation, code 03 is identical with code 04.
04	Read input registers	Reads the binary contents of input registers. In this implementation, code 04 is identical with code 03.
06	Pre-set single register	Writes a single value to a single register.
08	Diagnostics	Obtains communications diagnostics information
16	Pre-set multiple Registers	Writes values to multiple holding registers

Table 6.2.1a MODBUS Function code definition

DIAGNOSTIC CODES

Function code 08, subfunction 00 (Return query data) echoes the query (Loop back).

6.2.1 FUNCTION CODES (Cont.)

EXCEPTION CODES

MODBUS TCP provides reserved codes used for exceptions. These codes provide error information relating to failed requests. Exceptions are signalled by hex 80 being added to the function code of the request, followed by one of the codes listed in table 6.2.1b, below.

Code Dec	Code Hex	MODBUS definition	Description (see Modbus specification for full details)
01	01	Illegal Function	An invalid function code was received
02	02	Illegal Data Address	An invalid data address was received
03	03	Illegal Data Value	An invalid data value was received
04	04	Slave Device Failure	An unrecoverable error occurred in the recorder
09	09	Illegal Sub Function	An invalid sub function was received.
10	0A	Gateway path unavailable	Gateway misconfigured or overloaded.
11	0B	Gateway target device failed to respond	Device not present on the network

Table 6.2.1b Exception codes

6.2.2 Data types

The following data types are supported:

1 2's complement signed 16-bit analogue values with implied decimal point. The decimal point position must be configured in both the recorder and the host computer.

2 2's complement, 16, 32 and 64 bit signed integers.

3 16-bit unsigned integer values.

4 32 bit IEEE Floating point values.

5 Strings of limited size, can be transferred across Modbus TCP in ASCII format using a single non-multiplexed set of consecutive registers.

DATA ENCODING

MODBUS uses what is called a 'Big endian' representation for addresses and data items. This means that when a numerical quantity larger than a single byte is transmitted, the most significant byte is sent first. For example a 32-bit hex value of 12345678 would be transmitted as 12, followed by 34, followed by 56 and finally 78.

6.2.3 Invalid multiple register writes

When a recorder receives a multi-register write request, it is possible that one or more requests will be rejected. Under such a circumstance, the recorder will accept all valid write requests and ignore any invalid writes. No error response is produced.

6.2.4 Security

The recorder has a local file in which the correct Username and Password are stored. Should a host fail to login after three attempts, the recorder will terminate the connection.

This MODBUS security function can be enabled/disabled in the Operator/Config/Instrument menu (section 4.3.1).

Note: Modbus Security must be disabled in order for Modbus communications to be established. Once the Master is communicating with the Slave, Modbus security can be re-enabled, providing that the master has the correct remote user name and password data for the relevant slave. If this information is missing, all read/write requests will be ignored by the slave.

6.2.4 SECURITY (Cont.)

The following C++ code is intended for use in creating a suitable 16-bit encrypted register using an IP address and password:

```
/*-------------------------------------------------------------------------

          FUNCTION  : MB_Driver::encrypt
       DESCRIPTION  : Create an encrypted value from a password string
         ARGUMENTS  : pswd   : Pointer to password from network file
                      eKey   : Pointer to eKey, usually I.P. address (must be 4 bytes)
                    RETURN   : result : A 16 bit value representing the encryption result
                     NOTES   : None
-------------------------------------------------------------------------*/
Ushort MB_Driver::encrypt(cchar *pswd, cchar *ipAddr)
{
   Uchar   key1;
   Uchar   key2;
   Ushort  dataLen;
   Uchar   ibyte;
   Ushort  byteResult = 0;
   Uchar  *encryptedData = NULL;
   Uchar   eKeys[4];
   Ulong  ipAddress;

   /* Convert ip address to an unsigned long value so that we can manipulate
      each of the 4 bytes, to be used as our private keys */
   ipAddress = inet_addr(ipAddr);

   // Now split the bytes up by copying the IP address into a byte array
   memcpy(eKeys, &ipAddress, sizeof(Ulong));

   // From the 4 bytes of the IP address create two exclusive keys
   key1 = eKeys[0] ^ eKeys[3];
   key2 = eKeys[1] ^ eKeys[2];

   // Calculate the length of the string to be encrypted
   dataLen = strlen(pswd);

   // Create some memory to store the new encrypted password
   encryptedData = (Uchar*) malloc(sizeof(Uchar)*dataLen);

   /* Copy the unencrypted password into a byte array, so we can use the
      character code as each byte value */
   memcpy(encryptedData, pswd, dataLen);

   /* Perform EXOR comparison between keys and raw data.
      Perform the operation on each byte using alternate key values
      starting at byte 1 with key 1 */
   for(ibyte=0; ibyte < dataLen;)
   {
      // EXOR with the key1
      encryptedData[ibyte++] ^= key1;
```

(Continued)

6.2.4 SECURITY (Cont.)

```
        // Compare the next byte with key2
        if(ibyte < dataLen)
        {
            encryptedData[ibyte++] ^= key2;
        }
    }

    /* Now EXOR each byte to the next byte until no more are available
       if all goes well the last byte in the array should never change */
    for(ibyte=0; ibyte < (dataLen-1); ibyte++)
    {
        encryptedData[ibyte] = (encryptedData[ibyte] ^ encryptedData[ibyte+1]);
    }

    // Now add all the bytes together to get a 16 bit value result
    for(ibyte=0; ibyte < dataLen; ibyte++)
    {
        byteResult += encryptedData[ibyte];
    }

    // Return the encrypted string as a 16 bit value
    return(byteResult);
}
```

Notes:

1. If login is accepted, a standard response is sent to the master
2. If three invalid logins are sent, by the master, then an ‘illegal address’ exception code (2) is sent to the master.

6.2.4 SECURITY (Cont.)

TO SEND A LOGIN REQUEST

Request

Figure 6.2.4a shows data transmission sequence for sending a login request to a recorder with Modbus address 1, using the Ethernet network connection. Figure 6.2.4b is the same message for use with serial communications

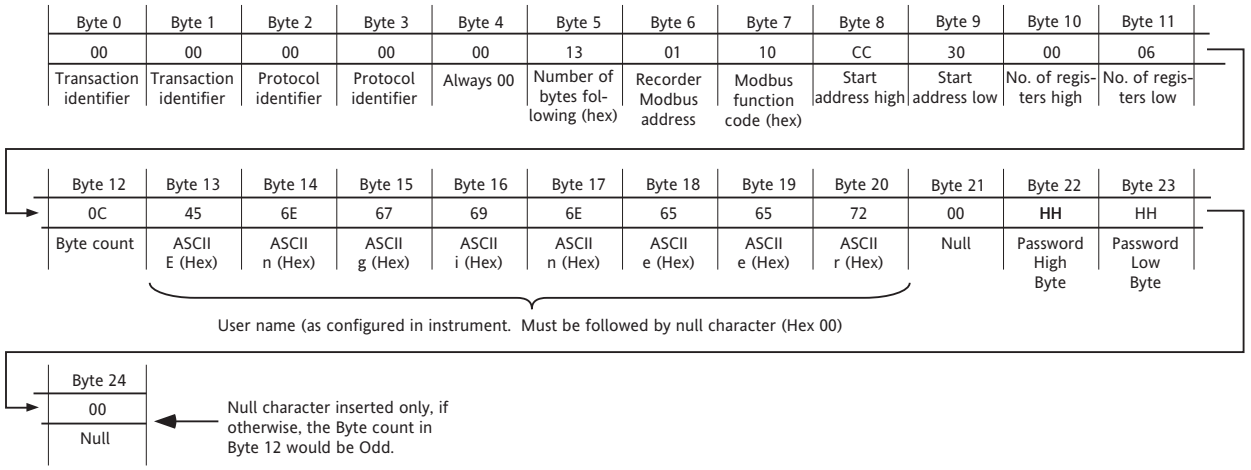


Figure 6.2.4a Login request via Ethernet (Modbus TCP)

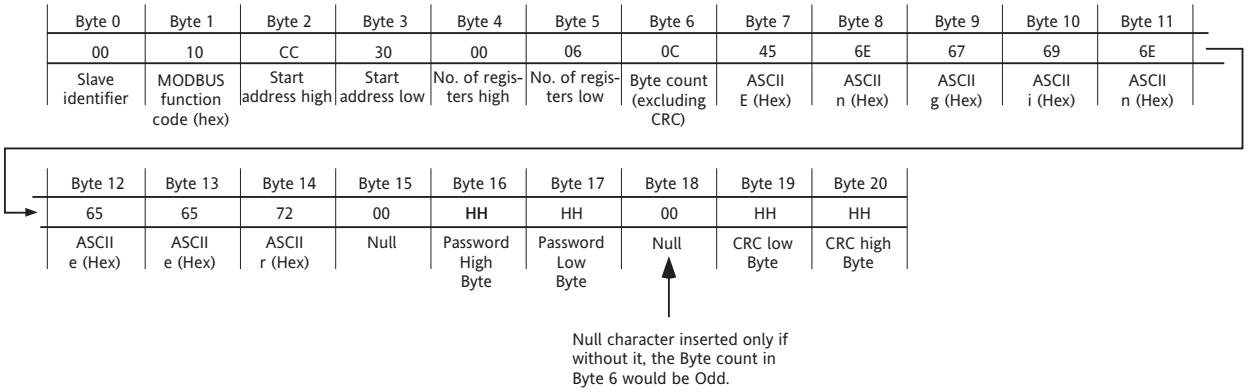


Figure 6.2.4b Login Request using a serial transmission line.

Notes:

1 The high and low password bytes are entered using the result of the encryption program above. If the password is blank, both High and Low Bytes must be 00 (null).

2 For successful login, the 'Connect from remote' item must be enabled (ref. 'Access levels in section 4.4.1).

6.2.4 SECURITY (Cont.)

TO SEND A LOGIN REQUEST (CONT.)

Response

Figures 6.2.4c and 6.2.4d show response messages for successful and non-successful login attempts.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11
00	00	00	00	00	06	01	10	CC	30	00	05
Transaction identifier	Transaction identifier	Protocol identifier	Protocol identifier	Always 00	Number of bytes following (hex)	Recorder Modbus address	Modbus function code (hex)	Start Address high	Start Address low	No. of registers high	No. of registers low

Figure 6.2.4c Response to a successful login attempt

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
00	00	00	00	00	04	01	90	02
Transaction identifier	Transaction identifier	Protocol identifier	Protocol identifier	Always 00	Number of bytes following (hex)	Recorder Modbus address	Modbus function code+ MSB set (hex)	Exception code

Figure 6.2.4d Response after an unsuccessful login attempt

Note: MSB = Most Significant Bit

6.2.5 Text messages

In order to increase efficiency, it is possible to set the system to transmit screen messages (e.g. alarm on/off) only when a new message occurs. This is done by continuously polling the 'Text Length' parameter (in group data - section 6.4.4) to see if its value is non-zero. (This parameter contains the character count of the latest message to occur since the last poll.)

If 'text length' is non-zero, the host must access the parameter 'Read Text' (also in group data) to read the message, and it must also reset the 'Text Length' parameter to zero. This causes the recorder to look for any further messages in the queue, and if there are, it will load the latest message into the area accessed by 'Read Data', and then set 'Text Length' to the length of the new message. If the host fails to set Text Length to zero after reading a message, no new messages will be read.

If 'Text Length' is zero, no new messages have been generated since the last poll.

LONG MESSAGES

All messages are terminated with a null character.

Messages of up to 60 characters (including the time and date and the terminating 'null') can be read by the master device in a single transaction.

If the message contains more than 60 characters, one or more continuation messages of up to 60 characters each are placed in 'Read Text', as soon as the previous message has been confirmed as 'read'. The master can continue to read all these messages, until it detects a 'null' character. Intelligent masters can then re-assemble the characters into a single message. Non-intelligent masters can treat the continuation messages as separate messages sent at the same time as the first message.

Notes:

1. If any of the messages is of less than 60 characters, the unused part of message is filled with 'null' characters (example 1). Thus, by reading character 60, the master can determine either that this is the last message (character 60 = 'null'), or that there is at least one message to follow (character 60 is not 'null').
2. Continuation messages cannot contain only null characters. For this reason, if the message itself (i.e. excluding final 'null' characters) is exactly 60 characters long (or a multiple of 60 characters long) then the final extension message contains a space, followed by 59 'nulls' (Example 2).
3. Time and date appear only in the main message, not the continuation message(s).

Example 1

Message of less than 60 characters

Character no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
English message	0	4	/	0	4	/	0	2		1	6	:	3	1	:	0	5		L	i	n	e	s		s	t	o	p	p	e	d		b	e	c	a	u	s	e		o	f		b	e	l	t		f	a	i	l	u	r	e							
ASCII (Hex)	30	34	2F	30	34	2F	30	32	20	31	36	3A	33	31	3A	30	35	20	4C	69	6E	65	73	20	73	74	6F	70	70	65	64	20	62	65	63	61	75	73	65	20	6F	66	20	62	65	6C	74	20	66	61	69	6C	75	72	65	00	00	00	00	00

Example 2

Message of exactly 60 characters

Message	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
	0	4	/	0	4	/	0	2		1	6	:	3	1	:	0	5		L	i	n	e	s		s	t	o	p	p	e	d		b	e	c	a	u	s	e		o	f		b	e	l	t		f	a	i	l	u	r	e		B	T	0	1
	30	34	2F	30	34	2F	30	32	20	31	36	3A	33	31	3A	30	35	20	4C	69	6E	65	73	20	73	74	6F	70	70	65	64	20	62	65	63	61	75	73	65	20	6F	66	20	62	65	6C	74	20	66	61	69	6C	75	72	65	20	42	54	30	31

Space = hex 20; Null = 00

Extension message (Space + 59 null characters)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
	20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

6.2.5 TEXT MESSAGES (Cont.)

Example 3

Message of more than 60 but less than 120 characters

Message

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
0	4	/	0	4	/	0	2		1	6	:	3	1	:	0	5		L	i	n	e	s		s	t	o	p	p	e	d		b	e	c	a	u	s	e		o	f		b	e	l	t		f	a	i	l	u	r	e		o	n		l
30	34	2F	30	34	2F	30	32	20	31	36	3A	33	31	3A	30	35	20	4C	69	6E	65	73	20	73	74	6F	70	70	65	64	20	62	65	63	61	75	73	65	20	6F	66	20	62	65	6C	74	20	66	61	69	6C	75	72	65	20	6F	6E	20	6C

Space = hex 20; Null = 00

Extension message

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
i	n	e		3		s	e	c	t	i	o	n		1	7																																																		
69	6E	65	20	33	20	73	65	63	74	69	6F	6E	20	31	37	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

6.3 ADDRESS MAP

Figure 6.3 shows the range of addresses allocated to various recorder functions. Each of these functions is described in detail in later sections.

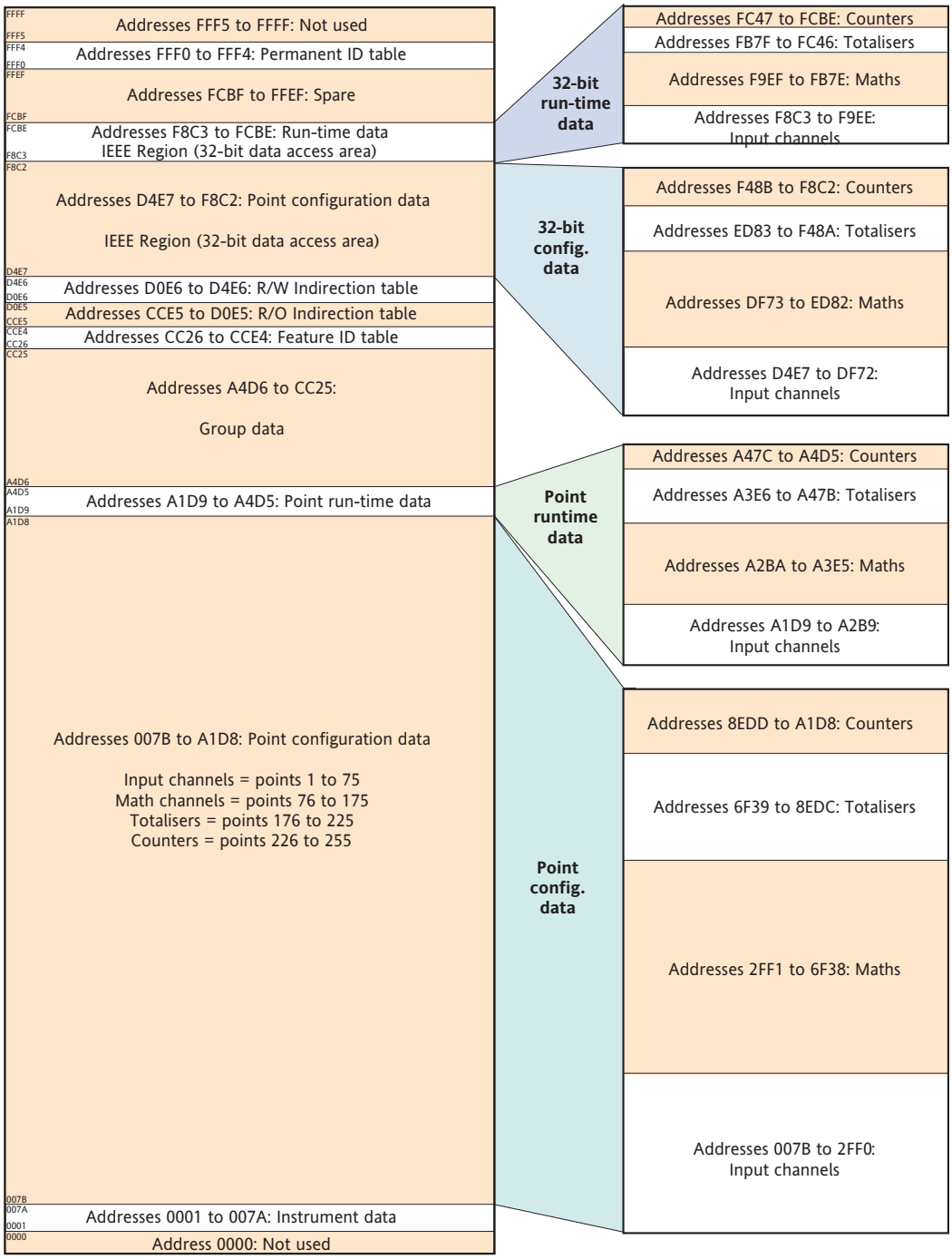


Figure 6.3 Address map representation

Notes:

1 All addresses in hexadecimal
2 Areas represent relative sizes, but are not to scale
3. Not all the points referred to in the map are available with this recorder model

6.3 ADDRESS MAP (Cont.)

The contents of the group can be determined by reading the relevant register number, as shown in section 6.4.4, below. The table below is a decoder for the results.

For example, if the group has channels 1 to 6, maths channel 1 and totaliser three fitted, the results would be:

Register 1 = 63 (32 + 16 + 8 + 4 + 2 + 1) (channels 1 to 6)
Register 5 = 2048 (maths channel 1)
Register 12 = 2 (Totaliser 1)
All other register values = 0

Value if bit set →		1	2	4	8	16	32	64	128	256	512	1024	2048	4096	8192	16384	32768
Bit number →		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Register Number	1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	2	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
	3	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
	4	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
	5	65	66	67	68	69	70	71	72	73	74	75	M1	M2	M3	M4	M5
	6	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21
	7	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36	M37
	8	M38	M39	M40	M41	M42	M43	M44	M45	M46	M47	M48	M49	M50	M51	M52	M53
	9	M54	M55	M56	M57	M58	M59	M60	M61	M62	M63	M64	M65	M66	M67	M68	M69
	10	M70	M71	M72	M73	M74	M75	M76	M77	M78	M79	M80	M81	M82	M83	M84	M85
	11	M86	M87	M88	M89	M90	M91	M92	M93	M94	M95	M96	M97	M98	M99	M100	T1
	12	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17
	13	T18	T19	T20	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30	T31	T32	T33
	14	T34	T35	T36	T37	T38	T39	T40	T41	T42	T43	T44	T45	T46	T47	T48	T49
	15	T50	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15
	16	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29	C30	

Table 6.3 'Channels in group' interpretation

6.4 ADDRESS ALLOCATION

This section consists of a number of tables showing how the address space within the memory map is allocated. For full details of configuration parameters, refer to section 4. For convenience, the word 'channel' is used as an umbrella term for measuring points in general (i.e. input channels, maths channels, totalisers etc.).

The following 'types' are used in the tables.

1 Uint16 16 bit unsigned integer.
2 Uint32 32 bit unsigned integer.
3 Uint64 64 bit unsigned integer.
4 Scaled Double precision floating point value scaled to represent single precision 16-bit integer between – 32,767 and + 32,767.
5 Boolean Represented as a single 16 bit integer.
6 Enum Enumeration value - represented by a single 16 bit character.
7 16, 32 and 64-bit 2's complement signed integers.

Note: When reading a Process Variable (PV) values, as 'scaled' integers the position of the decimal point is set by the 'Max. Decimal Digits' parameter in the relevant Channel's Configuration. Only if the resulting value can be represented within 16 bit resolution (±32767), will the value be transmitted accurately. For example, a value of 12.3456 needs more than 16-bit resolution, and the transmitted value would be the maximum value of 32767 (over range). Reducing the number of decimal places to three, for example (12.345) allows the value to be encoded as a 16-bit value which can be transmitted accurately.

6.4.1 Instrument data

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec)	Register Length
Instrument type	Instrument type number	Uint16	Read only	0001 (1)	1
Instrument descriptor	Instrument descriptor (up to 20 characters)	String_20	Read only	0002 (2)	10
Reserved	Not used			000C (12)	10
Instrument status		Uint16	Read only	0016 (22)	1
	Bit 0: Not used (value always 0)		Read only		
	Bit 1: Not used (value always 0)		Read only		
	Bit 2: Not used (value always 0)		Read only		
	Bit 3: 0 = SD/Flash card inserted, 1 = Missing		Read only		
	Bit 4: 0 = SD/Flash card not full, 1 = Full		Read only		
	Bit 5: Not used (value always 0)		Read only		
	Bit 6 Not used (value always 0)		Read only		
	Bit 7 Not used (value always 0)		Read only		
	Bit 8: Not used (value always 0)		Read only		
	Bit 9: 0 = No channel failures, 1 = channel failure		Read only		
	Bits 10 to 15: Not used (value always 0)		Read only		
Config counter	Counts configuration changes. Powers up at zero, and is reset to zero at brown-out	Uint16	Read only	0017 (23)	1
Time	Current instrument time (UTC format)	Double	Read only	0018 (24)	4
Date	Current instrument date	Double	Read only	001C (28)	4
Global alarm acknowledge	A value of 1 acknowledges all alarms. Other values: no effect	Uint16	Write only	0020 (32)	1
Spare	Not used			0021 (33)	74
Product version	Product version. Returns value HHHH (CNOMO*) (HHHH = version number in hex. E.G. 0401 = version 4.01)	Uint 16	Read only	006B (107)	1
Serial number	Returns 'Instrument Number' (see Section 4.5) in decimal.	Uint32	Read only	006C (108)	2
Not used				006E (110)	11
Company ID	Company ID. Returns value hex 0500 (CNOMO*)	Uint 16	Read only	0079 (121)	1
Product ID	Product ID. Returns model number in hex (CNOMO*)	Uint 16	Read only	007A (122)	1

* CNOMO = Comité de normalisation de movens de production

6.4.2 Channel configuration data

The following tables give hex addresses for channels 1 to 6, inclusive.
Generally: channel N parameter address = channel 1 parameter address + 162 (N-1) (decimal).

