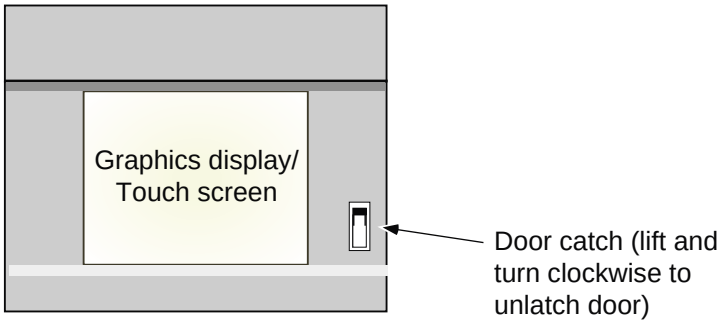
GRAPHICS UNITS

EUROTHERM
CHESSELL

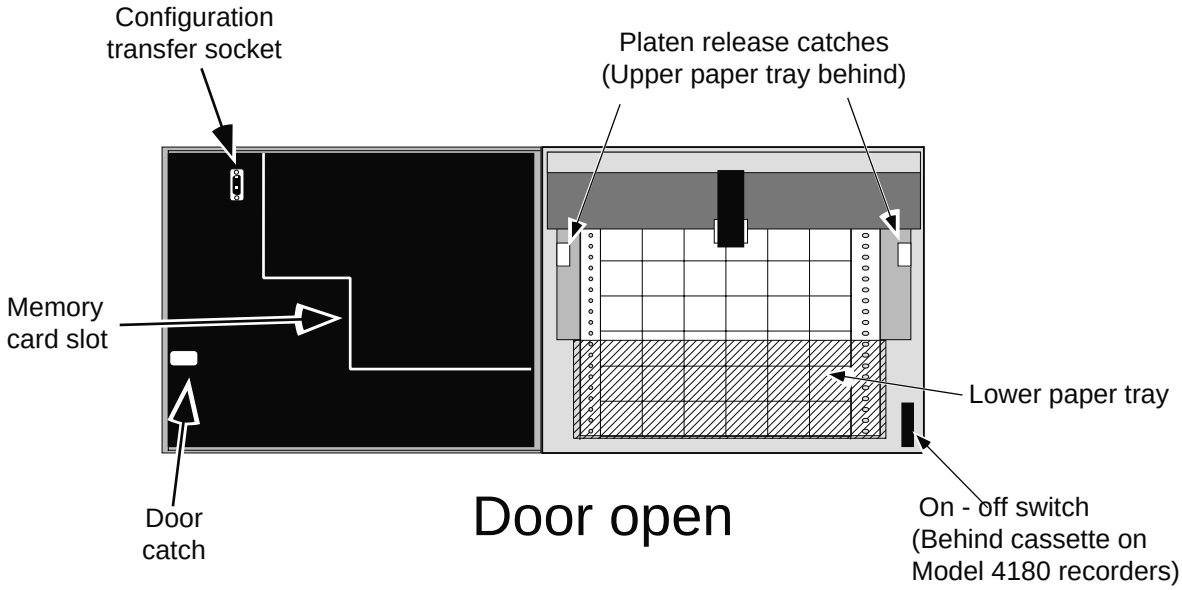
180/250mm Graphics recorders / Display units

Installation and operation manual

Major Functional Items



Door closed



Door open

250mm Graphics Recorder Major Functional items
(180mm units similar)

(See inside rear cover for 4250D)

EUROTHERM CHESSELL

Declaration of Conformity

Manufacturer's name:	**Eurotherm Recorders Limited**
Manufacturer's address	**Dominion Way, Worthing, West Sussex, BN14 8QL, United Kingdom.**
Product type:	**Industrial video chart recorder**
Models:	**4180G (Status level N8 or higher)** **4181G (Status level A1 or higher)** **4250D (Status level G7 or higher)** **4250G (Status level S13 or higher)**
Safety specification:	**EN61010-1: 1993 / A2:1995**
EMC emissions specification:	**EN50081-2 (Group1; Class A)**
EMC immunity specification:	**EN50082-2**