CHANNEL 1

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Ch1 Span high	Upper span value (display full scale)	Scaled	Read only	007B (123)	1
Ch1 Span low	Lower span value (display 'zero')	Scaled	Read only	007C (124)	1
Ch1 Zone high	Zone high value (two decimal places)	Scaled	Read only	007D (125)	1
Ch1 Zone low	Zone low value (two decimal places)	Scaled	Read only	007E (126)	1
Ch1 PV type	Input type 1 = Analogue input 3 = Totaliser 2 = Maths 4 = Counter	Enum	Read only	007F (127)	1
Ch1 Decimal places	Number of decimal places (0 to 9) (used by all scaled parameters except where stated)	Uint16	Read only	0080 (128)	1
Ch1 Colour	Channel colour (0 to 55) (See Annex B for RGB definitions)	Enum	Read only	0081 (129)	1
Ch1 Units	Units string (up to five characters)	String_5	Read only	0082 (130)	3
Spare				0085 (133)	2
Ch1 Open string	Open Digital Input string (up to eight characters)	String_8	Read only	0087 (135)	4
Spare				008B (139)	4
Ch1 Close string	Closed Digital Input string (up to eight characters)	String_8	Read only	008F (143)	4
Spare				0093 (147)	4
Ch1 Descriptor	Channel descriptor (up to 20 characters)	String_20	Read only	0097 (151)	10
Spare				00A1 (161)	10
Ch1 No of alarms	Number of alarms on this channel	Uint16	Read only	00AB (171)	1
Ch1 PV format	0 = Numeric 1 = Digital strings	Enum	Read only	00AC (172)	1
Spare				00AD (173)	60
Ch1 Alarm 1 enable	Alarm 1 enable 0 = Off 2 = Latched 1 = Unlatched 3 = Trigger	Enum	Read only	00E9 (233)	1
Ch1 Alarm 1 type	Alarm 1 type 0 = Absolute low 1 = Absolute high 2 = Deviation in 3 = Deviation out 4 = Rate of change rise 5 = Rate of change fall	Enum	Read only	00EA (234)	1
Ch1 Alarm 1 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	00EB (235)	1
Spare				00EC (236)	10
Ch1 Alarm 2 enable	Alarm 2 enable (As alarm 1 enable above)	Enum	Read only	00F6 (246)	1
Ch1 Alarm 2 type	Alarm 2 type (As alarm 1 type above)	Enum	Read only	00F7 (247)	1
Ch1 Alarm 2 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	00F8 (248)	1
Spare				00F9 (249)	10
Ch1 Alarm 3 enable	Alarm 3 enable (As alarm 1 enable above)	Enum	Read only	0103 (259)	1
Ch1 Alarm 3 type	Alarm 3 type (As alarm 1 type above)	Enum	Read only	0104 (260)	1
Ch1 Alarm 3 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	0105 (261)	1
Spare				0106 (262)	10
Ch1 Alarm 4 enable	Alarm 4 enable (As alarm 1 enable above)	Enum	Read only	0110 (272)	1
Ch1 Alarm 4 type	Alarm 4 type (As alarm 1 type above)	Enum	Read only	0111 (273)	1
Ch1 Alarm 4 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	0112 (274)	1
Spare				0113 (275)	10

Notes:
1 For maths totalisers and counters refer to the relevant section of the manual
2. If an alarm's Setpoint Source (section 4.3.3) is anything other than 'Constant', the value returned is the previously configured constant value.

6.4.2 CHANNEL CONFIGURATION DATA (Cont.)

CHANNEL 2

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Ch2 Span high	Upper span value (display full scale)	Scaled	Read only	011D (285)	1
Ch2 Span low	Lower span value (display 'zero')	Scaled	Read only	011E (286)	1
Ch2 Zone high	Zone high value (two decimal places)	Scaled	Read only	011F (287)	1
Ch2 Zone low	Zone low value (two decimal places)	Scaled	Read only	0120 (288)	1
Ch2 PV type	Input type 1 = Analogue input 3 = Totaliser 2 = Maths 4 = Counter	Enum	Read only	0121 (289)	1
Ch2 Decimal places	Number of decimal places (0 to 9) (used by all scaled parameters except where stated)	Uint16	Read only	0122 (290)	1
Ch2 Colour	Channel colour (0 to 55) (See Annex B for RGB definitions)	Enum	Read only	0123 (291)	1
Ch2 Units	Units string (up to five characters)	String_5	Read only	0124 (292)	3
Spare				0127 (295)	2
Ch2 Open string	Open Digital Input string (up to eight characters)	String_8	Read only	0129 (297)	4
Spare				012D (301)	4
Ch2 Close string	Closed Digital Input string (up to eight characters)	String_8	Read only	0131 (305)	4
Spare				0135 (309)	4
Ch2 Descriptor	Channel descriptor (up to 20 characters)	String_20	Read only	0139 (313)	10
Spare				0143 (323)	10
Ch2 No of alarms	Number of alarms on this channel (0 to 2)	Uint16	Read only	014D (333)	1
Ch2 PV format	0 = Numeric 1 = Digital strings	Enum	Read only	014E (334)	1
Spare				014F (335)	60
Ch2 Alarm 1 enable	Alarm 1 enable 0 = Off 2 = Latched 1 = Unlatched 3 = Trigger	Enum	Read only	018B (395)	1
Ch2 Alarm 1 type	Alarm 1 type 0 = Absolute low 1 = Absolute high 2 = Deviation in 3 = Deviation out 4 = Rate of change rise 5 = Rate of change fall	Enum	Read only	018C (396)	1
Ch2 Alarm 1 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	018D (397)	1
Spare				018E (398)	10
Ch2 Alarm 2 enable	Alarm 2 enable (As alarm 1 enable, above)	Enum	Read only	0198 (408)	1
Ch2 Alarm 2 type	Alarm 2 type (As alarm 1 type, above)	Enum	Read only	0199 (409)	1
Ch2 Alarm 2 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	019A (410)	1
Spare				019B (411)	10
Ch2 Alarm 3 enable	Alarm 3 enable (As alarm 1 enable above)	Enum	Read only	01A5 (421)	1
Ch2 Alarm 3 type	Alarm 3 type (As alarm 1 type above)	Enum	Read only	01A6 (422)	1
Ch2 Alarm 3 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	01A7 (423)	1
Spare				01A8 (424)	10
Ch2 Alarm 4 enable	Alarm 4 enable (As alarm 1 enable above)	Enum	Read only	01B2 (434)	1
Ch2 Alarm 4 type	Alarm 4 type (As alarm 1 type above)	Enum	Read only	01B3 (435)	1
Ch2 Alarm 4 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	01B4 (436)	1
Spare				01B5 (437)	10

Notes:
1 For maths totalisers and counters refer to the relevant section of the manual
2. If an alarm's Setpoint Source (section 4.3.3) is anything other than 'Constant', the value returned is the previously configured constant value.

6.4.2 CHANNEL CONFIGURATION DATA (Cont.)

CHANNEL 3

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Ch3 Span high	Upper span value (display full scale)	Scaled	Read only	01BF (447)	1
Ch3 Span low	Lower span value (display 'zero')	Scaled	Read only	01C0 (448)	1
Ch3 Zone high	Zone high value (two decimal places)	Scaled	Read only	01C1 (449)	1
Ch3 Zone low	Zone low value (two decimal places)	Scaled	Read only	01C2 (450)	1
Ch3 PV type	Input type 1 = Analogue input 3 = Totaliser 2 = Maths 4 = Counter	Enum	Read only	01C3 (451)	1
Ch3 Decimal places	Number of decimal places (0 to 9) (used by all scaled parameters except where stated)	Uint16	Read only	01C4 (452)	1
Ch3 Colour	Channel colour (0 to 55) (See Annex B for RGB definitions)	Enum	Read only	01C5 (453)	1
Ch3 Units	Units string (up to five characters)	String_5	Read only	01C6 (454)	3
Spare				01C9 (457)	2
Ch3 Open string	Open Digital Input string (up to eight characters)	String_8	Read only	01CB (459)	4
Spare				01CF (463)	4
Ch3 Close string	Closed Digital Input string (up to eight characters)	String_8	Read only	01D3 (467)	4
Spare				01D7 (471)	4
Ch3 Descriptor	Channel descriptor (up to 20 characters)	String_20	Read only	01DB (475)	10
Spare				01E5 (485)	10
Ch3 No of alarms	Number of alarms on this channel (0 to 2)	Uint16	Read only	01EF (495)	1
Ch3 PV format	0 = Numeric 1 = Digital strings	Enum	Read only	01F0 (496)	1
Spare				01F1 (497)	60
Ch3 Alarm 1 enable	Alarm 1 enable 0 = Off 2 = Latched 1 = Unlatched 3 = Trigger	Enum	Read only	022D (557)	1
Ch3 Alarm 1 type	Alarm 1 type 0 = Absolute low 1 = Absolute high 2 = Deviation in 3 = Deviation out 4 = Rate of change rise 5 = Rate of change fall	Enum	Read only	022E (558)	1
Ch3 Alarm 1 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	022F (559)	1
Spare			0230 (560)	10	
Ch3 Alarm 2 enable	Alarm 2 enable (As alarm 1 enable, above)	Enum	Read only	023A (570)	1
Ch3 Alarm 2 type	Alarm 2 type (As alarm 1 type, above)	Enum	Read only	023B (571)	1
Ch3 Alarm 2 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	023C (572)	1
Spare				023D (573)	10
Ch3 Alarm 3 enable	Alarm 3 enable (As alarm 1 enable above)	Enum	Read only	0247 (583)	1
Ch3 Alarm 3 type	Alarm 3 type (As alarm 1 type above)	Enum	Read only	0248 (584)	1
Ch3 Alarm 3 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	0249 (585)	1
Spare				024A (586)	10
Ch3 Alarm 4 enable	Alarm 4 enable (As alarm 1 enable above)	Enum	Read only	0254 (596)	1
Ch3 Alarm 4 type	Alarm 4 type (As alarm 1 type above)	Enum	Read only	0255 (597)	1
Ch3 Alarm 4 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	0256 (598)	1
Spare				0257 (599)	10

Notes:
1 For maths totalisers and counters refer to the relevant section of the manual
2. If an alarm's Setpoint Source (section 4.3.3) is anything other than 'Constant', the value returned is the previously configured constant value.

6.4.2 CHANNEL CONFIGURATION DATA (Cont.)

CHANNEL 4

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Ch4 Span high	Upper span value (display full scale)	Scaled	Read only	0261 (609)	1
Ch4 Span low	Lower span value (display 'zero')	Scaled	Read only	0262 (610)	1
Ch4 Zone high	Zone high value (two decimal places)	Scaled	Read only	0263 (611)	1
Ch4 Zone low	Zone low value (two decimal places)	Scaled	Read only	0264 (612)	1
Ch4 PV type	Input type 1 = Analogue input 3 = Totaliser 2 = Maths 4 = Counter	Enum	Read only	0265 (613)	1
Ch4 Decimal places	Number of decimal places (0 to 9) (used by all scaled parameters except where stated)	Uint16	Read only	0266 (614)	1
Ch4 Colour	Channel colour (0 to 55) (See Annex B for RGB definitions)	Enum	Read only	0267 (615)	1
Ch4 Units	Units string (up to five characters)	String_5	Read only	0268 (616)	3
Spare				026B (619)	2
Ch4 Open string	Open Digital Input string (up to eight characters)	String_8	Read only	026D (621)	4
Spare				0271 (625)	4
Ch4 Close string	Closed Digital Input string (up to eight characters)	String_8	Read only	0275 (629)	4
Spare				0279 (633)	4
Ch4 Descriptor	Channel descriptor (up to 20 characters)	String_20	Read only	027D (637)	10
Spare				0287 (647)	10
Ch4 No of alarms	Number of alarms on this channel (0 to 2)	Uint16	Read only	0291 (657)	1
Ch4 PV format	0 = Numeric 1 = Digital strings	Enum	Read only	0292 (658)	1
Spare				0293 (659)	60
Ch4 Alarm 1 enable	Alarm 1 enable 0 = Off 2 = Latched 1 = Unlatched 3 = Trigger	Enum	Read only	02CF (719)	1
Ch4 Alarm 1 type	Alarm 1 type 0 = Absolute low 1 = Absolute high 2 = Deviation in 3 = Deviation out 4 = Rate of change rise 5 = Rate of change fall	Enum	Read only	02DO (720)	1
Ch4 Alarm 1 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	02D1 (721)	1
Spare				02D2 (722)	10
Ch4 Alarm 2 enable	Alarm 2 enable (As alarm 1 enable, above)	Enum	Read only	02DC (732)	1
Ch4 Alarm 2 type	Alarm 2 type (As alarm 1 type, above)	Enum	Read only	02DD (733)	1
Ch4 Alarm 2 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	02DE (734)	1
Spare				02DF (735)	10
Ch4 Alarm 3 enable	Alarm 3 enable (As alarm 1 enable above)	Enum	Read only	02E9 (745)	1
Ch4 Alarm 3 type	Alarm 3 type (As alarm 1 type above)	Enum	Read only	02EA (746)	1
Ch4 Alarm 3 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	02EB (747)	1
Spare				02EC (748)	10
Ch4 Alarm 4 enable	Alarm 4 enable (As alarm 1 enable above)	Enum	Read only	02F6 (758)	1
Ch4 Alarm 4 type	Alarm 4 type (As alarm 1 type above)	Enum	Read only	02F7 (759)	1
Ch4 Alarm 4 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	02F8 (760)	1
Spare				02F9 (761)	10

Notes:
1 For maths totalisers and counters refer to the relevant section of the manual
2. If an alarm's Setpoint Source (section 4.3.3) is anything other than 'Constant', the value returned is the previously configured constant value.

6.4.2 CHANNEL CONFIGURATION DATA (Cont.)

CHANNEL 5

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Ch5 Span high	Upper span value (display full scale)	Scaled	Read only	0303 (771)	1
Ch5 Span low	Lower span value (display 'zero')	Scaled	Read only	0304 (772)	1
Ch5 Zone high	Zone high value (two decimal places)	Scaled	Read only	0305 (773)	1
Ch5 Zone low	Zone low value (two decimal places)	Scaled	Read only	0306 (774)	1
Ch5 PV type	Input type 1 = Analogue input 3 = Totaliser 2 = Maths 4 = Counter	Enum	Read only	0307 (775)	1
Ch5 Decimal places	Number of decimal places (0 to 9) (used by all scaled parameters except where stated)	Uint16	Read only	0308 (776)	1
Ch5 Colour	Channel colour (0 to 55) (See Annex B for RGB definitions)	Enum	Read only	0309 (777)	1
Ch5 Units	Units string (up to five characters)	String_5	Read only	030A (778)	3
Spare				030D (781)	2
Ch5 Open string	Open Digital Input string (up to eight characters)	String_8	Read only	030F (783)	4
Spare				0313 (787)	4
Ch5 Close string	Closed Digital Input string (up to eight characters)	String_8	Read only	0317 (791)	4
Spare				031B (795)	4
Ch5 Descriptor	Channel descriptor (up to 20 characters)	String_20	Read only	031F (799)	10
Spare				0329 (809)	10
Ch5 No of alarms	Number of alarms on this channel (0 to 2)	Uint16	Read only	0333 (819)	1
Ch5 PV format	0 = Numeric 1 = Digital strings	Enum	Read only	0334 (820)	1
Spare				0335 (821)	60
Ch5 Alarm 1 enable	Alarm 1 enable 0 = Off 2 = Latched 1 = Unlatched 3 = Trigger	Enum	Read only	0371 (881)	1
Ch5 Alarm 1 type	Alarm 1 type 0 = Absolute low 1 = Absolute high 2 = Deviation in 3 = Deviation out 4 = Rate of change rise 5 = Rate of change fall	Enum	Read only	0372 (882)	1
Ch5 Alarm 1 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	0373 (883)	1
Spare				0374 (884)	10
Ch5 Alarm 2 enable	Alarm 2 enable (As alarm 1 enable, above)	Enum	Read only	037E (894)	1
Ch5 Alarm 2 type	Alarm 2 type (As alarm 1 type, above)	Enum	Read only	037F (895)	1
Ch5 Alarm 2 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	0380 (896)	1
Spare				0381 (897)	10
Ch5 Alarm 3 enable	Alarm 3 enable (As alarm 1 enable above)	Enum	Read only	02E9 (907)	1
Ch5 Alarm 3 type	Alarm 3 type (As alarm 1 type above)	Enum	Read only	02EA (908)	1
Ch5 Alarm 3 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	02EB (909)	1
Spare				02EC (910)	10
Ch5 Alarm 4 enable	Alarm 4 enable (As alarm 1 enable above)	Enum	Read only	02F6 (920)	1
Ch5 Alarm 4 type	Alarm 4 type (As alarm 1 type above)	Enum	Read only	02F7 (921)	1
Ch5 Alarm 4 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	02F8 (922)	1
Spare				02F9 (923)	10

Notes:
1 For maths totalisers and counters refer to the relevant section of the manual
2. If an alarm's Setpoint Source (section 4.3.3) is anything other than 'Constant', the value returned is the previously configured constant value.

6.4.2 CHANNEL CONFIGURATION DATA (Cont.)

CHANNEL 6

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Ch6 Span high	Upper span value (display full scale)	Scaled	Read only	03A5 (933)	1
Ch6 Span low	Lower span value (display 'zero')	Scaled	Read only	03A6 (934)	1
Ch6 Zone high	Zone high value (two decimal places)	Scaled	Read only	03A7 (935)	1
Ch6 Zone low	Zone low value (two decimal places)	Scaled	Read only	03A8 (936)	1
Ch6 PV type	Input type 1 = Analogue input 3 = Totaliser 2 = Maths 4 = Counter	Enum	Read only	03A9 (937)	1
Ch6 Decimal places	Number of decimal places (0 to 9) (used by all scaled parameters except where stated)	Uint16	Read only	03AA (938)	1
Ch6 Colour	Channel colour (0 to 55) (See Annex B for RGB definitions)	Enum	Read only	03AB (939)	1
Ch6 Units	Units string (up to five characters)	String_5	Read only	03AC (940)	3
Spare				03AF (943)	2
Ch6 Open string	Open Digital Input string (up to eight characters)	String_8	Read only	03B1 (945)	4
Spare				03B5 (949)	4
Ch6 Close string	Closed Digital Input string (up to eight characters)	String_8	Read only	03B9 (953)	4
Spare				03BD (957)	4
Ch6 Descriptor	Channel descriptor (up to 20 characters)	String_20	Read only	03C1 (961)	10
Spare				03CB (971)	10
Ch6 No of alarms	Number of alarms on this channel (0 to 2)	Uint16	Read only	03D5 (981)	1
Ch6 PV format	0 = Numeric 1 = Digital strings	Enum	Read only	03D6 (982)	1
Spare				03D7 (983)	60
Ch6 Alarm 1 enable	Alarm 1 enable 0 = Off 2 = Latched 1 = Unlatched 3 = Trigger	Enum	Read only	0413 (1043)	1
Ch6 Alarm 1 type	Alarm 1 type 0 = Absolute low 1 = Absolute high 2 = Deviation in 3 = Deviation out 4 = Rate of change rise 5 = Rate of change fall	Enum	Read only	0414 (1044)	1
Ch6 Alarm 1 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	0415 (1045)	1
Spare				0416 (1046)	10
Ch6 Alarm 2 enable	Alarm 2 enable (As alarm 1 enable, above)	Enum	Read only	0420 (1056)	1
Ch6 Alarm 2 type	Alarm 2 type (As alarm 1 type, above)	Enum	Read only	0421 (1057)	1
Ch6 Alarm 2 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	0422 (1058)	1
Spare				0423 (1059)	10
Ch6 Alarm 3 enable	Alarm 3 enable (As alarm 1 enable above)	Enum	Read only	042D (1069)	1
Ch6 Alarm 3 type	Alarm 3 type (As alarm 1 type above)	Enum	Read only	042E (1070)	1
Ch6 Alarm 3 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	042F (1071)	1
Spare				0430 (1072)	10
Ch6 Alarm 4 enable	Alarm 4 enable (As alarm 1 enable above)	Enum	Read only	043A (1082)	1
Ch6 Alarm 4 type	Alarm 4 type (As alarm 1 type above)	Enum	Read only	043B (1083)	1
Ch6 Alarm 4 setpoint	Trigger setpoint (Note 2)	Scaled	Read/Write	043C (1084)	1
Spare				043D (1085)	10

Notes:
1 For maths totalisers and counters refer to the relevant section of the manual
2. If an alarm's Setpoint Source (section 4.3.3) is anything other than 'Constant', the value returned is the previously configured constant value.

6.4.3 Channel Run-Time data

These tables show addresses for channel input values. Generally: channel N address = channel 1 address + 3(N-1) (decimal)

CHANNEL 1

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Ch1 value	Current process value (PV)	Scaled	See note 1	A1D9 (41433)	1
Ch1 status	Channel status 0 = Good PV 5 = Ranging error 1 = Channel off 6 = Overflow 2 = Over range 7 = Bad PV 3 = Under range 8 = No data 4 = Hardware error	Enum	Read only	A1DA (41434)	1
Ch1 Alarms	Alarm information	Uint16	-	A1DB (41435)	1
	Bit 0: 0 = Alarm 1 inactive; 1 = Alarm 1 active		Read only		
	Bit 1: 0 = No alarm 1 Ack. required; 1 = Ack. required		Read only		
	Bit 2: 1 = Acknowledge alarm 1		Read/Write		
	Bit 3: Spare				
	Bit 4: 0 = Alarm 2 inactive; 1 = Alarm 2 active		Read only		
	Bit 5: 0 = No Alarm 2 Ack. required; 1 = Ack. required		Read only		
	Bit 6: 1 = Acknowledge alarm 2		Read/Write		
	Bit 7: Spare				
	Bit 8: 0 = Alarm 3 inactive; 1 = Alarm 3 active		Read only		
	Bit 9: 0 = No alarm 3 Ack. required; 1 = Ack. required		Read only		
	Bit 10: 1 = Acknowledge alarm 3		Read/Write		
	Bit 11: Spare				
	Bit 12: 0 = Alarm 4 inactive; 1 = Alarm 4 active		Read only		
	Bit 13: 0 = No Alarm 4 Ack. required; 1 = Ack. required		Read only		
	Bit 14: 1 = Acknowledge alarm 4		Read/Write		
	Bit 15: Spare				

CHANNEL 2

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Ch2 value	Current process value (PV)	Scaled	See note 1	A1DC (41436)	1
Ch2 status	Channel status 0 = Good PV 5 = Ranging error 1 = Channel off 6 = Overflow 2 = Over range 7 = Bad PV 3 = Under range 8 = No data 4 = Hardware error	Enum	Read only	A1DD (41437)	1
Ch2 Alarms	Alarm information	Uint16	-	A1DE (41438)	1
	Bit 0: 0 = Alarm 1 inactive; 1 = Alarm 1 active		Read only		
	Bit 1: 0 = No alarm 1 Ack. required; 1 = Ack. required		Read only		
	Bit 2: 1 = Acknowledge alarm 1		Read/Write		
	Bit 3: Spare				
	Bit 4: 0 = Alarm 2 inactive; 1 = Alarm 2 active		Read only		
	Bit 5: 0 = No Alarm 2 Ack. required; 1 = Ack. required		Read only		
	Bit 6: 1 = Acknowledge alarm 2		Read/Write		
	Bit 7: Spare				
	Bit 8: 0 = Alarm 3 inactive; 1 = Alarm 3 active		Read only		
	Bit 9: 0 = No alarm 3 Ack. required; 1 = Ack. required		Read only		
	Bit 10: 1 = Acknowledge alarm 3		Read/Write		
	Bit 11: Spare				
	Bit 12: 0 = Alarm 4 inactive; 1 = Alarm 4 active		Read only		
	Bit 13: 0 = No Alarm 4 Ack. required; 1 = Ack. required		Read only		
	Bit 14: 1 = Acknowledge alarm 4		Read/Write		
	Bit 15: Spare				

Note: PV access is Read/Write for any point configured wuth ‘Slave Comms’ as its Type or Function. Otherwise PV access is Read only

6.4.3 CHANNEL RUN TIME DATA (Cont.)

CHANNEL 3

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Ch3 value	Current process value (PV)	Scaled	See note 1	A1DF (41439)	1
Ch3 status	Channel status 0 = Good PV 5 = Ranging error 1 = Channel off 6 = Overflow 2 = Over range 7 = Bad PV 3 = Under range 8 = No data 4 = Hardware error	Enum	Read only	A1E0 (41440)	1
Ch3 Alarms	Alarm information	Uint16	-	A1E1 (41441)	1
	Bit 0: 0 = Alarm 1 inactive; 1 = Alarm 1 active		Read only		
	Bit 1: 0 = No alarm 1 Ack. required; 1 = Ack. required		Read only		
	Bit 2: 1 = Acknowledge alarm 1		Read/Write		
	Bit 3: Spare				
	Bit 4: 0 = Alarm 2 inactive; 1 = Alarm 2 active		Read only		
	Bit 5: 0 = No Alarm 2 Ack. required; 1 = Ack. required		Read only		
	Bit 6: 1 = Acknowledge alarm 2		Read/Write		
	Bit 7: Spare				
	Bit 8: 0 = Alarm 3 inactive; 1 = Alarm 3 active		Read only		
	Bit 9: 0 = No alarm 3 Ack. required; 1 = Ack. required		Read only		
	Bit 10: 1 = Acknowledge alarm 3		Read/Write		
	Bit 11: Spare				
	Bit 12: 0 = Alarm 4 inactive; 1 = Alarm 4 active		Read only		
	Bit 13: 0 = No Alarm 4 Ack. required; 1 = Ack. required		Read only		
	Bit 14: 1 = Acknowledge alarm 4		Read/Write		
	Bit 15: Spare				

CHANNEL 4

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Ch4 value	Current process value (PV)	Scaled	See note 1	A1E2 (41442)	1
Ch4 status	Channel status 0 = Good PV 5 = Ranging error 1 = Channel off 6 = Overflow 2 = Over range 7 = Bad PV 3 = Under range 8 = No data 4 = Hardware error	Enum	Read only	A1E3 (41443)	1
Ch4 Alarms	Alarm information	Uint16	-	A1E4 (41444)	1
	Bit 0: 0 = Alarm 1 inactive; 1 = Alarm 1 active		Read only		
	Bit 1: 0 = No alarm 1 Ack. required; 1 = Ack. required		Read only		
	Bit 2: 1 = Acknowledge alarm 1		Read/Write		
	Bit 3: Spare				
	Bit 4: 0 = Alarm 2 inactive; 1 = Alarm 2 active		Read only		
	Bit 5: 0 = No Alarm 2 Ack. required; 1 = Ack. required		Read only		
	Bit 6: 1 = Acknowledge alarm 2		Read/Write		
	Bit 7: Spare				
	Bit 8: 0 = Alarm 3 inactive; 1 = Alarm 3 active		Read only		
	Bit 9: 0 = No alarm 3 Ack. required; 1 = Ack. required		Read only		
	Bit 10: 1 = Acknowledge alarm 3		Read/Write		
	Bit 11: Spare				
	Bit 12: 0 = Alarm 4 inactive; 1 = Alarm 4 active		Read only		
	Bit 13: 0 = No Alarm 4 Ack. required; 1 = Ack. required		Read only		
	Bit 14: 1 = Acknowledge alarm 4		Read/Write		
	Bit 15: Spare				

Note: PV access is Read/Write for any point configured wuth ‘Slave Comms’ as its Type or Function. Otherwise PV access is Read only

6.4.3 CHANNEL RUN TIME DATA (Cont.)

CHANNEL 5

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Ch5 value	Current process value (PV)	Scaled	See note 1	A1E5 (41445)	1
Ch5 status	Channel status 0 = Good PV 5 = Ranging error 1 = Channel off 6 = Overflow 2 = Over range 7 = Bad PV 3 = Under range 8 = No data 4 = Hardware error	Enum	Read only	A1E6 (41446)	1
Ch5 Alarms	Alarm information Bit 0: 0 = Alarm 1 inactive; 1 = Alarm 1 active Bit 1: 0 = No alarm 1 Ack. required; 1 = Ack. required Bit 2: 1 = Acknowledge alarm 1 Bit 3: Spare Bit 4: 0 = Alarm 2 inactive; 1 = Alarm 2 active Bit 5: 0 = No Alarm 2 Ack. required; 1 = Ack. required Bit 6: 1 = Acknowledge alarm 2 Bit 7: Spare Bit 8: 0 = Alarm 3 inactive; 1 = Alarm 3 active Bit 9: 0 = No alarm 3 Ack. required; 1 = Ack. required Bit 10: 1 = Acknowledge alarm 3 Bit 11: Spare Bit 12: 0 = Alarm 4 inactive; 1 = Alarm 4 active Bit 13: 0 = No Alarm 4 Ack. required; 1 = Ack. required Bit 14: 1 = Acknowledge alarm 4 Bit 15: Spare	Uint16	- Read only Read only Read/Write Read only Read only Read/Write Read only Read only Read/Write Read only Read only Read/Write	A1E7 (41447)	1

CHANNEL 6

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Ch6 value	Current process value (PV)	Scaled	See note 1	A1E8 (41448)	1
Ch6 status	Channel status 0 = Good PV 5 = Ranging error 1 = Channel off 6 = Overflow 2 = Over range 7 = Bad PV 3 = Under range 8 = No data 4 = Hardware error	Enum	Read only	A1E9 (41449)	1
Ch6 Alarms	Alarm information Bit 0: 0 = Alarm 1 inactive; 1 = Alarm 1 active Bit 1: 0 = No alarm 1 Ack. required; 1 = Ack. required Bit 2: 1 = Acknowledge alarm 1 Bit 3: Spare Bit 4: 0 = Alarm 2 inactive; 1 = Alarm 2 active Bit 5: 0 = No Alarm 2 Ack. required; 1 = Ack. required Bit 6: 1 = Acknowledge alarm 2 Bit 7: Spare Bit 8: 0 = Alarm 3 inactive; 1 = Alarm 3 active Bit 9: 0 = No alarm 3 Ack. required; 1 = Ack. required Bit 10: 1 = Acknowledge alarm 3 Bit 11: Spare Bit 12: 0 = Alarm 4 inactive; 1 = Alarm 4 active Bit 13: 0 = No Alarm 4 Ack. required; 1 = Ack. required Bit 14: 1 = Acknowledge alarm 4 Bit 15: Spare	Uint16	- Read only Read only Read/Write Read only Read only Read/Write Read only Read only Read/Write Read only Read only Read/Write	A1EA (41450)	1

Note: PV access is Read/Write for any point configured wuth ‘Slave Comms’ as its Type or Function. Otherwise PV access is Read only

6.4.4 Group data

GROUP 1

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Grp1 Trend type	Trend enhancements 0 = Interpolation enabled 1 = Adaptive recording enabled	Enum	Read only	A4D6 (42198)	1
Grp1 Trend rate	Trend update rate in milliseconds	Uint32	Read only	A4D7 (42199)	2
Grp1 Archive rate	Archive (to flash) rate in milliseconds	Uint 32	Read only	A4D9 (42201)	2
Grp1 Descriptor	Group descriptor (20 characters max.)	String_20	Read only	A4DB (42203)	10
Spare				A4E5 (42213)	10
Grp1 Channels in group	16 Registers holding the group contents, as follows:				(16)
	Register 1	Uint16	Read only	A4EF (42223)	1
	Bit 0: 0 = Point 1 not in group; 1 = Point 1 is in group				
	Bit 1: 0 = Point 2 not in group; 1 = Point 2 is in group				
	Bit 2: 0 = Point 3 not in group; 1 = Point 3 is in group				
	Etc.				
	Bit 15: 0 = Point 16 not in group; 1 = Point 16 is in group				
	Register 2 - as register 1, but for points 17 to 32	Uint16	Read only	A4F0 (42224)	1
	Register 3 - as register 1, but for points 33 to 48	Uint16	Read only	A4F1 (42225)	1
	Register 4 - as register 1, but for points 49 to 64	Uint16	Read only	A4F2 (42226)	1
	Register 5 - as register 1, but for points 65 to 80	Uint16	Read only	A4F3 (42227)	1
	Register 6 - as register 1, but for points 81 to 96	Uint16	Read only	A4F4 (42228)	1
	Register 7 - as register 1, but for points 97 to 112	Uint16	Read only	A4F5 (42229)	1
	Register 8 - as register 1, but for points 113 to 128	Uint16	Read only	A4F6 (42230)	1
	Register 9 - as register 1, but for points 129 to 144	Uint16	Read only	A4F7 (42231)	1
	Register 10 - as register 1, but for points 145 to 160	Uint16	Read only	A4F8 (42232)	1
	Register 11 - as register 1, but for points 161 to 176	Uint16	Read only	A4F9 (42233)	1
	Register 12 - as register 1, but for points 177 to 192	Uint16	Read only	A4FA (42234)	1
	Register 13 - as register 1, but for points 193 to 208	Uint16	Read only	A4FB (42235)	1
	Register 14 - as register 1, but for points 209 to 224	Uint16	Read only	A4FC (42236)	1
	Register 15 - as register 1, but for points 225 to 240	Uint16	Read only	A4FD (42237)	1
	Register 16 - as register 1, but for points 241 to 256	Uint16	Read only	A4FE (42238)	1
Grp1 Text length	Identifies the length of a text message to be read	Uint16	Read/Write	A4FF (42239)	1
Grp1 Text time stamp	Time stamp of the text message to be read (UTC format)	Double	Read only	A500 (42240)	4
Grp1 Read text	Read text string from instrument display	String_60	Read only	A504 (42244)	30
Reserved				A522 (42274)	30
Grp1 Write text	Write a text string to instrument display	String_60	Write only	A540 (42304)	30
Reserved				A55E (42334)	30
Grp1 Batch start	Not used this recorder model	Boolean	Write only	A57C (42364)	1
Grp1 Batch stop	Not used this recorder model	Boolean	Write only	A57D (42365)	1
Grp1 Batch running	Not used this recorder model	Boolean	Read only	A57E (42366)	1
Grp1 Text field 1	Not used this recorder model)	String_60	Read/Write	A57F (42367)	30
Reserved				A59D (42397)	30
Grp1 Text field 2	Not used this recorder model	String_60	Read/Write	A5BB (42427)	30
Reserved				A5D9 (42457)	30
Grp1 Text field 3	Not used this recorder model	String_60	Read/Write	A5F7 (42487)	30
Reserved				A615 (42517)	30
Grp1 Text field 4	Not used this recorder model	String_60	Read/Write	A633 (42547)	30
Reserved				A651 (42577)	30
Grp1 Text field 5	Not used this recorder model	String_60	Read/Write	A66F (42607)	30
Reserved				A68D (42637)	30
Grp1 Text field 6	Not used this recorder model	String_60	Read/Write	A6AB (42667)	30
Reserved				A6C9 (42697)	30
Spare				A6E7 (42727)	100

See table 6.3 for point types

6.4.5 Feature identification table (FIT)

This table allows the host to identify which features are available at the recorder.

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Number of features	Number of supported features	3	Read only	CC26 (52262)	1
Feature 1	Indirection Table	1	Read only	CC27 (52263)	1
	Read only indirection table start address (R/O vector)	CD89	Read only	CC28 (52264)	1
	Read/Write indirection table start address (R/W vector)	D18A	Read only	CC29 (52265)	1
	Spare			CC2A (52266)	1
Feature 2	Function codes supported (FC I.D.)	4	Read only	CC2B (52267)	1
	Bit map of supported MODBUS function codes	32940	Read only	CC2C (52268)	1
	Bit 0: 0 = code 1 not supported; 1 = code 1 supported				
	Bit 1: 0 = code 2 not supported; 1 = code 2 supported				
	Bit 2: 0 = code 3 not supported; 1 = code 3 supported				
	Bit 3: 0 = code 4 not supported; 1 = code 4 supported				
	Etc.				
	Bit 15: 0 = code 16 not supported; 1 = code 16 supported				
	Reserved			CC2D (52269)	1
	Reserved			CC2E (52270)	1
Feature 3	Security ID (MODBUS login security feature)	9	Read only	CC2F (52271)	1
	User name		Write only	CC30 (52272)	40
	Password		Write only	CC58 (52312)	40
	Reserved			CC80 (52352)	1
Feature N	100 Spare addresses for further features			CC81 (52353)	100

6.4.6 Indirection tables

The standard MODBUS protocol allows block register reads and writes. This is efficient only if data is grouped contiguously, or nearly so. Indirection tables are a means by which widely spaced register addresses can (in effect) be grouped, offering the host the ability to access a block of user defined data in one single read/write request.

Two configurable tables are available, one for read only parameters, the other for read/write. Each table is in two halves - the lower address half contains the addresses of the registers to be accessed; the higher address half contains the values which have been read or which are to be written.

Notes:

1. For Ethernet connections, indirection table entries are lost at power off, as the result of a brown-out or if the connection with the host is broken.
2. Parameters in IEEE format can be accessed by configuring two successive entries in the table. Parameters which occupy more than one register can be loaded into the indirection area by using function code 16 (pre-set multiple registers) and the parameter's base address (i.e. the parameter's 1st register).
3. Separate indirection table entries are held for each host - the recorder automatically switches each host to its own indirection table without user intervention.
4. Indirection table addresses (CCE5 to D4E7) cannot be entered in the indirection tables. Any attempt to do so will be ignored.

6.4.6 INDIRECTION TABLES (CONT.)

Table 6.4.6a shows the overall arrangement of the indirection table area. Figures 6.4.6b and 6.4.6c show simple examples of Read only and Read/Write addressing for tables with 6 entries.

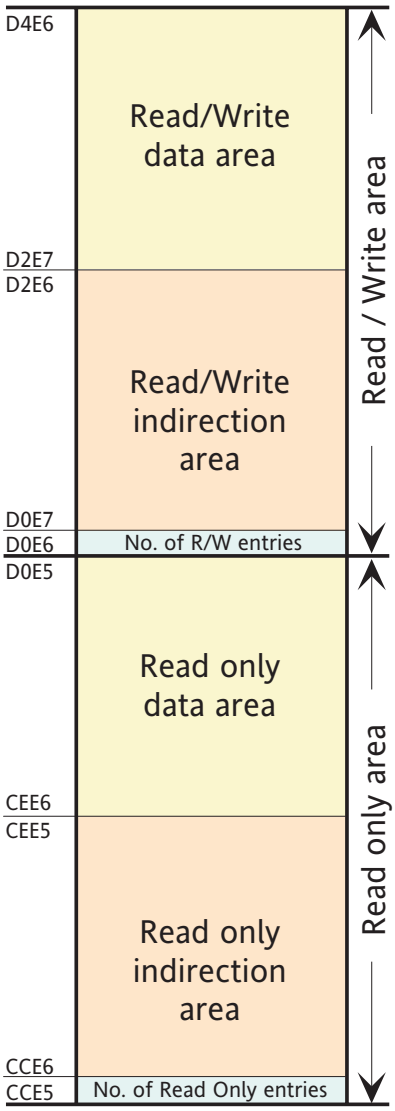


Table 6.4.6a Indirection table areas

6.4.6 INDIRECTION TABLES (CONT.)

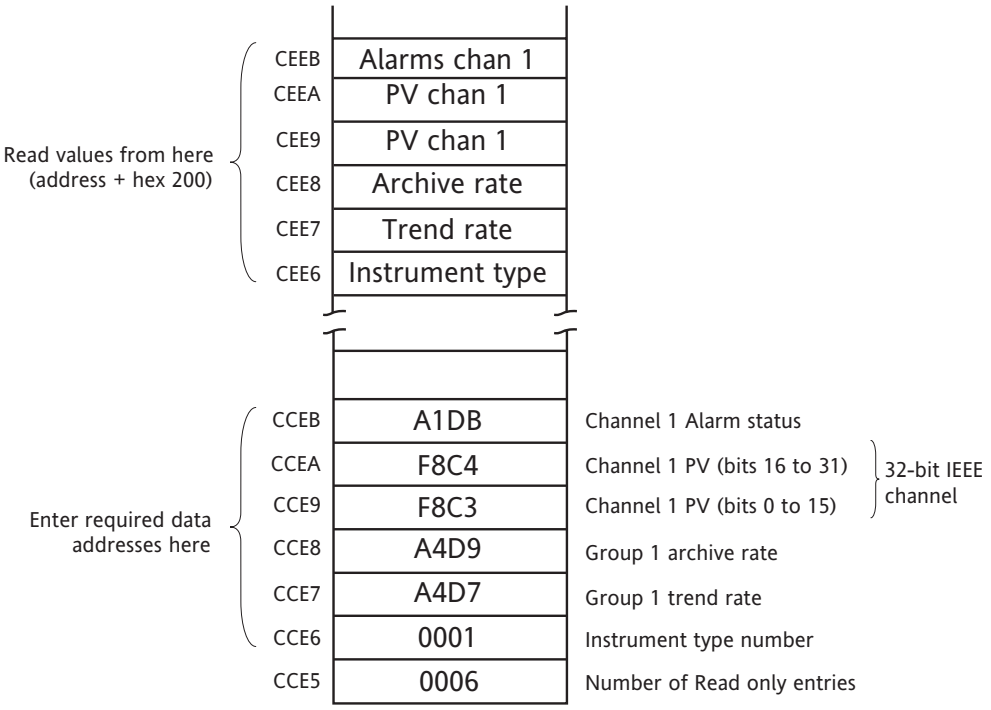


Table 6.4.6b Read only indirection example

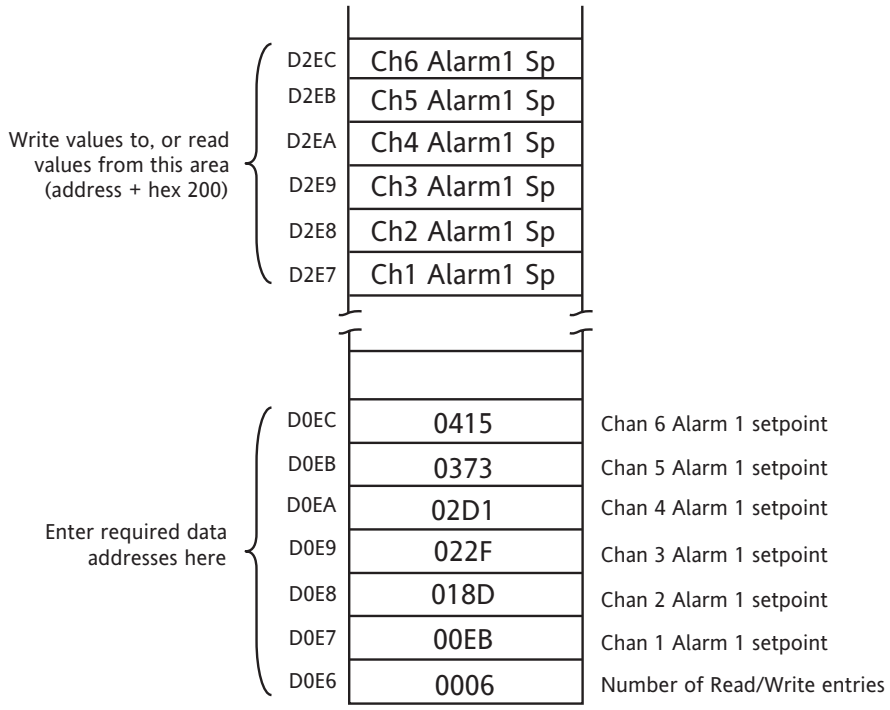


Table 6.4.6c Read/Write indirection example

6.4.7 IEEE 32-bit channel configuration data

The following tables show the hexadecimal addresses for the specified 32-bit floating-point values, for channels 1 to 6. Generally, Parameter address for channel N = Parameter address for channel 1 + 36(N-1) (decimal). The word channel is used as an umbrella term for input channels, maths channels, totalisers etc.

CHANNEL 1

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Ch1 span high	Upper span value (Display full scale)	Float	Read only	D4E7 (54503)	2
Ch1 span low	Lower span value (display 'zero')	Float	Read only	D4E9 (54505)	2
Ch1 Zone high	Zone upper value (% of 'chart' width)	Float	Read only	D4EB (54507)	2
Ch1 Zone low	Zone lower value (% of 'chart' width)	Float	Read only	D4ED (54509)	2
Ch1 Alarm 1 setpoint	Trigger setpoint (Note 2) for alarm 1 (Note 2)	Float	Read/Write	D4EF (54511)	2
Ch1 Alarm 2 setpoint	Trigger setpoint (Note 2) for alarm 2 (Note 2)	Float	Read/Write	D4F1 (54513)	2
Ch1 Alarm 3 setpoint	Trigger setpoint (Note 2) for alarm 3 (Note 2)	Float	Read/Write	D4F3 (54515)	2
Ch1 Alarm 4 setpoint	Trigger setpoint (Note 2) for alarm 4 (Note 2)	Float	Read/Write	D4F5 (54517)	2
Spare				D4F7 (54519)	20

CHANNEL 2

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Ch2 span high	Upper span value (display full scale)	Float	Read only	D50B (54539)	2
Ch2 span low	Lower span value (display 'zero')	Float	Read only	D50D (54541)	2
Ch2 Zone high	Zone upper value (% of 'chart' width)	Float	Read only	D50F (54543)	2
Ch2 Zone low	Zone lower value (% of 'chart' width)	Float	Read only	D511 (54545)	2
Ch2 Alarm 1 setpoint	Trigger setpoint for alarm 1 (Note 2)	Float	Read/Write	D513 (54547)	2
Ch2 Alarm 2 setpoint	Trigger setpoint for alarm 2 (Note 2)	Float	Read/Write	D515 (54549)	2
Ch2 Alarm 3 setpoint	Trigger setpoint for alarm 3 (Note 2)	Float	Read/Write	D517 (54551)	2
Ch2 Alarm 4 setpoint	Trigger setpoint for alarm 4 (Note 2)	Float	Read/Write	D519 (54553)	2
Spare				D51B (54555)	20

CHANNEL 3

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Ch3 span high	Upper span value (display full scale)	Float	Read only	D52F (54575)	2
Ch3 span low	Lower span value (display 'zero')	Float	Read only	D531 (54577)	2
Ch3 Zone high	Zone upper value (% of 'chart' width)	Float	Read only	D533 (54579)	2
Ch3 Zone low	Zone lower value (% of 'chart' width)	Float	Read only	D535 (54581)	2
Ch3 Alarm 1 setpoint	Trigger setpoint for alarm 1 (Note 2)	Float	Read/Write	D537 (54583)	2
Ch3 Alarm 2 setpoint	Trigger setpoint for alarm 2 (Note 2)	Float	Read/Write	D539 (54585)	2
Ch3 Alarm 3 setpoint	Trigger setpoint for alarm 3 (Note 2)	Float	Read/Write	D53B (54587)	2
Ch3 Alarm 4 setpoint	Trigger setpoint for alarm 4 (Note 2)	Float	Read/Write	D53D (54589)	2
Spare				D53F (54591)	20

Notes

1. For maths, totalisers and counters, see the relevant option description.
2. If an alarm's Setpoint Source (section 4.3.3) is set to anything other than 'Constant' the value returned will be the previously configured constant value.