Eurotherm Recorders Limited hereby declares that the above products conform to the safety and EMC specifications listed. Eurotherm Recorders Limited further declares that the above products comply with the EMC Directive 89 / 336 / EEC amended by 93 / 68 / EEC, and also with the Low Voltage Directive 73 /23 / EEC

Signed: PRJ de la Nougerède Dated: 16-July-98

Signed for and on behalf of Eurotherm Recorders Limited
Peter De La Nouger de
(Technical Director)

CE

IA249986U060 Issue 3 Jly 98

Graphics Recorders / Display Units

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(Continued)

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Safety Notes

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 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*.

> 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.

3. Whenever it is likely that protection has been impaired, the unit shall be made inoperative and secured against unintended operation. The nearest manufacturer's service centre should be consulted for advice.
4. 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.
5. Where conductive pollution (e.g. condensation, carbon dust) is likely, adequate air conditioning/filtering/sealing etc. must be installed in the recorder enclosure.
6 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.
7. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment might be impaired.
8. Before switching on the apparatus, it must be ensured that it is set to the voltage of the power supply.

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

Static electricity

All circuit boards associated with the recorder contain components which are susceptible to damage caused by static electrical discharge of voltages as low as 60 Volts. Should it be necessary to handle such circuit boards, appropriate precautions must first be taken to ensure that the recorder, the circuit board, the operator and the work area are all at the same electrical potential.

Recorder labelling

One or more of the symbols below may appear in 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
	Supply voltage on /off switch. 1 = on; O = off

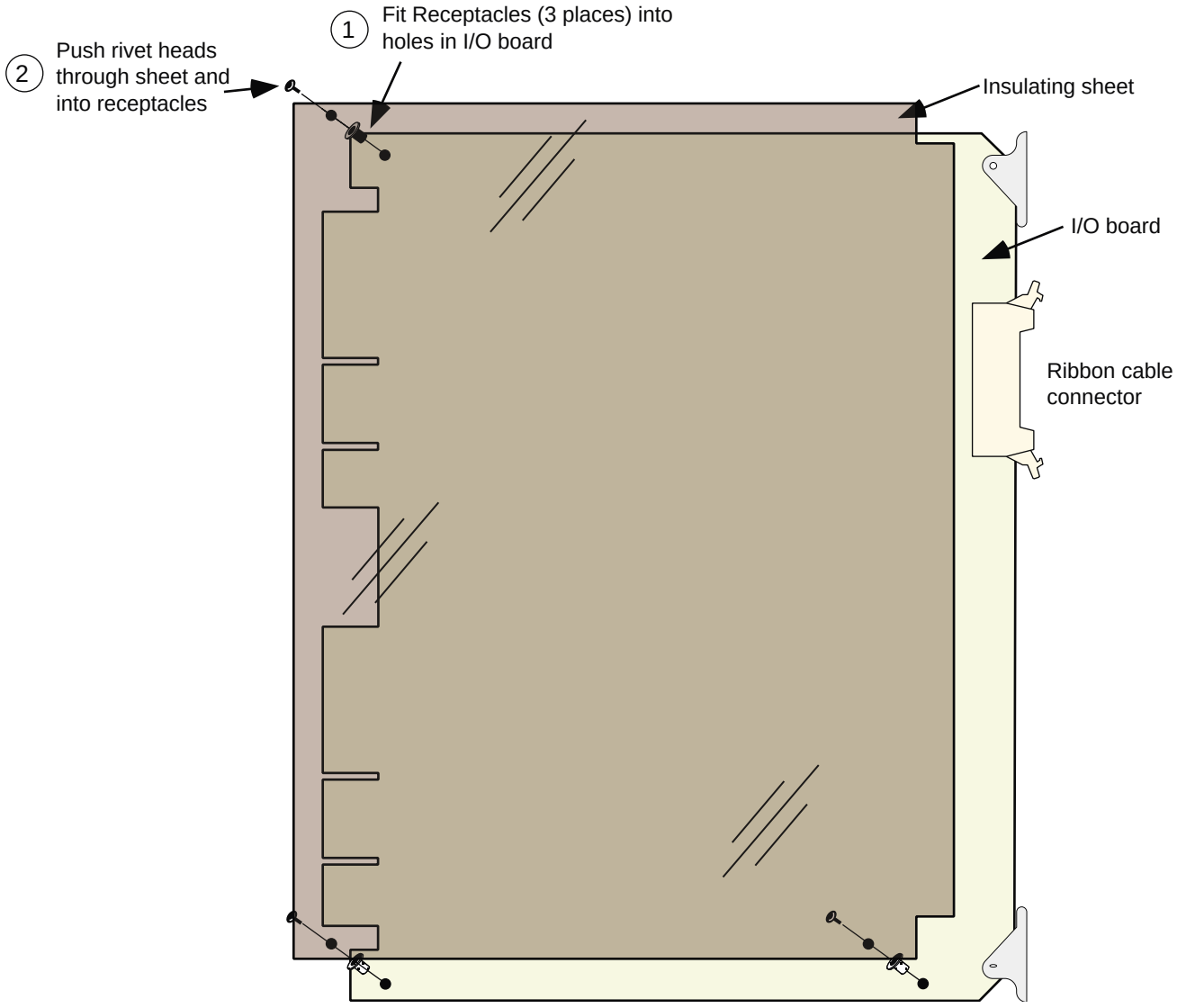
Insulation sheet installation (250mm recorders only)