6.4.7 IEEE 32-BIT CHANNEL CONFIGURATION DATA (Cont.)

CHANNEL 4

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Ch4 span high	Upper span value (display full scale)	Float	Read only	D553 (54611)	2
Ch4 span low	Lower span value (display 'zero')	Float	Read only	D555 (54613)	2
Ch4 Zone high	Zone upper value (% of 'chart' width)	Float	Read only	D557 (54615)	2
Ch4 Zone low	Zone lower value (% of 'chart' width)	Float	Read only	D559 (54617)	2
Ch4 Alarm 1 setpoint	Trigger setpoint for alarm 1 (Note 2)	Float	Read/Write	D55B (54619)	2
Ch4 Alarm 2 setpoint	Trigger setpoint for alarm 2 (Note 2)	Float	Read/Write	D55D (54621)	2
Ch4 Alarm 3 setpoint	Trigger setpoint for alarm 3 (Note 2)	Float	Read/Write	D55F (54623)	2
Ch4 Alarm 4 setpoint	Trigger setpoint for alarm 4 (Note 2)	Float	Read/Write	D561 (54625)	2
Spare				D563 (54627)	20

CHANNEL 5

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Ch5 span high	Upper span value (display full scale)	Float	Read only	D577 (54647)	2
Ch5 span low	Lower span value (display 'zero')	Float	Read only	D569 (54649)	2
Ch5 Zone high	Zone upper value (% of 'chart' width)	Float	Read only	D57B (54651)	2
Ch5 Zone low	Zone lower value (% of 'chart' width)	Float	Read only	D57D (54653)	2
Ch5 Alarm 1 setpoint	Trigger setpoint for alarm 1 (Note 2)	Float	Read/Write	D57F (54655)	2
Ch5 Alarm 2 setpoint	Trigger setpoint for alarm 2 (Note 2)	Float	Read/Write	D581 (54657)	2
Ch5 Alarm 3 setpoint	Trigger setpoint for alarm 3 (Note 2)	Float	Read/Write	D583 (54659)	2
Ch5 Alarm 4 setpoint	Trigger setpoint for alarm 4 (Note 2)	Float	Read/Write	D585 (54661)	2
Spare				D587 (54663)	20

CHANNEL 6

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Ch6 span high	Upper span value (display full scale)	Float	Read only	D59B (54683)	2
Ch6 span low	Lower span value (display 'zero')	Float	Read only	D59D (54685)	2
Ch6 Zone high	Zone upper value (% of 'chart' width)	Float	Read only	D59F (54687)	2
Ch6 Zone low	Zone lower value (% of 'chart' width)	Float	Read only	D5A1 (54689)	2
Ch6 Alarm 1 setpoint	Trigger setpoint for alarm 1 (Note 2)	Float	Read/Write	D5A3 (54691)	2
Ch6 Alarm 2 setpoint	Trigger setpoint for alarm 2 (Note 2)	Float	Read/Write	D5A5 (54693)	2
Ch6 Alarm 3 setpoint	Trigger setpoint for alarm 3 (Note 2)	Float	Read/Write	D5A7 (54695)	2
Ch6 Alarm 4 setpoint	Trigger setpoint for alarm 4 (Note 2)	Float	Read/Write	D5A9 (54697)	2
Spare				D5AB (54699)	20

Notes

1. For maths, totalisers and counters, see the relevant option description.
2. If an alarm's Setpoint Source (section 4.3.3) is set to anything other than 'Constant' the value returned will be the previously configured constant value.

6.4.8 IEEE Area Channel run-time data

The following tables show the hexadecimal addresses for the specified 32-bit floating-point values. Generally, Parameter address for channel N = Parameter address for channel 1 + 4(N-1) (decimal).

CHANNEL 1

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Channel 1 value	Current process value (PV)	Float	See note 1	F8C3 (63683)	2
Channel 1 status	Channel status 0 = Good PV 5 = Ranging error 1 = Channel off 6 = Overflow 2 = Over range 7 = Bad PV 3 = Under range 8 = No data 4 = Hardware error	Enum	Read only	F8C5 (63685)	1
Channel 1 Alarms	Alarm information	Uint16	-	F8C6 (63686)	1
	Bit 0: 0 = Alarm 1 inactive; 1 = Alarm 1 active		Read only		
	Bit 1: 0 = No alarm 1 Ack. required; 1 = Ack. required		Read only		
	Bit 2: 1 = Acknowledge alarm 1		Read/Write		
	Bit 3: Spare				
	Bit 4: 0 = Alarm 2 inactive; 1 = Alarm 2 active		Read only		
	Bit 5: 0 = No Alarm 2 Ack. required; 1 = Ack. required		Read only		
	Bit 6: 1 = Acknowledge alarm 2		Read/Write		
	Bit 7: Spare				
	Bit 8: 0 = Alarm 3 inactive; 1 = Alarm 3 active		Read only		
	Bit 9: 0 = No alarm 3 Ack. required; 1 = Ack. required		Read only		
	Bit 10: 1 = Acknowledge alarm 3		Read/Write		
	Bit 11: Spare				
	Bit 12: 0 = Alarm 4 inactive; 1 = Alarm 4 active		Read only		
	Bit 13: 0 = No Alarm 4 Ack. required; 1 = Ack. required		Read only		
	Bit 14: 1 = Acknowledge alarm 4		Read/Write		
	Bit 15: Spare				

CHANNEL 2

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Channel 2 value	Current process value (PV)	Float	See note 1	F8C7 (63687)	2
Channel 2 status	Channel status 0 = Good PV 5 = Ranging error 1 = Channel off 6 = Overflow 2 = Over range 7 = Bad PV 3 = Under range 8 = No data 4 = Hardware error	Enum	Read only	F8C9 (63689)	1
Channel 2 alarms	Alarm information	Uint16	-	F8CA (63690)	1
	Bit 0: 0 = Alarm 1 inactive; 1 = Alarm 1 active		Read only		
	Bit 1: 0 = No alarm 1 Ack. required; 1 = Ack. required		Read only		
	Bit 2: 1 = Acknowledge alarm 1		Read/Write		
	Bit 3: Spare				
	Bit 4: 0 = Alarm 2 inactive; 1 = Alarm 2 active		Read only		
	Bit 5: 0 = No Alarm 2 Ack. required; 1 = Ack. required		Read only		
	Bit 6: 1 = Acknowledge alarm 2		Read/Write		
	Bit 7: Spare				
	Bit 8: 0 = Alarm 3 inactive; 1 = Alarm 3 active		Read only		
	Bit 9: 0 = No alarm 3 Ack. required; 1 = Ack. required		Read only		
	Bit 10: 1 = Acknowledge alarm 3		Read/Write		
	Bit 11: Spare				
	Bit 12: 0 = Alarm 4 inactive; 1 = Alarm 4 active		Read only		
	Bit 13: 0 = No Alarm 4 Ack. required; 1 = Ack. required		Read only		
	Bit 14: 1 = Acknowledge alarm 4		Read/Write		
	Bit 15: Spare				

Note: PV access is Read/Write for any point configured with 'Slave Comms' as its Type or Function. Otherwise PV access is Read only.

6.4.8 IEEE AREA CHANNEL RUN-TIME DATA (Cont.)

CHANNEL 3

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Channel 3 value	Current process value (PV)	Float	See note 1	F8CB (63691)	2
Channel 3 status	Channel status	Enum	Read only	F8CD (63693)	1
	0 = Good PV 5 = Ranging error				
	1 = Channel off 6 = Overflow				
	2 = Over range 7 = Bad PV				
	3 = Under range 8 = No data				
	4 = Hardware error				
Channel 3 Alarms	Alarm information	Uint16	-	F8CE (63694)	1
	Bit 0: 0 = Alarm 1 inactive; 1 = Alarm 1 active		Read only		
	Bit 1: 0 = No alarm 1 Ack. required; 1 = Ack. required		Read only		
	Bit 2: 1 = Acknowledge alarm 1		Read/Write		
	Bit 3: Spare				
	Bit 4: 0 = Alarm 2 inactive; 1 = Alarm 2 active		Read only		
	Bit 5: 0 = No Alarm 2 Ack. required; 1 = Ack. required		Read only		
	Bit 6: 1 = Acknowledge alarm 2		Read/Write		
	Bit 7: Spare				
	Bit 8: 0 = Alarm 3 inactive; 1 = Alarm 3 active		Read only		
	Bit 9: 0 = No alarm 3 Ack. required; 1 = Ack. required		Read only		
	Bit 10: 1 = Acknowledge alarm 3		Read/Write		
	Bit 11: Spare				
	Bit 12: 0 = Alarm 4 inactive; 1 = Alarm 4 active		Read only		
	Bit 13: 0 = No Alarm 4 Ack. required; 1 = Ack. required		Read only		
	Bit 14: 1 = Acknowledge alarm 4		Read/Write		
	Bit 15: Spare				

CHANNEL 4

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Channel 4 value	Current process value (PV)	Float	See note 1	F8CF (63695)	2
Channel 4 status	Channel status	Enum	Read only	F8D1 (63697)	1
	0 = Good PV 5 = Ranging error				
	1 = Channel off 6 = Overflow				
	2 = Over range 7 = Bad PV				
	3 = Under range 8 = No data				
	4 = Hardware error				
Channel 4 alarms	Alarm information	Uint16	-	F8D2 (63698)	1
	Bit 0: 0 = Alarm 1 inactive; 1 = Alarm 1 active		Read only		
	Bit 1: 0 = No alarm 1 Ack. required; 1 = Ack. required		Read only		
	Bit 2: 1 = Acknowledge alarm 1		Read/Write		
	Bit 3: Spare				
	Bit 4: 0 = Alarm 2 inactive; 1 = Alarm 2 active		Read only		
	Bit 5: 0 = No Alarm 2 Ack. required; 1 = Ack. required		Read only		
	Bit 6: 1 = Acknowledge alarm 2		Read/Write		
	Bit 7: Spare				
	Bit 8: 0 = Alarm 3 inactive; 1 = Alarm 3 active		Read only		
	Bit 9: 0 = No alarm 3 Ack. required; 1 = Ack. required		Read only		
	Bit 10: 1 = Acknowledge alarm 3		Read/Write		
	Bit 11: Spare				
	Bit 12: 0 = Alarm 4 inactive; 1 = Alarm 4 active		Read only		
	Bit 13: 0 = No Alarm 4 Ack. required; 1 = Ack. required		Read only		
	Bit 14: 1 = Acknowledge alarm 4		Read/Write		
	Bit 15: Spare				

Note: PV access is Read/Write for any point configured with ‘Slave Comms’ as its Type or Function. Otherwise PV access is Read only.

6.4.8 IEEE AREA CHANNEL RUN-TIME DATA (Cont.)

CHANNEL 5

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Channel 5 value	Current process value (PV)	Float	See note 1	F8D3 (63699)	2
Channel 5 status	Channel status 0 = Good PV 5 = Ranging error 1 = Channel off 6 = Overflow 2 = Over range 7 = Bad PV 3 = Under range 8 = No data 4 = Hardware error	Enum	Read only	F8D5 (63701)	1
Channel 5 Alarms	Alarm information	Uint16	-	F8D6 (63702)	1
	Bit 0: 0 = Alarm 1 inactive; 1 = Alarm 1 active		Read only		
	Bit 1: 0 = No alarm 1 Ack. required; 1 = Ack. required		Read only		
	Bit 2: 1 = Acknowledge alarm 1		Read/Write		
	Bit 3: Spare				
	Bit 4: 0 = Alarm 2 inactive; 1 = Alarm 2 active		Read only		
	Bit 5: 0 = No Alarm 2 Ack. required; 1 = Ack. required		Read only		
	Bit 6: 1 = Acknowledge alarm 2		Read/Write		
	Bit 7: Spare				
	Bit 8: 0 = Alarm 3 inactive; 1 = Alarm 3 active		Read only		
	Bit 9: 0 = No alarm 3 Ack. required; 1 = Ack. required		Read only		
	Bit 10: 1 = Acknowledge alarm 3		Read/Write		
	Bit 11: Spare				
	Bit 12: 0 = Alarm 4 inactive; 1 = Alarm 4 active		Read only		
	Bit 13: 0 = No Alarm 4 Ack. required; 1 = Ack. required		Read only		
	Bit 14: 1 = Acknowledge alarm 4		Read/Write		
	Bit 15: Spare				

CHANNEL 6

Parameter Name	Description	Type	Access	Start Addr. Hex (Dec,)	Register Length
Channel 6 value	Current process value (PV)	Float	See note 1	F8D7 (63703)	2
Channel 6 status	Channel status 0 = Good PV 5 = Ranging error 1 = Channel off 6 = Overflow 2 = Over range 7 = Bad PV 3 = Under range 8 = No data 4 = Hardware error	Enum	Read only	F8D9 (63705)	1
Channel 6 alarms	Alarm information	Uint16	-	F8DA (63706)	1
	Bit 0: 0 = Alarm 1 inactive; 1 = Alarm 1 active		Read only		
	Bit 1: 0 = No alarm 1 Ack. required; 1 = Ack. required		Read only		
	Bit 2: 1 = Acknowledge alarm 1		Read/Write		
	Bit 3: Spare				
	Bit 4: 0 = Alarm 2 inactive; 1 = Alarm 2 active		Read only		
	Bit 5: 0 = No Alarm 2 Ack. required; 1 = Ack. required		Read only		
	Bit 6: 1 = Acknowledge alarm 2		Read/Write		
	Bit 7: Spare				
	Bit 8: 0 = Alarm 3 inactive; 1 = Alarm 3 active		Read only		
	Bit 9: 0 = No alarm 3 Ack. required; 1 = Ack. required		Read only		
	Bit 10: 1 = Acknowledge alarm 3		Read/Write		
	Bit 11: Spare				
	Bit 12: 0 = Alarm 4 inactive; 1 = Alarm 4 active		Read only		
	Bit 13: 0 = No Alarm 4 Ack. required; 1 = Ack. required		Read only		
	Bit 14: 1 = Acknowledge alarm 4		Read/Write		
	Bit 15: Spare				

Note: PV access is Read/Write for any point configured with ‘Slave Comms’ as its Type or Function. Otherwise PV access is Read only.

6.4.9 Permanent ID table

This table contains information relating to the recorder, and also gives the start address of the feature identification table (FIT).

FFF4	HHHH	Checksum
FFF3	CC26	FIT start address
FFF2	0001	Version ID
FFF1	6100 or 6180	Product ID
FFF0	0500	Company ID

Table 6.4.9 Permanent ID table

6.5 DATA TRANSMISSION

Each message (request or response) is packaged in the (MODBUS) frame shown below. The messages consist of a 7 byte prefix, followed by the function code (in hex), followed by the relevant data bytes, the number and content of which depend on the function code, as described in subsequent sections.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Bytes 8 onwards
Transaction identifier (usually 00)	Transaction identifier (usually 00)	Protocol identifier (00)	Protocol identifier (00)	Always 00	Number of bytes following	Recorder Modbus address	Modbus function code (hex)	Data (Depends on function code)

Figure 6.5 MODBUS package

Notes:

1 The transaction identifier has no active function - the recorder just copies the bytes from the request message to the response message.

2 The protocol identifier bytes are always zero.

FUNCTION CODES AND EXCEPTION CODES

Refer to section 6.2.1 for lists of function codes and exception codes supported.

TEXT STRINGS

When sending text strings, the final character must be followed by one or two ‘Null’ characters. The number of bytes in the text string (including the null) must be even, even if this means adding two nulls at the end of the message instead of one.

For example, the text string: “Alarm Number’ should be sent as

```
Al  ar  mSpace  Nu  mb  er NullNull, or  Al  ar  mSpace  Nu  mb  er SpaceNull
```

where each pair of characters occupies on 16-bit word. Similarly, the text string ‘Alarm Number:’ would be sent as

```
Al  ar  mSpace  Nu  mb  er :null,
```

but only one Null character is required to provide an even number of bytes.

6.5.1 Function code 03

REQUEST

The bytes after the 7-byte prefix described above are:
Function code (03) (1 byte)
Register start address (2 bytes)
Word count (Total number of registers) (1 to 125 decimal; 1 to 7D hex) (2 bytes)Thus to read Channel 5 descriptor (start address 031F - 10 registers altogether) the following request (as described in figure 6.5.1a) would be transmitted for a recorder with a Modbus address of 1:
000000000060103031F000A

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11
00	00	00	00	00	06	01	03	03	1F	00	0A
Transaction identifier	Transaction identifier	Protocol identifier	Protocol identifier	Always 00	Number of bytes following	Recorder Modbus address	Modbus function code (hex)	Register start address high byte	Register start address low byte	Word count high byte	Word count low byte

Figure 6.5.1a Function code 03 request example

RESPONSE

As a response to a request, the recorder returns a similar message, but the function code (03) is followed by:

Byte count (= 2 x the number of register values requested) in hex (1 byte)
Value of register at start address (2 bytes)
Value of register at start address + 1 (2 bytes)
etc.
etc.
Value of final register (2 bytes)

Thus as a response to the above request for channel 5 descriptor, the following message (as expanded in figure 6.5.1b) would be returned to the host (assuming channel descriptor to be: Channel 5 Descriptor) and Modbus address = 1:
000000000017010314436861 6E6E656C20352044657363726970746F72

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11
00	00	00	00	00	17	01	03	14	43	68	61
Transaction identifier	Transaction identifier	Protocol identifier	Protocol identifier	Always 00	Number of bytes following (hex)	Recorder Modbus address	Modbus function code (hex)	Byte count (No of registers x 2) (Hex)	ASCII C (Hex)	ASCII h (Hex)	ASCII a (Hex)

Byte 12	Byte 13	Byte 14	Byte 15	Byte 16	Byte 17	Byte 18	Byte 19	Byte 20	Byte 21	Byte 22	Byte 23
6E	6E	65	6C	20	35	20	44	65	73	63	72
ASCII n (Hex)	ASCII n (Hex)	ASCII e (Hex)	ASCII l (Hex)	ASCII space (Hex)	ASCII 5 (Hex)	ASCII space (Hex)	ASCII D (Hex)	ASCII e (Hex)	ASCII s (Hex)	ASCII c (Hex)	ASCII r (Hex)

Byte 24	Byte 25	Byte 26	Byte 27	Byte 28
69	70	74	6F	72
ASCII i (Hex)	ASCII p (Hex)	ASCII t (Hex)	ASCII o (Hex)	ASCII r (Hex)

Figure 6.5.1b Function code 03 response example

EXCEPTION RESPONSES

Byte 0 = Function code 83 (hex) (i.e. Hex (80 + function code))

Byte 1 = Exception code 01 (Illegal function) or 02 (Invalid data address)

6.5.2 Function code 04

This is identical with function code 03, except that 04 must be used as the function code and the exception response Function code is 84 (hex) not 83.

6.5.3 Function code 06

REQUEST

This is used to write a value to a single register. The bytes after the 7-byte prefix described in section 6.5, above are:

Function code (06) (1 byte)
Register address (2 bytes)
Value to be written (2 bytes)

Thus to write a value of 80 degrees as Alarm 1 setpoint for channel 3 (register address 022F), the following request (as detailed in figure 6.5.3) would be transmitted to the recorder:
00000000000060106022F0050

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11
00	00	00	00	00	06	01	06	02	2F	00	50
Transaction identifier	Transaction identifier	Protocol identifier	Protocol identifier	Always 00	Number of bytes following	Recorder Modbus address	Modbus function code (hex)	Register start address high byte	Register start address low byte	Value high byte (hex)	Value low byte (hex)

Figure 6.5.3 Function code 06 request/response example

RESPONSE

As a response to a request, the recorder returns a message identical with the request message.

EXCEPTION RESPONSES

Byte 0 = Function code 86 (hex) (i.e. Hex (80 + function code))

Byte 1 = Exception code 01 (Illegal function) or 02 (Invalid data address)

6.5.4 Function code 08

This is used to initiate a loop-back test. The bytes after the 7-byte prefix described in section 6.5, above are:

Function code (08) (1 byte)
Subfunction code (00 00) (2 bytes)
Query data (loopback value) (HH HH) (2 bytes)

Thus to initiate a loopback test (using, as an example, ‘P’ ’Q’ as the query data), the following request (as detailed in figure 6.5.4) is transmitted to the recorder:

00000000000060108000050 51

The response to the receipt of such a message should be to ‘echo’ the request back to the host.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11
00	00	00	00	00	06	01	08	00	00	50	51
Transaction identifier	Transaction identifier	Protocol identifier	Protocol identifier	Always 00	Number of bytes following	Recorder Modbus address	Modbus function code (hex)	Subfunction code high byte	Subfunction code low byte	Query data high byte (ASCII 'P') (Hex)	Query data low byte (ASCII 'Q') (Hex)

Figure 6.5.4 Function code 08 (loopback test) example

6.5.5 Function code 16 (Hex 10)

REQUEST

This is used to write values to multiple registers. The bytes after the 7-byte prefix described in section 6.5, above are:

Function code (10) (1 byte)
Register Start address (2 bytes)
Word count (Total number of registers to be written) (1 to 100 decimal; 1 to 64 hex) (2 bytes)
Byte count (B) (2 x word count) (1 byte)
Values to be written (2B bytes).

Thus to write "Doors Opened" as a text string to instrument display (start address A540), the following message (expanded in figure 6.5.5a) would be transmitted to the recorder:

0000000000150110A54000070E446F6F7273204F70656E65640000

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11	Byte 12
00	00	00	00	00	15	01	10	A5	40	00	07	0E
Transaction identifier	Transaction identifier	Protocol identifier	Protocol identifier	Always 00	Number of bytes to follow (hex)	Recorder Modbus address	Modbus function code (hex)	Base address High byte	Base address Low byte	Word count High byte	Word count Low byte	Byte count

Byte 13	Byte 14	Byte 15	Byte 16	Byte 17	Byte 18	Byte 19	Byte 20	Byte 21	Byte 22	Byte 23	Byte 24	Byte 25	Byte 26
44	6F	6F	72	73	20	4F	70	65	6E	65	64	00	00
ASCII D (Hex)	ASCII o (Hex)	ASCII o (Hex)	ASCII r (Hex)	ASCII s (Hex)	ASCII space (Hex)	ASCII O (Hex)	ASCII p (Hex)	ASCII e (Hex)	ASCII n (Hex)	ASCII e (Hex)	ASCII d (Hex)	ASCII Null	ASCII Null

Figure 6.5.5a Function code 16 request example

RESPONSE

The response message (detailed in figure 6.5.5b) after the 7-byte prefix described in section 6.5, above is:

Function code 10 (1 byte)
Start address (2 bytes)
Word count (2 bytes)
Thus, the response to the above batch field request would be:

0000000000060110A5400007

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11
00	00	00	00	00	06	01	10	A5	40	00	07
Transaction identifier	Transaction identifier	Protocol identifier	Protocol identifier	Always 00	Number of bytes following (hex)	Recorder Modbus address	Modbus function code (hex)	Base address High byte	Base address Low byte	Word count High byte	Word count Low byte

Figure 6.5.5b Function code 16 response example

EXCEPTION RESPONSES

Byte 0 = Function code 90 (hex) (i.e. Hex (80 + function code))

Byte 1 = Exception code 01 (Illegal function) or 02 (Invalid data address)

Note: Function code 16 can be used to write multiple registers into the indirection table area, for example, by writing the base register address of a 32-bit channel value (e.g. channel 3 - start address: F994) into location D18B.

7 TRANSMITTER POWER SUPPLY

7.1 INTRODUCTION

WARNING!

Transmitter power supplies must not be used with dc supply voltages.

Notes:

1. Transmitter power supplies are not suitable for use with dc or low-voltage ac supplies.
2 The transmitter power supply is available only with 100 mm. recorders.

This option consists of a circuit board, terminal block and suitable wiring inside a long terminal cover at the rear of a 100mm recorder. The board supplies three mutually isolated dc supplies (nominal 25 Volts) each of which is intended to power a single 0 to 20 mA or 4 to 20 mA current loop.

7.2 FUSING

7.2.1 Fuse Rating

The circuit board is protected by a 20 mm anti-surge (type T) fuse, the value of which depends on the supply voltage as shown in table 7.2.1, below.

Access to the output wiring and to the fuse is achieved by isolating the recorder from mains power and opening the terminal cover (after removing its securing screws). The process is fully described below.

Supply voltage	Fuse rating	Part Number
115V ac	100 mA	CH050012
230V ac	63mA	CH050630

Table 7.2.1 Transmitter power supply fuse details

7.2.2 Access to the user connections/fuse

1 Isolate the recorder from the supply voltage.
2 At the rear of the recorder remove the terminal cover securing screws (figure 7.2.2a), taking care to retain them for use in re-assembly.

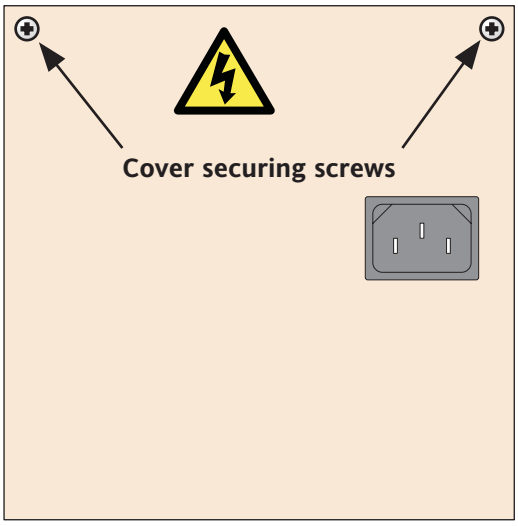


Figure 7.2.2a Securing screw locations

7.2.2 ACCESS TO THE USER CONNECTIONS/FUSE (Cont.)

3 Open the cover (figure 7.2.2b) to reveal the circuit board, user connections etc. (figure 7.2.2c)

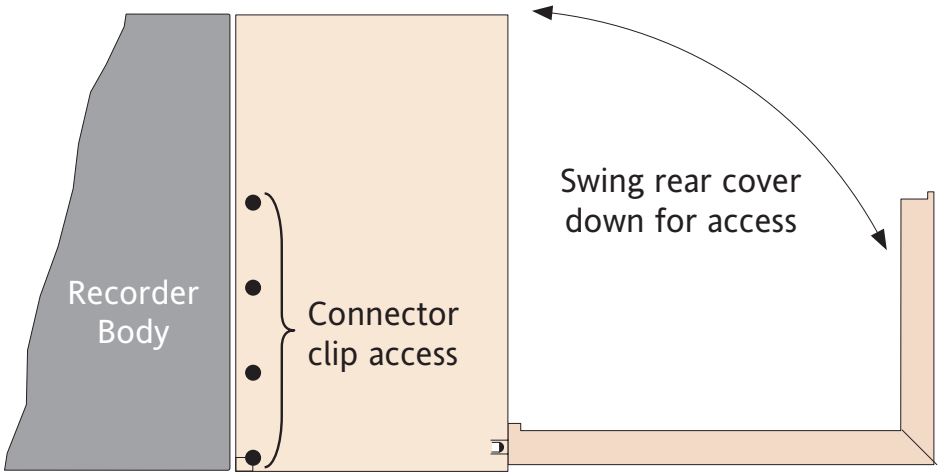


Figure 7.2.2b Opening the rear cover

4 The fuse is located as shown in figure 7.2.2c. User wiring to the terminal block (figures 7.2.3a/b) can be carried out now, or the terminal cover can be removed for convenience, as described in steps 5 onwards below.

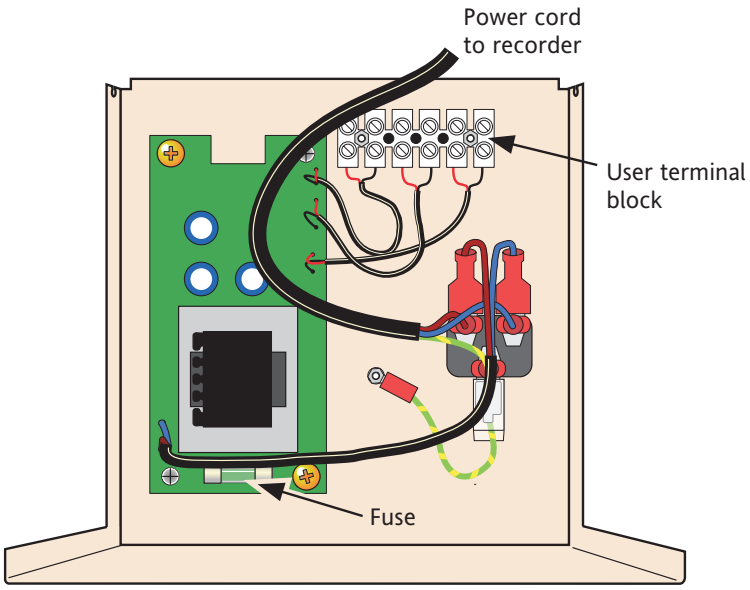


Figure 7.2.2c Fuse and User terminal block locations

To remove the terminal cover:

5. Unplug the IEC connector from the rear of the recorder connector panel and remove the cable tie securing the loom to the chassis.
6. Close the terminal cover, and lift it off.

Note: Four apertures in each side of the terminal cover allow the user to actuate the clips which secure the i/o connectors to the rear panel of the recorder. This allows the i/o connectors to be removed if, for example, the recorder is to be removed from the panel for any reason. The positions of these apertures are shown in figure 7.2.2b (right-hand side shown; left-hand side similar).

7.2.3 User wiring

Figure 7.2.3a shows the terminal block pinout, and figure 7.2.3b shows typical applications wiring.

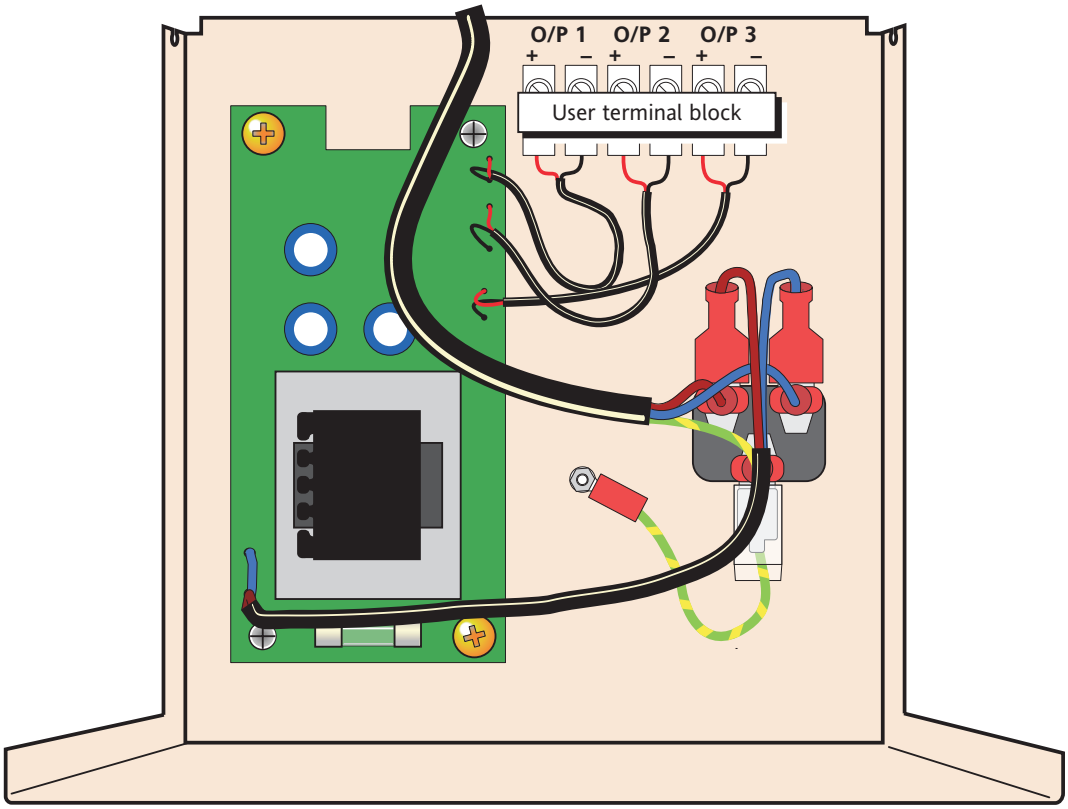
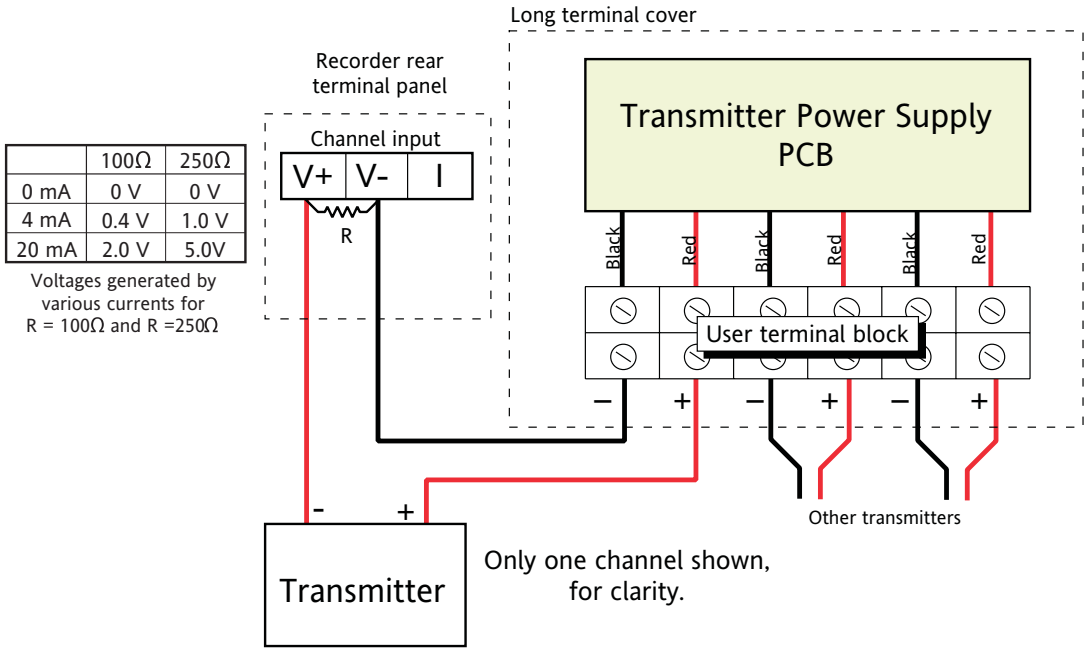


Figure 7.2.3a Terminal block wiring



R (minimum spec) = 1.4W, ± 1%. 100Ω or 250Ω as required (see table)

Figure 7.2.3b Applications wiring

ANNEX A: SPECIFICATION

INSTALLATION CATEGORY AND POLLUTION DEGREE

This product has been designed to conform to BS EN61010 installation category II and pollution degree 2. These are defined as follows:

Installation category II

The rated impulse voltage for equipment on nominal 230V ac mains is 2500V.

Pollution degree 2

Normally, only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation shall be expected.

TECHNICAL SPECIFICATION (Recorder)

Board types (I/O)

Universal input board
Relay output board (three change-over relays)

Standard features

Three input channels
Configuration Copy
CSV Archive file format
File transfer protocol (FTP)
Job search
Log scales
MODBUS TCP
Messages
Timers
USB port behind access flap
Web server

Options

Software:	Maths/Totalisers/Counters
Hardware:	Three additional input channels (total six channels)
	Transmitter power supply - isolated (100 mm recorders only)
	Low supply voltage

Environmental Performance

Temperature limits	Operation:	0 to 50˚C.
	Storage:	- 20 to +60˚C
Humidity limits	Operation:	5% to 80% RH non - condensing
	Storage:	5% to 90% RH non - condensing
Altitude (maximum)		<2000 metres
Protection	Standard bezel/display:	IP66 for a recorder mounted in a panel.
	Standard sleeve:	IP20
Shock		BS EN61010
Vibration (10 Hz to 150Hz)		2g peak

Physical

Panel mounting		DIN 43700
Bezel size		144mm x 144mm
Panel cutout		138mm x 138mm (-0.0 + 1.0) mm
Depth behind bezel	Small frame:	246.5 mm (211.5 mm without terminal cover, 284 with long terminal cover)
Weight	Small frame:	3 kg. max.
Mounting angle		±45 ˚ from vertical

Electromagnetic compatibility (EMC)

Emissions and immunity:	BS EN61326

Electrical safety

BS EN61010. Installation category II, Pollution degree 2

TECHNICAL SPECIFICATION (RECORDER) (Cont.)

Power requirements

Supply voltage	Standard:	85 to 265 volts; 47 to 63 Hz
	Low voltage option[1]:	20 to 42V RMS; 45 to 400 Hz, or 20 to 54V dc (option not to be used if isolated transmitter power supply fitted)
Power (max.)	All options:	50 W
Inrush current	Standard:	36A
Fuse type		None
Interrupt protection	Standard:	Holdup >200msec. at 240V ac, with full load.
	Low voltage option[1]:	Holdup 20msec at 20Vdc or RMS, with full load.

Back-up battery

Type	Poly-carbonmonofluoride/lithium (BR2330). Part Number PA261095. See also section B2.2.
Support time	A fully-charged, new battery supports the Real-Time Clock for a minimum of 1 year with the recorder unpowered
Replacement period	3-years
Stored data	Time; date; values for totalisers, counters and timers; Rolling average maths values

Clock (RTC) data

Temperature stability	0 to 50˚C:	± 20 ppm
Ageing		±5 ppm per year

Touch screen

Colour TFT LCD with cold-cathode backlighting, fitted with resistive, analogue, touch panel

Screen specification	1/4 VGA Resolution = 320 x 240 pixels

Update information

Input/relay output sample rate:	8 Hz.
Display update:	1 Hz,
Archive sample value:	Latest value at archive time
Trended/displayed value:	Latest value at display update time

Ethernet Communications

Type		10/100 base T (IEEE802.3)
Protocols		TCP/IP, FTP, DHCP, BootP, SNTP, Modbus, SMTP, ICMP.
Cable	Type:	CAT5
	Maximum length:	100 metres
	Termination:	RJ45
RJ45 LED indicators	Green:	Indicates a 100MB link
	Yellow:	Indicates Ethernet activity
Internal green LED		Indicates a 10MB link

Transmitter power supply (Isolated)

Number of outputs	Three
Output voltage	25V nominal
Max. current	20mA per output
Isolation (dc to 65Hz BS EN61010)	Installation category II; Pollution degree 2.
Channel to channel:	100V RMS or dc (double insulation)
Channel to ground:	100V RMS or dc (basic insulation).
Fuse (20mm Type T)	
Supply voltage = 110/120Vac:	100 mA
Supply voltage = 220/240Vac:	63 mA

[1] Option obsolete.

TECHNICAL SPECIFICATION (RECORDER) (Cont.)

USB ports

Number of ports	1 at front of recorder
Standard	USB1.1
Transmission speeds	12Mbits/sec (full speed devices) or 1.5Mbits/sec (low speed devices)
Maximum current per port	500mA
Peripherals supported	Floppy disk drive, Keyboard, Bar code reader, Mouse, Memory stick.

Note: The recorder meets the industrial EMC requirements of BS EN61326. Typically, USB peripherals are tested to domestic information technology standards (BS EN55022) with category C performance. Some USB peripherals, designed for use in domestic or office environments, can be susceptible to 'lock up' in environments containing high electromagnetic field strengths. In order to recover from such 'lock up' situations, the peripheral must be disconnected and then reconnected. Recorder operation is not affected.

Other items

Virus susceptibility		The 6000 series VxWorks operating system is immune to viruses targeted at Windows based operating systems. As at December 2005, there are no known viruses that target VxWorks.
Calibration coefficients	Input:	The Read-only input coefficients are stored in EEPROM on the input board.
	Instrument:	Instrument configuration is held in FLASH memory and has no effect on calibration coefficients.

TECHNICAL SPECIFICATION (Universal input board)

General

Termination		Edge connector/terminal block
Max. number of inputs	Small frame:	One input board (6 channels)
Input ranges		±38mV; ±150mV; ±1Volt; ± 20 Volts
Input types		Dc volts, dc millivolts, dc milliamps, (with external shunt), thermocouple, 2/3 wire resistance temperature detector (RTD), Ohms, Contact closure (not channel 1) (Minimum contact closure = 60msec.)
Input type mix		Freely configurable
Sample rate		See 'Update information' above
Noise rejection (48 to 62Hz)		
	Common mode:	>140dB (Channel to channel and channel to ground)
	Series mode:	>60dB
Maximum common mode voltage		250Volts continuous
Maximum series mode voltage		45mV at lowest range; 23.74 Volts peak at highest range
Isolation (dc to 65Hz; BS EN61010)		Installation category II; Pollution degree 2 300V RMS or dc channel to channel (double insulation), channel to common electronics (double insulation) and channel to ground (basic insulation)
Dielectric strength	Channel to ground:	1500Vac for 1 minute.
	Channel to channel:	2500Vac for 1 minute
Insulation resistance		>10MΩ at 500V dc
Input impedance	20V range:	65.3kΩ
	Other ranges:	>10MΩ
Overvoltage protection		50V peak (150V with attenuator)
Open circuit detection (applies only to ± 38mV and ± 150mV ranges).		
	Detection current:	± 57nA max
	Recognition time:	500mSec
	Minimum break resistance:	10MΩ
Long term drift (typical)		Better than 0.03% of reading or 30µV (whichever is greater) over a three month period.

DC input ranges

Shunt	Externally mounted resistor modules
Additional error due to shunt	0.1% of input
Performance	See table

Low Range	High Range	Resolution	Typical error (Instrument at 20 deg C)	Maximum error (Instrument at 20 deg C)	Worst case temperature performance
-38 mV	38 mV	1.4 mV	0.013% input + 0.031% range	0.030% input + 0.052% range	25ppm of input per deg C
-150 mV	150 mV	5.5 mV	0.013% input + 0.028% range	0.029% input + 0.039% range	25ppm of input per deg C
-1 V	1 V	37 mV	0.013% input + 0.024% range	0.029% input + 0.029% range	25ppm of input per deg C
-20 V	20 V	720 mV	0.075% input + 0.027% range	0.393% input + 0.033% range	388ppm of input per deg C

TECHNICAL SPECIFICATION (Universal input board) (Cont.)

Resistance inputs

Temperature scale: ITS90
Types, ranges and accuracies: See tables (values exclude influence of lead resistance)
Influence of lead resistance Error: Negligible
Mismatch: 1Ω/Ω
Maximum source current: 250µA

Low Range	High Range	Resolu-tion	Typical error (Instrument at 20 deg. C)	Maximum error (Instrument at 20 deg. C)	Worst case temperature performance
0 Ω	150 Ω	5 mΩ	0.027% input + 0.034% range	0.037% input + 0.077% range	30ppm of input per ˚C
0 Ω	600 Ω	22 mΩ	0.027% input + 0.035% range	0.037% input + 0.057% range	30ppm of input per ˚C
0 Ω	5 kΩ	148 mΩ	0.030% input + 0.034% range	0.040% input + 0.041% range	30ppm of input per ˚C

RTD type	Overall range (˚C)	Standard	Max. linearisation error
Cu10	-20 to + 400	General Electric Co.	0.02˚C
Cu53	-70 to + 200	RC21-4-1966	< 0.01˚C
JPT100	-220 to + 630	JIS C1604:1989	0.01˚C
Ni100	-60 to + 250	DIN43760:1987	0.01˚C
Ni120	-50 to + 170	DIN43760:1987	0.01˚C
Pt100	-200 to + 850	IEC751	0.01˚C
Pt100A	-200 to + 600	Eurotherm Recorders SA	0.09˚C
Pt1000	-200 to + 850	IEC751	0.01˚C

Thermocouple data

Temperature scale: ITS90
Bias current: 0.05nA
Cold junction compensation types: Off, internal, external, remote
Remote CJC source: Any input or maths channel.
Internal CJC error: 1˚C max with instrument at 25˚C
Internal CJC rejection ratio: 50:1 minimum
Upscale/downscale drive Types: 'High'. 'low' or 'none' selectable for each thermocouple channel.
Additional error: Typically 0.01˚C - depends on wiring. (Detect current = 57nA.)
Types, ranges and accuracies: See table

T/C type	Overall range (˚C)	Standard	Max.linearisation error
B	0 to + 1820	IEC584.1	0 to 400˚C = 1.7˚C 400 to 1820˚C = 0.03˚C
C	0 to + 2300	Hoskins	0.12˚C
D	0 to + 2495	Hoskins	0.08˚C
E	-270 to + 1000	IEC584.1	0.03˚C
G2	0 to + 2315	Hoskins	0.07˚C
J	-210 to + 1200	IEC584.1	0.02˚C
K	-270 to + 1372	IEC584.1	0.04˚C
L	-200 to + 900	DIN43710:1985 (To IPTS68)	0.02˚C
N	-270 to + 1300	IEC584.1	0.04˚C
R	-50 to + 1768	IEC584.1	0.04˚C
S	-50 to + 1768	IEC584.1	0.04˚C
T	-270 to + 400	IEC584.1	0.02˚C
U	-200 to + 600	DIN43710:1985	0.08˚C
NiMo/NiCo	-50 to + 1410	ASTM E1751-95	0.06˚C
Platinel	0 to + 1370	Engelhard	0.02˚C
Ni/NiMo	0 to + 1406	Ipsen	0.14˚C
Pt20%Rh/Pt40%Rh	0 to + 1888	ASTM E1751-95	0.07˚C

WORST CASE ERROR CALCULATION

Assuming type T thermocouple at 350˚C, ambient temp = 40˚C, CJC = internal.

Total error = input error + range error + temperature error +linearisation error + cold junction error.

Input error:

From thermocouple tables, a type T thermocouple generates a voltage of 17.819mV at 350 ˚C. From the dc performance table above, the maximum error is 0.030% input = 0.03 x 17.819/100 = 5.346µV

Range error:

The 38mV range is used as the type t thermocouple is defined to cover the range -270˚C (-6.258mV) to +400˚C (20.872mV). From the dc performance table, the maximum range error is 0.052% range, and the range is 38 + 38 = 76 mV. Thus the maximum range error is 0.052 x 76/100 = 39.52µV.

Temperature error:

The dc performance table above is specifed at 20˚C, but the ambient in this example is 40˚C. From the dc performance table, the worst case temperature performance is 25ppm/˚C, so our error is 25 x (40-20) x 17.819 x 10^{-6} = 8.910µV.

Linearisation error:

From the thermocouple table, the maximum linearisation error for a type t thermocouple is 0.02 ˚C

Cold junction compensation (CJC) error:

The internal CJC error is 1˚C maximum with the instrument at 25˚C. The CJC rejection ratio is 50:1, so a further error of (40-25)/50 = 0.30 ˚C may occur, giving a total maximum CJC error of 1.3˚C.

Maximum error

From the above, the total error adds up as follows:

Input error:	5.346µV		
Range error:	39.520µV		
Temperature error:	8.910µV		
Linearisation error:			0.02˚C
CJC error:			1.30 ˚C
Total error:	53.776µV	+	1.32˚C

From thermocouple tables, a change of 1˚C is equivalent to a change of 60µV, so a change of 53.776µV is equivalent to a change of 0.896˚C.

Thus the total worst case error for this example is (0.896 + 1.32) = 2.216˚C

TECHNICAL SPECIFICATION (Relay output board)

General

Maximum number of relay boards	
Small-frame unit	Four
Large-frame unit	Nine
Number of relays per board	
Changeover relays:	Three
Normally open relays:	Four
Normally closed relays:	Four
Estimated mechanical life	30,000,000 operations
Update rate	See 'Update rates' in 'Recorder specification' above

AC load ratings

Derating

The figures given below are for resistive loads. For reactive or inductive loads, de-rate in accordance with graph 1, in which

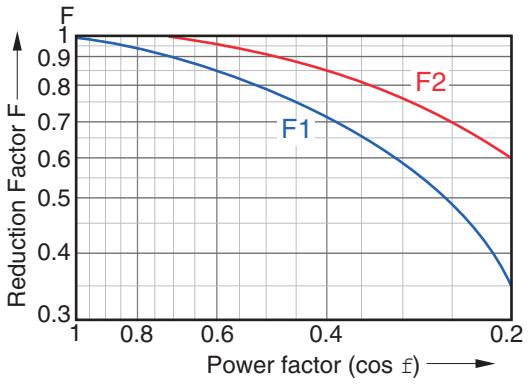
F1 =	Actually measured results on representative samples
F2 =	Typical values (according to experience)
Contact life =	Resistive contact life x reduction factor.
Maximum switching power	500VA
Maximum contact voltage	250V providing this does not cause the maximum switching power (above) to be exceeded
Maximum contact current	2 Amps providing this does not cause the maximum switching power (above) to be exceeded

DC load ratings

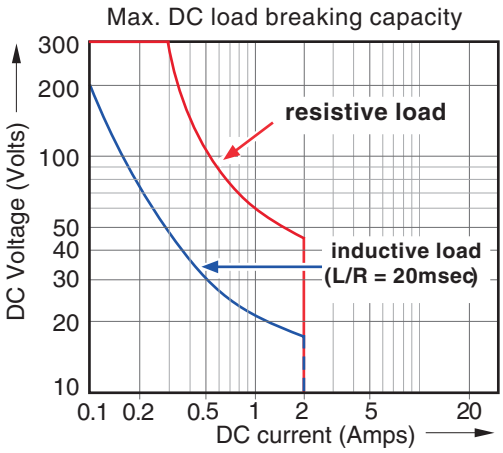
Maximum switching power	See graph 2 for operating volt/Amp envelope
Maximum contact voltage/current	See graph 2 for examples.

Safety isolation

Isolation (dc to 65 Hz; BS EN61010)	Installation category II; Pollution degree 2
Relay to relay:	300V RMS or dc (double insulation)
Relay to ground:	300V RMS or dc (basic insulation)



Graph 1 Derating curves for ac loads



Graph 2 DC load switching curves

ANNEX B: REFERENCE

B1 DIAGNOSTICS DISPLAY

B1.1 MAIN DIAGNOSTIC DISPLAY

At power-up, continuously hold a finger in contact with the screen until the main diagnostic display appears as shown in figure B1.1

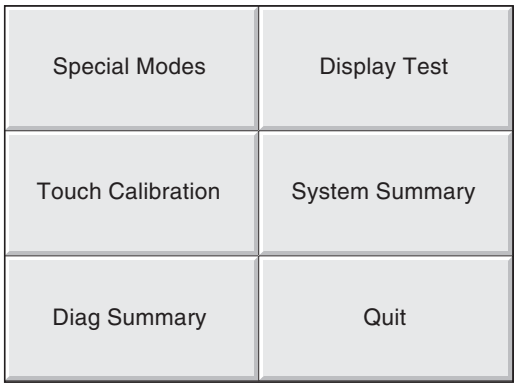


Figure B1.1b Top-level diagnostic display

B1.2 SPECIAL MODES

For factory use only, selecting 'Special Modes' allows the enabling and disabling of the Sales Demo mode of operation.

An 'S' symbol is displayed at the top of the screen whilst the recorder is in sales demo mode.

B1.3 DISPLAY TEST

Selecting this option, allows the user to check the display by flooding the screen with single colours. Repeatedly touching the screen, scrolls through the following colour sequence: Black, White, Red, Green, Blue, Cyan, Magenta, Yellow. A further operation of the touch screen returns the main diagnostic screen.

B1.4 TOUCH CALIBRATION

Touching this key calls a selection screen as shown below:

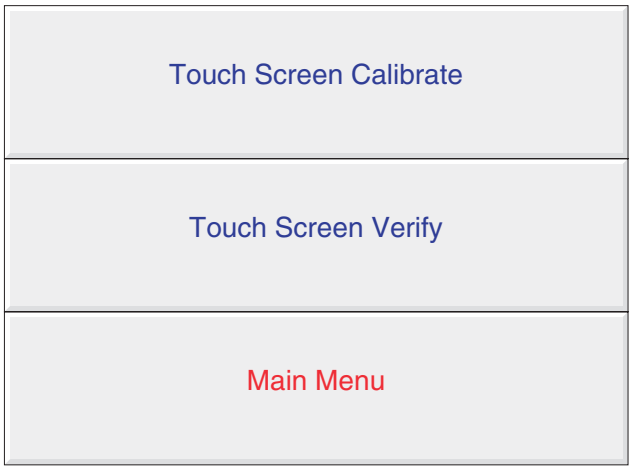


Figure B1.4 Touch screen selections

B1.4.1 Touch screen calibrate

This key initiates the display calibration (offset correction) procedure. This procedure ensures that the display screen image is positioned correctly compared with the touch screen (so that 'what you touch is what you get'). The procedure, is necessary only rarely, if at all, and is included here only for the sake of completeness.

1. Operate the 'Touch Screen Calibrate' key to call the first calibration screen, as depicted in figure B1.4.1
2. Using the stylus, touch the intersection of the upper set of crosshairs, as requested by the display and keep touching it until the next target appears.
3. Continue the process, according to the directions appearing on the screen. Once all the 'targets' have been accepted, the recorder returns to the diagnostic display.

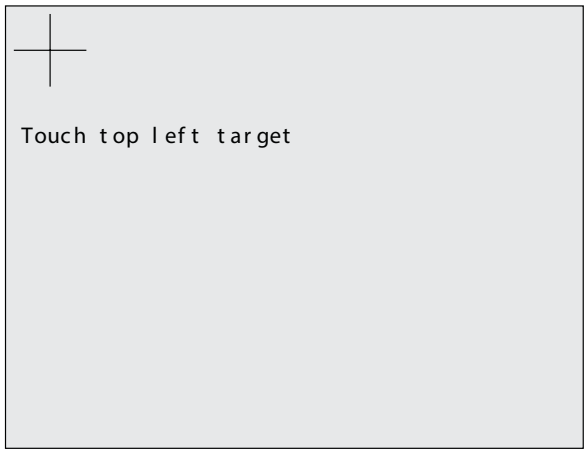


Figure B1.4.1 Initial calibration display

B1.4.2 Touch screen verify

This allows the user to check the accuracy of the touch screen without having to carry out the calibration procedure described above.

Touching the screen with the stylus produces a crosshair at the position the recorder believes the screen to have been touched. It is up to the user to decide if the response is good enough for recorder operation. After a few seconds of non-operation, the recorder returns to the top level touch screen display (figure B1.4).

B1.4.3 Main menu

Touching this returns the user to the top level diagnostics screen (Figure B1.1)

B1.5 SYSTEM SUMMARY

This key calls a system summary display, as shown for a typical small-frame recorder, in figure B1.5.

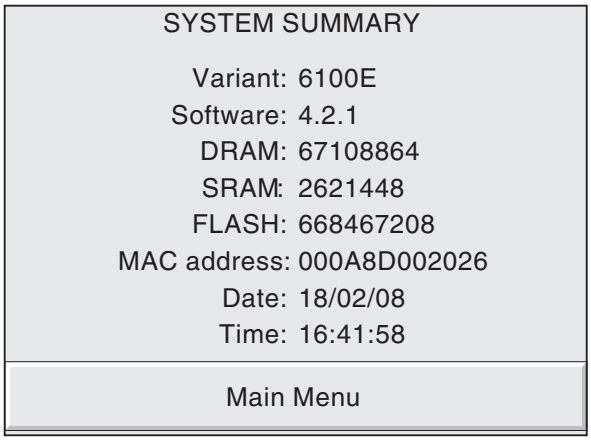


Figure B1.5 System summary display

B1.6 DIAG SUMMARY

Note: The diagnostic display does not include details of the Transmitter Power Supply option (if fitted).

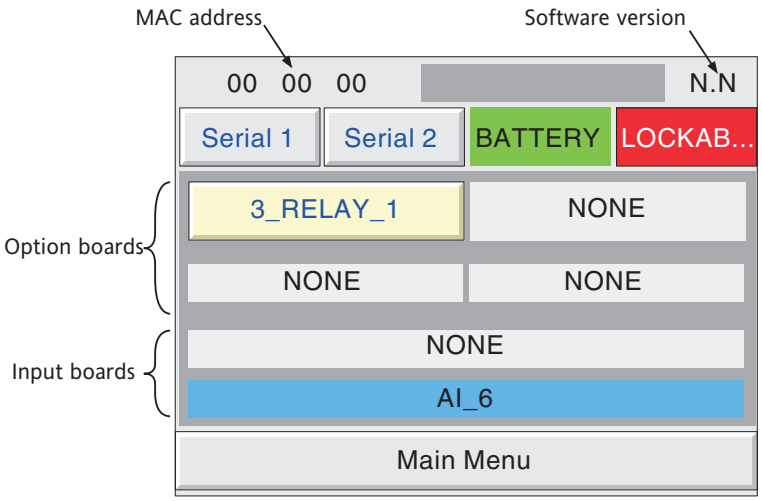


Figure B1.6 Diag Summary (small frame recorder - large frame similar)

B1.6.1 MAC Address

Each instrument is allocated a unique hex address as a part of the manufacturing process. The display at the top left of the display screen shows the final 6 characters of this address. The full address can be found in the System Summary display, described above, or in the Network\Name display described in section 4.5.1.

B1.6.2 Software version number

This shows the version number of the software fitted to the recorder.

B1.6.3 Serial 1/Serial 2

Not applicable this recorder model

B1.6.4 Battery

This area, normally green, flashes red/white when the battery needs to be replaced (section B2). Battery status is checked once every 15 minutes.

B1.6.5 Lockable

The lockable flap display is green if the lockable flap is fitted, or flashes red/white if the option is not fitted. (Option not available for this recorder version.

B1.6.6 Option boards

This shows which option boards are fitted where as viewed from the rear of the recorder. (Only one option board (three change-over relay) is available for this recorder model.

RELAY OUTPUT BOARDS

If a relay output board is fitted, its relays can be tested by touching the Option board key, then touching the relevant relay key to energise/de-energise the relay. Figure B1.6.6 shows a typical display.

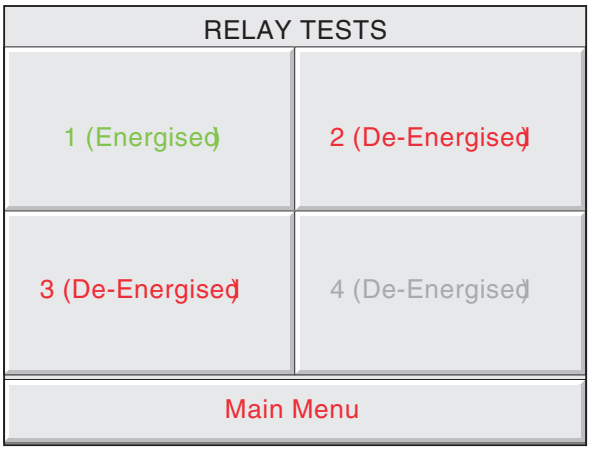


Figure B1.6.6 Relay board test display

B1.6.7 Input boards

This shows how many input boards are fitted. (Only one input board available this model of recorder.

B1.6.8 Main menu

To return to the main diagnostics display, touch the 'Main Menu' key.

B1.7 QUIT

Allows the user to quit diagnostics (after confirmation). The recorder restarts in normal operating mode.

B2 PREVENTIVE MAINTENANCE

B2.1 TOUCH SCREEN CLEANING

CAUTION

The touch-sensitive screen used in this product is designed for use by hand or by the stylus supplied only. The use of sharp or pointed implements such as pens, keys and fingernails to operate the instrument must be avoided, or irreparable damage will be done to the surface material. When cleaning the touch-screen, a moist cloth should be used, if necessary with a minimal amount of mild soap solution.

ALCOHOLS SUCH AS ISOPROPYL ALCOHOL MUST NEVER BE USED ON THE SCREEN.

B2.2 MAINTENANCE SCHEDULE

Battery replacement - Every three years

B2.2.1 BATTERY REPLACEMENT PROCEDURE

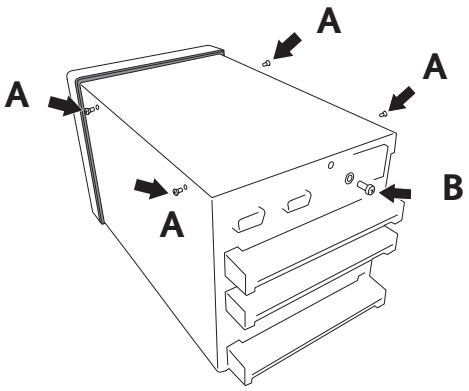
WARNING

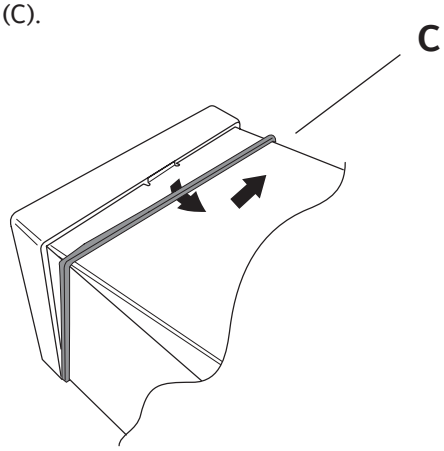
In order to eliminate the risk of user contact with hazardous voltages, the recorder must be isolated from line power before its top cover is removed.

The battery is of poly-carbonmonofluoride/lithium construction and should be disposed of according to local regulations covering this type of battery.

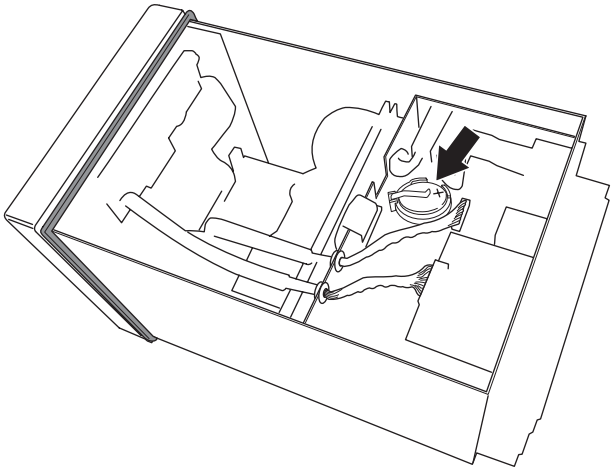
Note: All battery backed RAM data is lost during battery change (see Annex A for details of stored data)..

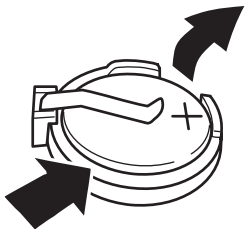
1. Isolate the recorder from supply power and remove the recorder from the panel (if fitted)
2. Remove the recorder cover by removing the Four Torx headed screws (A) and the Pozidriv-headed screw B, and then lifting the cover up and out, under the gasket (C).





3. With the cover removed, the battery board is accessible, allowing the exhausted battery to be slid out of its holder and the replacement battery to be inserted (+ up).





Battery type BR2330
Part Number PA261095

B3 OPTION ENABLING

See 'Upgrade' in section 4.6.3.

B4 COLOUR SELECTION

The following table, gives RGB values and decimal and hex numbers for the available channel colours. Normally, this table is necessary only when communicating over the Modbus link.

Note: Colour representation varies from screen to screen. For this reason, it is unlikely that the colour on a PC will match those on these pages or those on the recorder display.

B4 COLOUR SELECTION (Cont.)

	Colour	Red	Green	Blue	Decimal	Hex
	Red	255	0	0	0	00
	Blue	0	0	255	1	01
	Green	0	255	0	2	02
	Honey	255	191	0	3	03
	Violet	170	31	153	4	04
	Russet	170	95	0	5	05
	Dark Blue	0	0	102	6	06
	Jade	0	95	0	7	07
	Magenta	255	0	102	8	08
	Dusky Rose	255	95	51	9	09
	Yellow	255	255	255	10	0A
	Powder Blue	85	63	255	11	0B
	Dark Red	170	0	0	12	0C
	Avocado	0	233	102	13	0D
	Indigo	85	0	102	14	0E
	Dark Brown	85	63	0	15	0F
	Ægean	0	63	51	16	10
	Cyan	0	255	255	17	11
	Aubergine	85	0	51	18	12
	Dark Orange	255	63	0	19	13
	Pale Yellow	255	255	51	20	14
	Hyacinth	170	0	51	21	15
	Dark Green	0	63	0	22	16
	Sugar Pink	255	31	204	23	17
	Bluebell	85	31	255	24	18
	Orange	255	95	0	25	19
	Pink	255	159	255	26	1A
	Buttermilk	255	255	102	27	1B

Table B4, sheet 1: Colour definitions 0 to 27

B4 COLOUR SELECTION (Cont.)

Colour	Red	Green	Blue	Decimal	Hex
Terracotta	170	63	0	28	1C
Blue Babe	85	95	255	29	1D
Lime	0	223	0	30	1E
Blue Jive	85	31	204	31	1F
Cucumber	0	255	153	32	20
EuroGreen	67	107	103	33	21
Wheatgerm	255	223	51	34	22
Sea Blue	85	159	255	35	23
Ginger	255	159	0	36	24
Aqua Pool	0	63	255	37	25
Pale Red	255	63	51	38	26
Pale Blue	85	127	255	39	27
Lilac	170	0	255	40	28
Sky Blue	85	191	255	41	29
Wild Moss	0	127	0	42	2A
Turquoise	0	127	153	43	2B
Pale Green	85	255	153	44	2C
Coffee	170	127	0	45	2D
Wicker	255	255	191	46	2E
Black	0	0	0	47	2F
Dark Dark Grey	48	48	48	48	30
Dark Grey	64	64	64	49	31
Grey	128	128	128	50	32
Light Light Dark Grey	154	154	154	51	33
Light Dark Grey	172	172	172	52	34
Light Grey	192	192	192	53	35
Light Light Grey	212	212	212	54	36
White	255	255	255	55	37

Table B4, sheet 2: Colour definitions 28 to 55

B5 TCP PORT NUMBERS

The following TCP ports are made use of by the recorder. (This information would be needed by anyone involved in setting up 'firewalls', which may be used selectively to block incoming or outgoing access to specific ports.)

PORT	Usage
20	File Transfer Protocol - data
21	File Transfer Protocol - control
25	E-mail; SMTP
80	Web access
123	SNTP server
502	Modbus/TCPIP communications
1264	Bridge communications - general
50010	Bridge communications - trend review

B6 ASCII CHARACTERS FOR SERIAL COMMS

This section contains details of the ASCII characters that may be used with the Serial Comms option. All the ASCII characters listed can be used as Start or End-of-message characters, but only characters with decimal codes 32 to 127 can be used in messages, as decimal codes 0 to 31 are replaced by Question marks in messages.

Character	Decimal	Hex	Character	Decimal	Hex	Character	Decimal	Hex	Character	Decimal	Hex
NUL	0	00	Space	32	20	@	64	40	‘	96	60
SOH	1	01	!	33	21	A	65	41	a	97	61
STX	2	02	"	34	22	B	66	42	b	98	62
ETX	3	03	#	35	23	C	67	43	c	99	63
EOT	4	04	$	36	24	D	68	44	d	100	64
ENQ	5	05	%	37	25	E	69	45	e	101	65
ACK	6	06	&	38	26	F	70	46	f	102	66
BEL	7	07	’	39	27	G	71	47	g	103	67
BS	8	08	(	40	28	H	72	48	h	104	68
HT	9	09	)	41	29	I	73	49	i	105	69
LF	10	0A	*	42	2A	J	74	4A	j	106	6A
VT	11	0B	+	43	2B	K	75	4B	k	107	6B
FF	12	0C	,	44	2C	L	76	4C	l	108	6C
CR	13	0D	-	45	2D	M	77	4D	m	109	6D
SO	14	0E	.	46	2E	N	78	4E	n	110	6E
SI	15	0F	/	47	2F	O	79	4F	o	111	6F
DLE	16	10	0	48	30	P	80	50	p	112	70
DC1	17	11	1	49	31	Q	81	51	q	113	71
DC2	18	12	2	50	32	R	82	52	r	114	72
DC3	19	13	3	51	33	S	83	53	s	115	73
DC4	20	14	4	52	34	T	84	54	t	116	74
NAK	21	15	5	53	35	U	85	55	u	117	75
SYN	22	16	6	54	36	V	86	56	v	118	76
ETB	23	17	7	55	37	W	87	57	w	119	77
CAN	24	18	8	56	38	X	88	58	x	120	78
EM	25	19	9	57	39	Y	89	59	y	121	79
SUB	26	1A	:	58	3A	Z	90	5A	z	122	7A
ESC	27	1B	;	59	3B	[	91	5B	{	123	7B
FS	28	1C	<	60	3C	\	92	5C	|	124	7C
GS	29	1D	=	61	3D	]	93	5D	}	125	7D
RS	30	1E	>	62	3E	^	94	5E	~	126	7E
US	31	1F	?	63	3F	_	95	5F	Not printed	127	7F

Notes:

1 All the above characters can be used as Start or End-of-message characters (entered in decimal)

2 If characters 0 to 31 (00 to 1F) are used as message characters, they will be replaced by question marks on the screen.

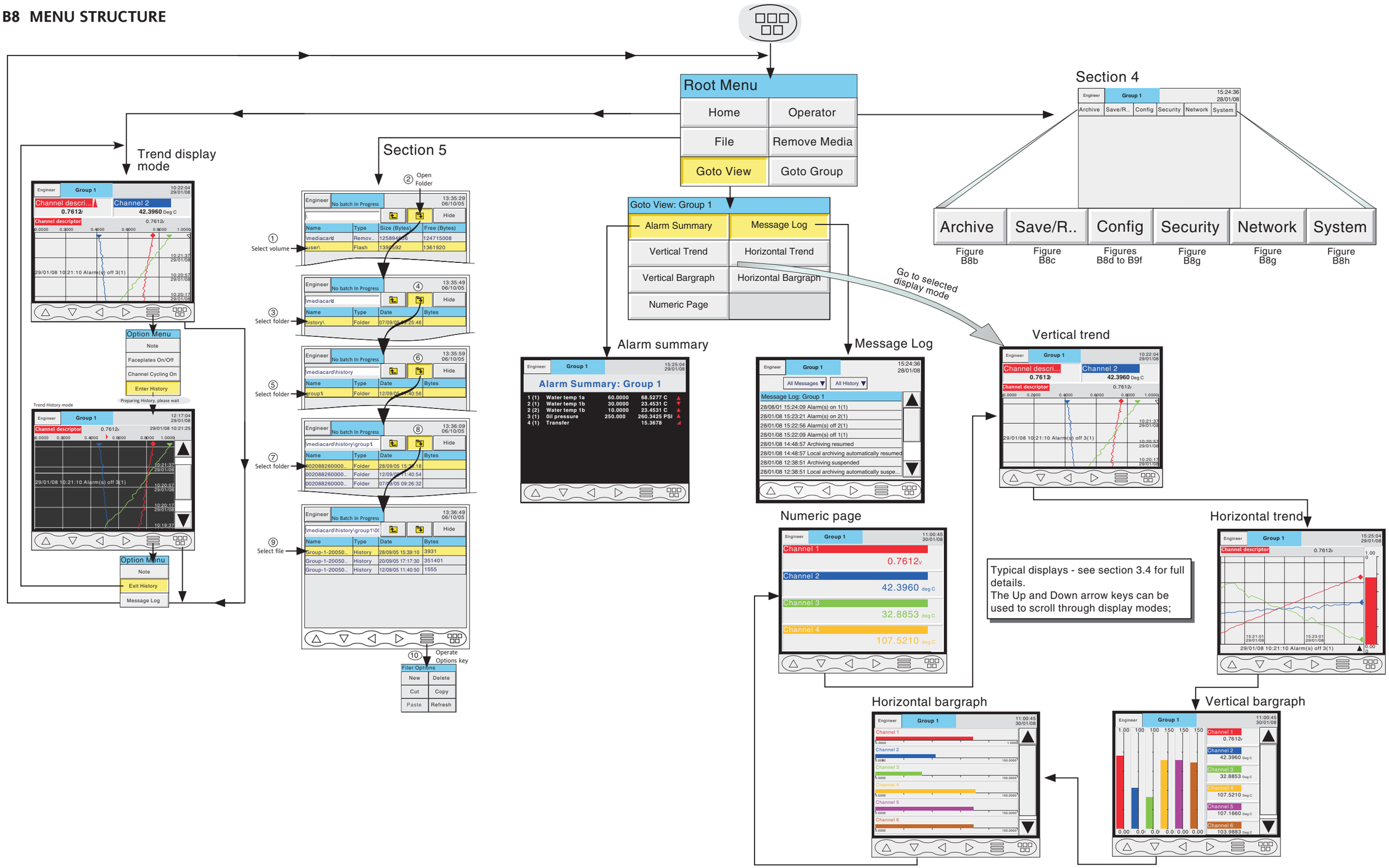
B7 TIME ZONE INFORMATION

This section gives an explanation of the time zone abbreviations listed in the System/Locale/Time Zone pick list. The list starts at GMT, travelling Eastwards round the world.

Abbre-viation	Full title	Time at noon GMT	Hours of difference
GMT	Greenwich mean time	12:00	0
UTC	Co-ordinated Universal time	12.00	0
ECT	Central European time	13:00	+1
EET	Eastern European time	13:00	+1
ART	Arabic standard time	14:00	+2
EAT	Eastern African time	15:00	+3
MET	Middle East time	15:30	+3.5
NET	Near East time	16:00	+4
PLT	Pakistan Lahore time	17:00	+5
IST	India standard time	17:30	+5.5
BST	Bangladesh standard time	18:00	+6
VST	Vietnam standard time	19:00	+7
CTT	China Taiwan time	20:00	+8
JST	Japan standard time	21:00	+9
ACT	Australia Central time	21:30	+9.5
AET	Australia Eastern time	22:00	+10
SST	Solomon standard time	23:00	+11
NST	New Zealand standard time	24:00	+12
MIT	Midway Islands time	01:00	-11
HST	Hawaii standard time	02:00	-10
AST	Alaska standard time	03:00	-9
PST	Pacific standard time	04:00	-8
PNT	Phoenix standard time	05:00	-7
MST	Mountain standard time	05:00	-7
CST	Central standard time	06:00	-6
EST	Eastern standard time	07:00	-5
IET	Indiana Eastern standard time	07:00	-5
PRT	Puerto Rico and US Virgin Islands time	08:00	-4
CNT	Canada Newfoundland time	08:30	-3.5
AGT	Argentina standard time	09:00	-3
BET	Brazil Eastern time	09:00	-3
CAT	Central African time	11:00	-1

This page is deliberately left blank

B8 MENU STRUCTURE



B8 MENU STRUCTURE (Cont.)

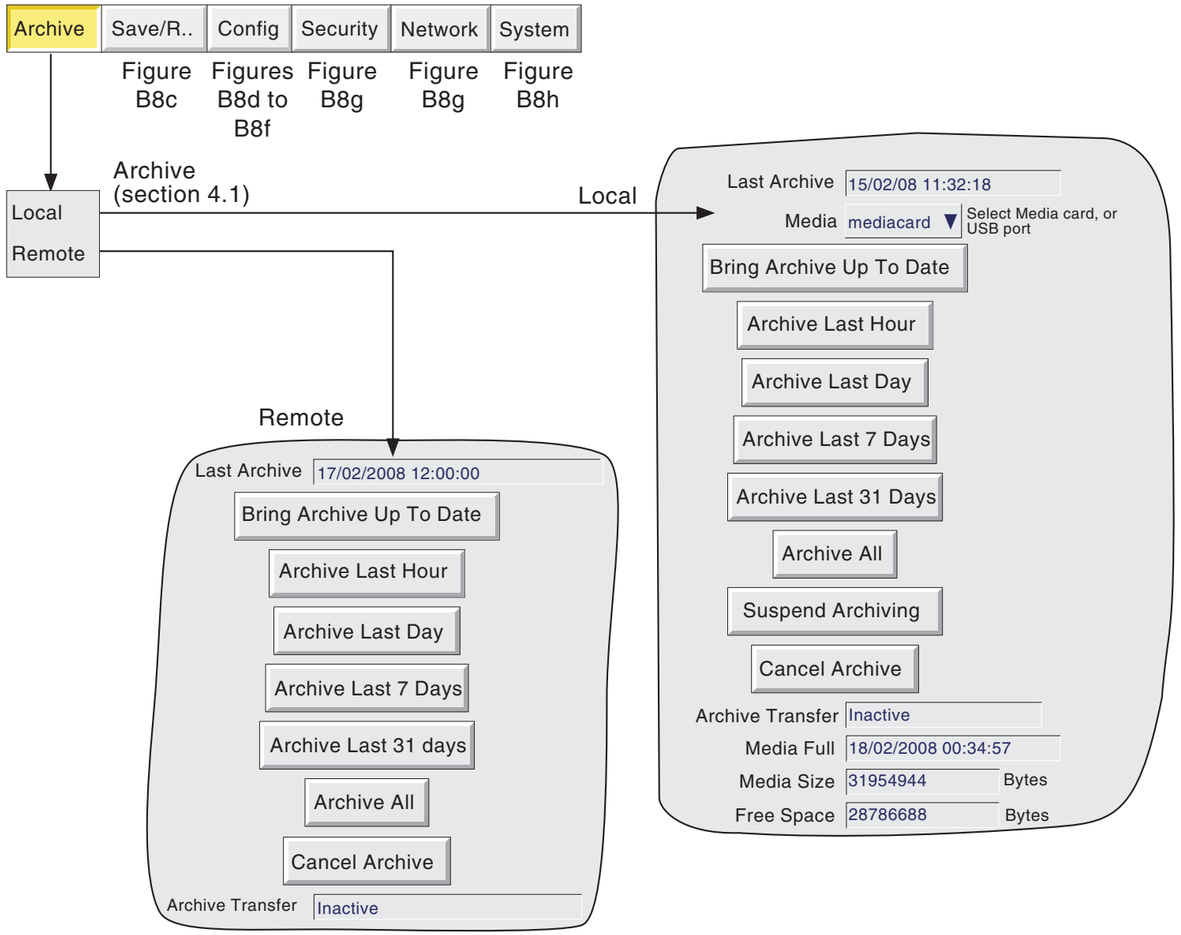


Figure B8b Archive key menu structure

B8 MENU STRUCTURE (Cont.)

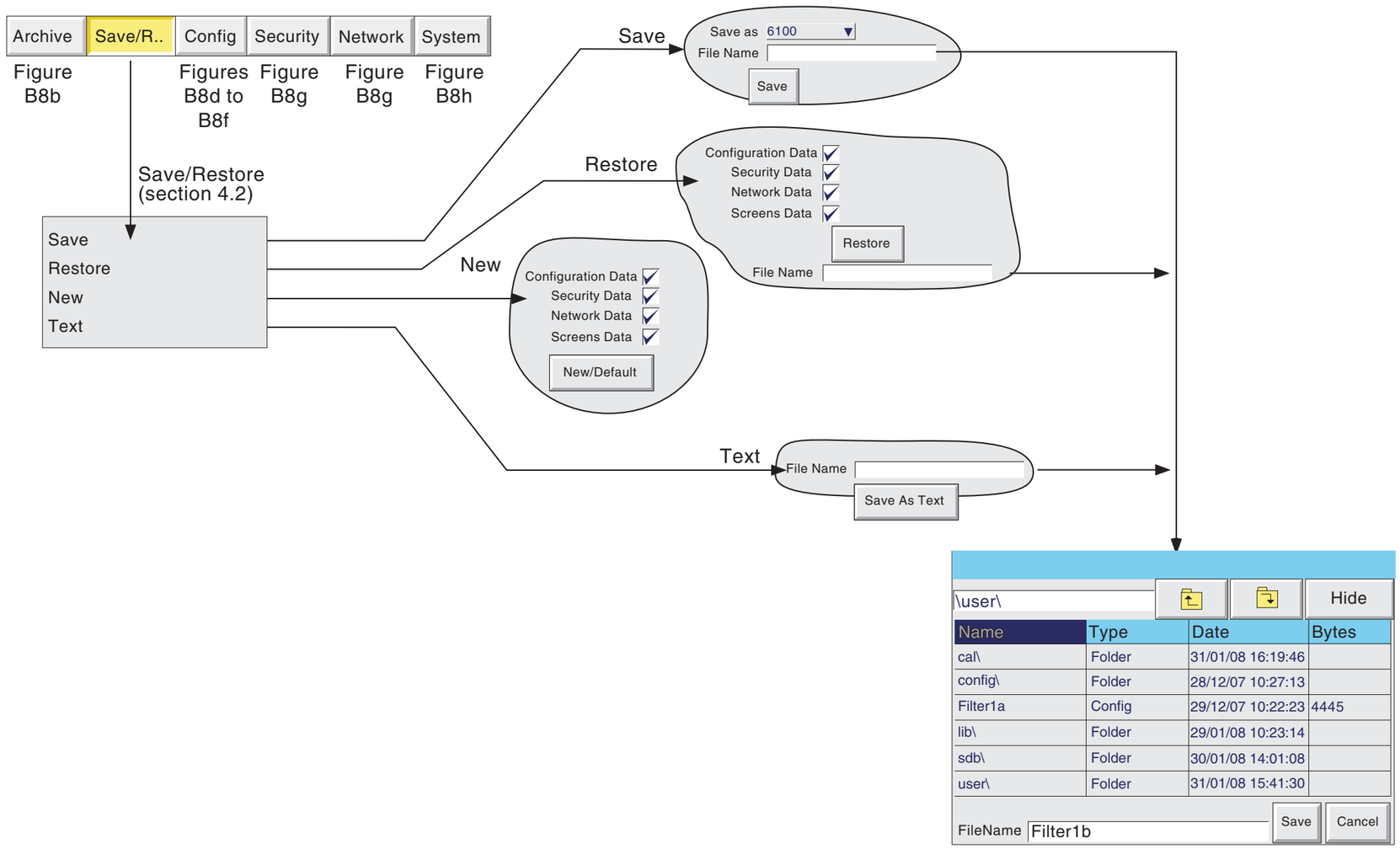


Figure B8c Save/Restore menu structure

B8 MENU STRUCTURE (Cont.)

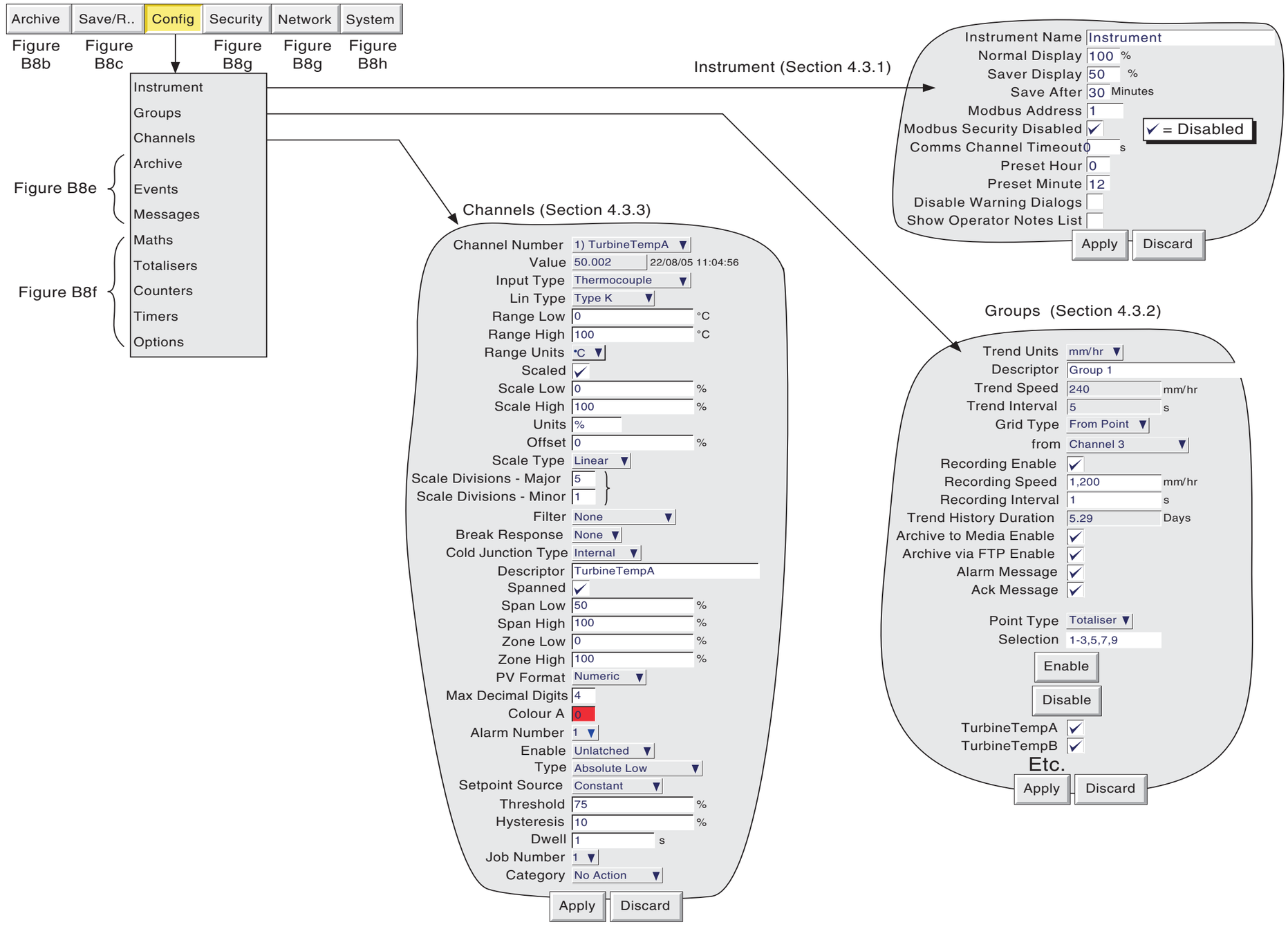


Figure B8d Config menu structure (sheet 1)

B8 MENU STRUCTURE (Cont.)

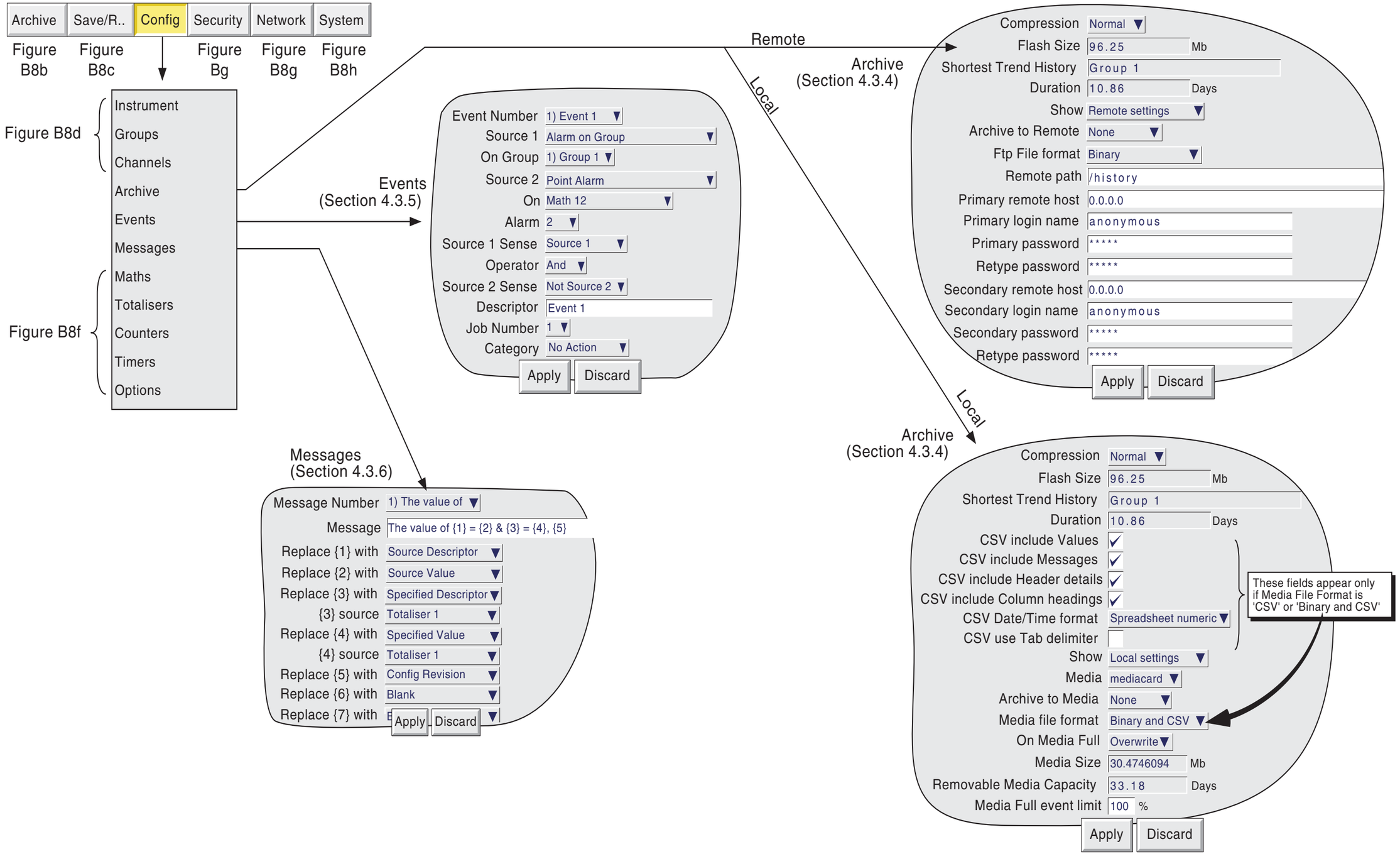


Figure B8e Config menu structure (sheet 2)

B8 MENU STRUCTURE (Cont.)

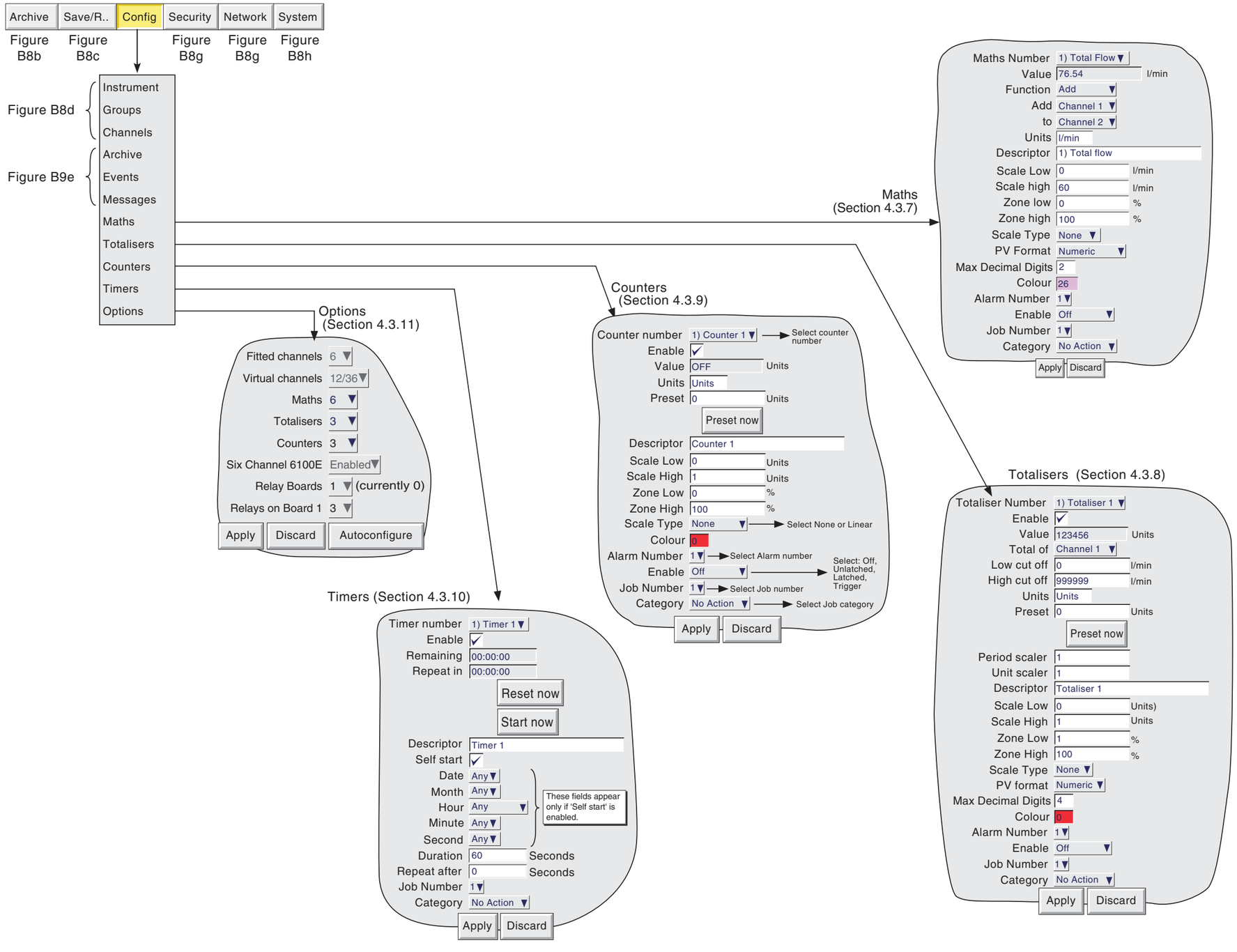


Figure B8f Config menu structure (sheet 3)

B8 MENU STRUCTURE (Cont.)

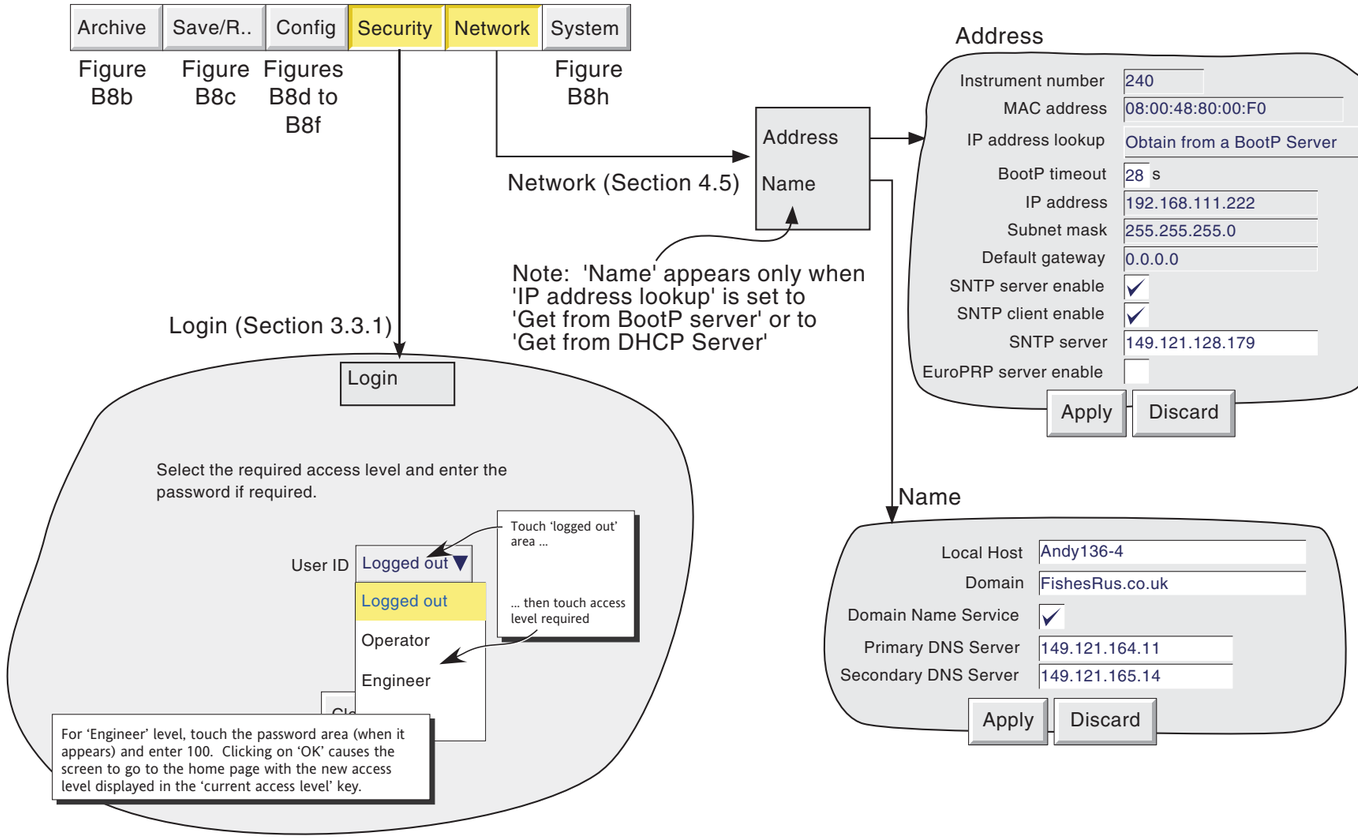


Figure B8g Security/Network key menus

B8 MENU STRUCTURE (Cont.)

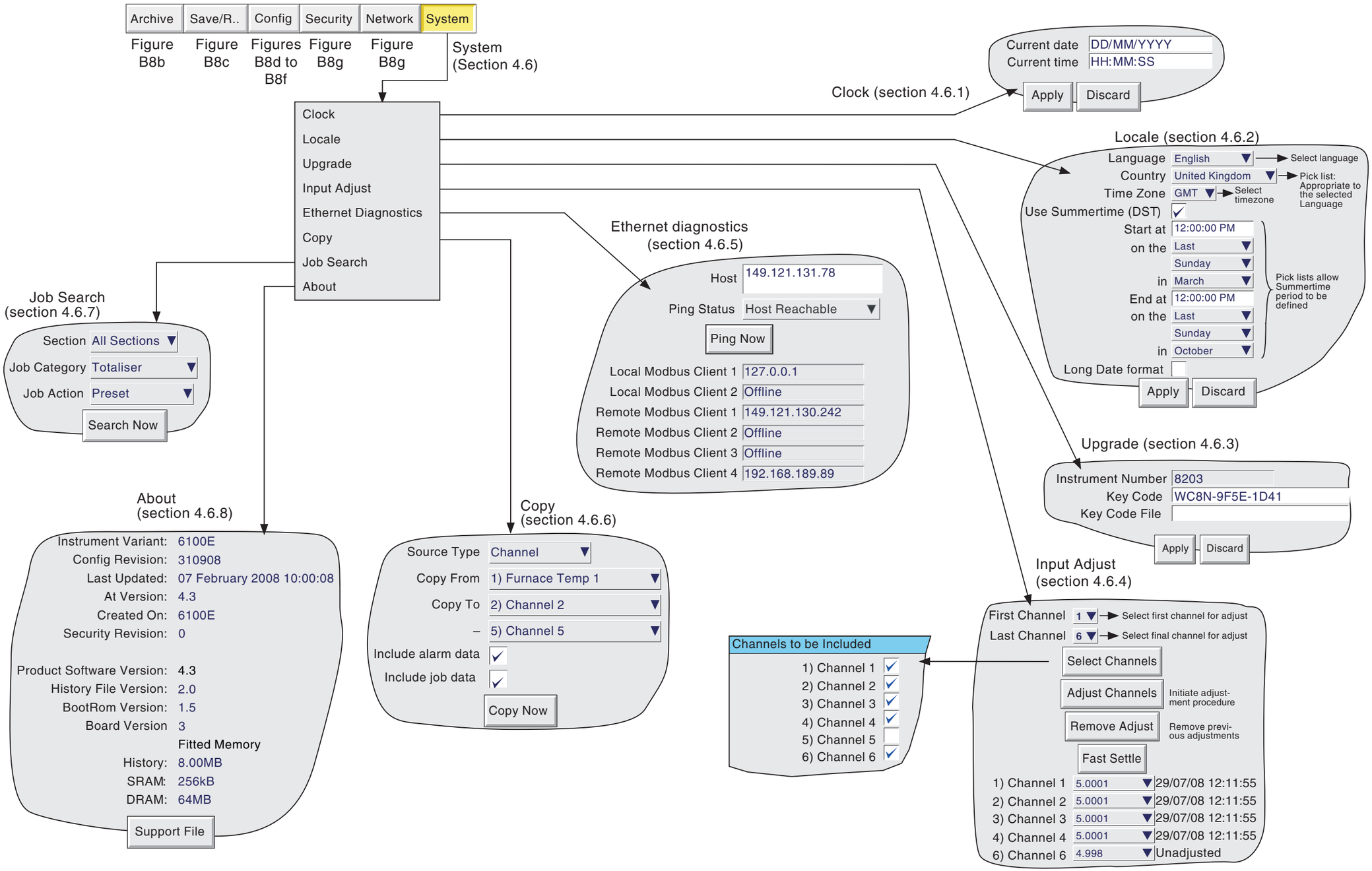


Figure B8h System key menu structure

ANNEX C: WEB SERVER DETAILS

C1 INTRODUCTION

This feature allows a user limited Read-Only access to the recorder from a remote PC, by:

1. Opening a standard internet browser
2. Typing-in the IP address of the recorder in the form: http://xxx.xxx.xxx.xxx, or the 'Local host' name http://*Local host*. IP address and Local host are described in section 4.5 of this manual.
3. Entering the correct Remote user name (Engineer) and Remote password (blank).

If all the entries are correct, the Web Server home page appears, the top part of which is shown in figure C1, below.

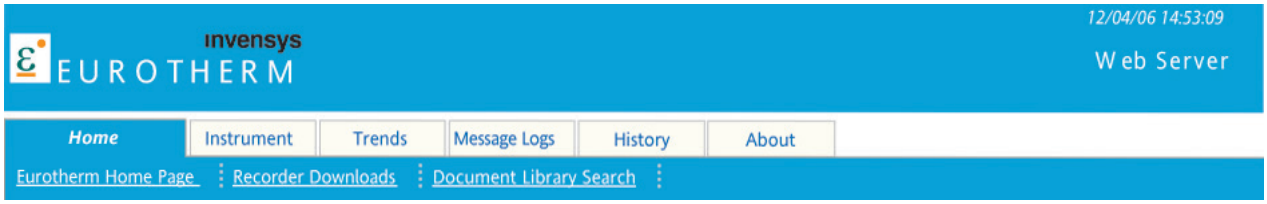


Figure C1 Home page

As can be seen there are two sets of 'controls' *viz* the internet links and the instrument access tabs.

C1.1 INTERNET LINKS

These three links take the user to various areas of the manufacturer's web site.

C1.2 ACCESS TABS

Most of the information displayed in the pages described below is updated every 20 seconds. The exception is the Trend page refresh rate which can be edited (as shown in figure C1.2.2a) by typing in the new value, and then either clicking on 'Set' or using the computer <Enter> key. Because of the processing time required, it is not recommended that a value of less than 5 seconds be entered.

C1.2.1 Instrument

This opens the instrument page, a typical example of which is shown in figure C1.2.1 below.

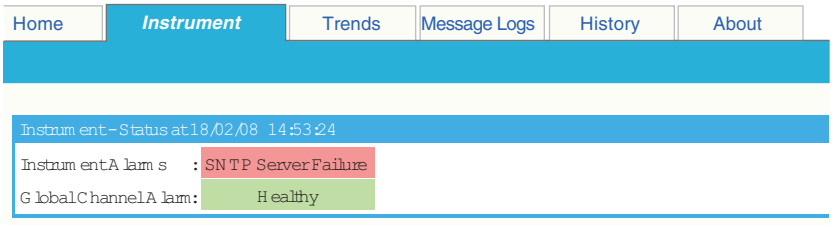


Figure C1.2.1 Instrument display

INSTRUMENT ALARMS

Either 'Healthy' (green background) or a list of any active instrument alarm(s) (red background).

GLOBAL CHANNEL ALARM

Either 'Healthy' (green background) if there are no point alarms, or 'Active' (red background) if there is one or more active point alarm.

C1.2.2 Trends

Clicking on the 'Trends' tab displays a screen allowing the user to select a refresh rate and one of Horizontal trend, Vertical Trend or Numeric as the display format. Both the horizontal and vertical trend modes include the numeric display table.

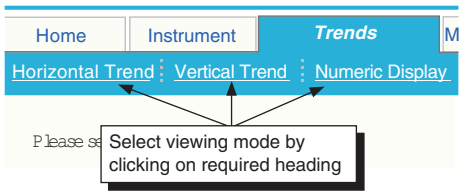


Figure C1.2.2a Trend mode selection

HORIZONTAL TREND

Figure C1.2.2b shows a horizontal trend display for an imaginary group (Furnace Temps 1) with two channels (Stack 1 and Stack2North)

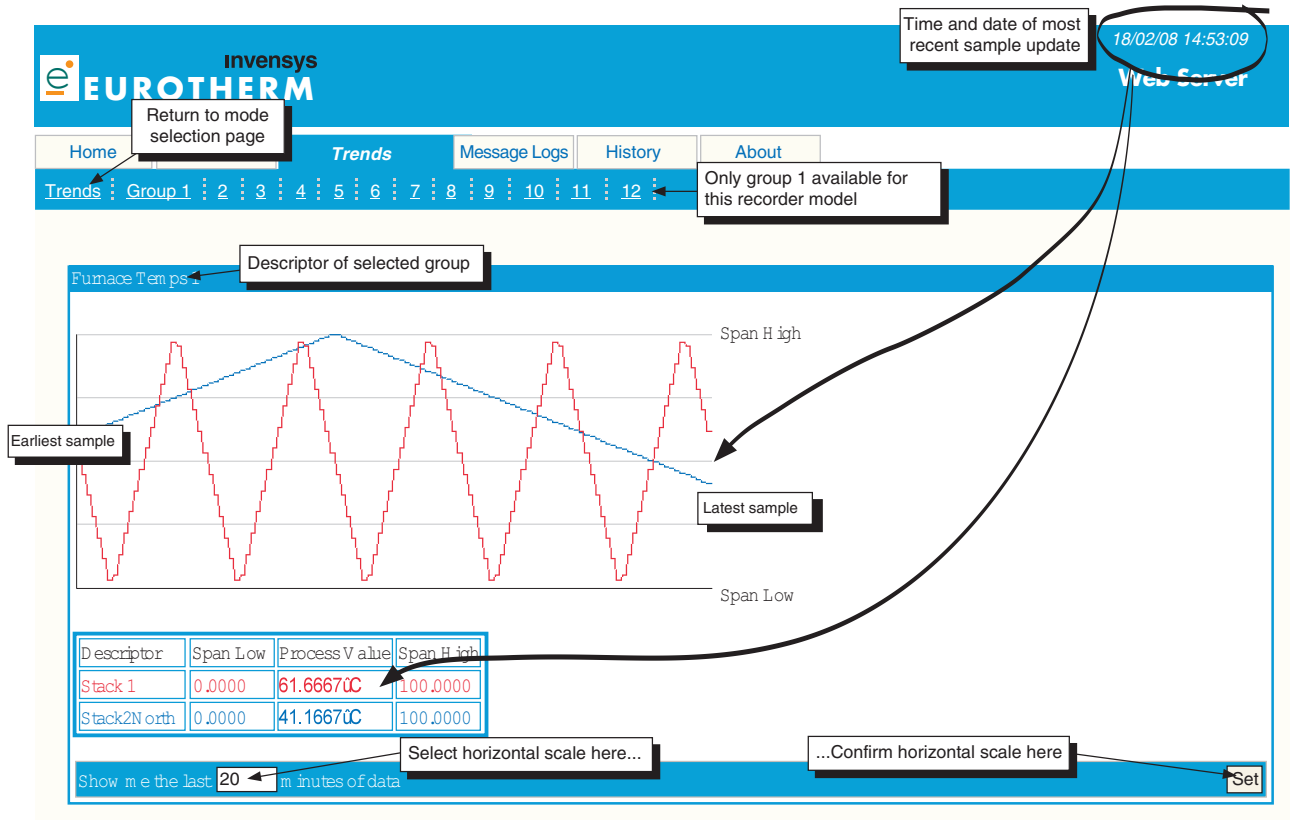


Figure C1.2.2b Horizontal trend example

As shown in the figure, the group process values appear as though being traced on a chart which is rolling from right to left (i.e the oldest sample is at the left edge of the chart, and the latest sample is at the right edge of the chart). The point Descriptors, Span high and Span low values and process values (at the time and date at the top left of the screen) appear in a table below the chart.

The amount of time across the width of the chart (the 'horizontal scale') can be edited from its default of 20 minutes by typing a new value in the box at bottom left of the page, and confirming either by clicking on the 'Set' button at bottom right or by using the pc's <Enter> key.

To return to the Trend Mode selection page, Click on the 'Trends' link at top left.

C1.2.2 TRENDS (Cont.)

VERTICAL TREND

This viewing mode is identical in operation to the Horizontal Trend mode described above, except that the 'chart' is vertical, with the most recent sample at the top, and the oldest at the bottom. The 'Vertical scale' (i.e the amount of trend history displayed within the height of the chart) is edited as described for 'Horizontal scale' in the Horizontal Trend description above.

To return to the Trend Mode selection page, Click on the 'Trends' link at top left.

NUMERIC DISPLAY

This viewing mode contains only a table of point descriptors, spans high and low, and process values. The table is identical in layout to that shown below the 'chart' in figure C1.2.2b, above.

To return to the Trend Mode selection page, Click on the 'Trends' link at top left.

C1.2.3 Message Logs

Figure C1.2.3 shows an imaginary message log with a number of alarm messages, for a group called Furnace Temps 1.

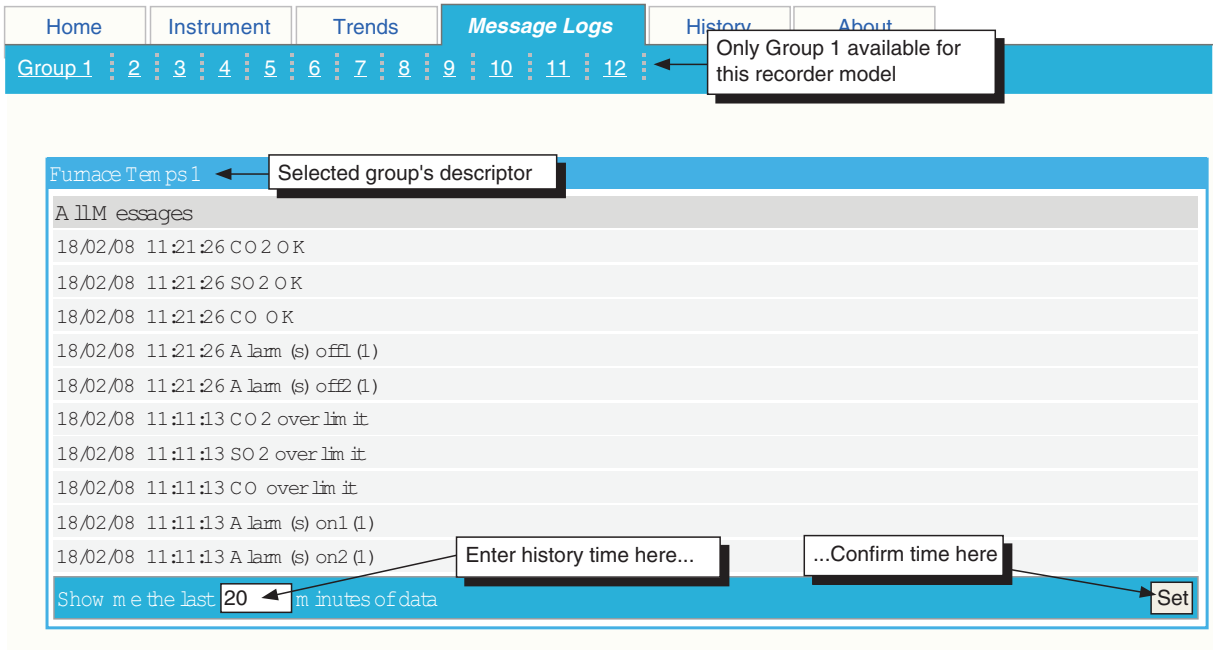
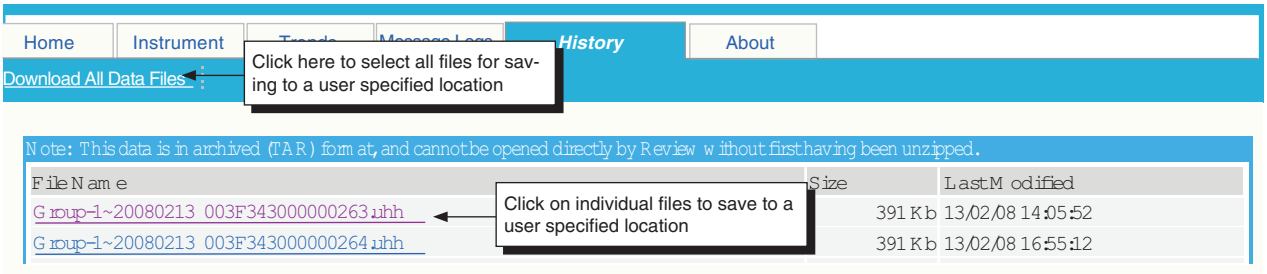


Figure C1.2.3 Message log

The required group is selected by clicking on the relevant number at the top of the page. The length of time that the list covers, can be edited from its default of 20 minutes by typing a new value in the box at bottom left of the page, and confirming by clicking on the 'Set' button at bottom right or using the <Enter> key on the pc. If there are more messages than can be accommodated in the window height, a scroll bar appear at the left edge of the window to allow hidden messages to be revealed.

C1.2.4 History

This produces a list of all the .uhh files held in the instrument archive. The files can be saved to a user-specified location, for use in Review or Quickchart applications. Figure C1.2.4 shows part of a typical page.



C1.2.4 History file display

C1.2.5 About

Clicking on this tab displays a subset of the information which appears in the recorder's 'About' screen, described in section 4.6.8.

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