These instructions describe the fitting of an insulation sheet to circuit boards being fitted by the user to slot seven of a 250mm graphics recorder for the first time. Factory fitted boards will already have been fitted with the sheet,

Slot 7 is the leftmost slot when viewed from the front of the recorder.

Before installing an I/O board in slot 7, it is essential to fit the insulation sheet to ensure againsmt short circuits between the circuit board and the door loom retainer. To attach the sheet, separate the rivets into their two constituent parts. Fit the three receptacle parts into the holes in the board. The insulating sheet can now be secured by passing the rivet heads through the sheet and pressing them into their receptacles.

To fit the board, remove the writing system as described in the installation and operation manual. Remove the board retainer, and disconnect the ribbon cable loom from all the current I/O boards. The new board can now be inserted into the slot. Re-connect the ribbon cable loom, re-fit the circuit board retainer, re-fit the writing system and carry out an autoconfigure as described in the installation and operation manual.



1 INTRODUCTION

This manual describes the operation of a graphics display panel. This panel may be an integral part of a chart recorder, or a stand-alone unit connected to one or more recorders or data acquisition units.

The operation of the graphics panel varies slightly according to whether it is a single unit or part of a network. If it is a part of a network, Section 2 should be ignored and Section 5 used instead.

If this is a 250mm recorder then read the following section (1.1); If this is a 180 mm recorder, start at section 1.2; If this is a graphics display unit, start at section 1.3.

Note: In the case where no chart drive is fitted, all chart menus etc. in this and the associated Installation and Operation Manual should be ignored

1.1 INTRODUTION TO THE 250MM GRAPHICS RECORDER

This instrument is essentially a standard 250mm chart recorder with the addition of a sophisticated, touch-sensitive graphics screen to replace the 80-character display and associated keyboards. The basic information needed to operate the recorder is contained in the recorder's Installation and Operation Manual and the Memory Card Manual supplied with the recorder.

This manual explains the differences between the Graphics recorder and the standard unit.

Note: In order to simplify the text, process variables (i.e. Measuring channels, Derived channels, Totaliser, Counter and Timer values) are referred to as ‘points’.

1.1.1 Mechanical Installation

The graphics recorder has a thicker door than the standard unit, and the recommended inter-recorder distance (horizontal) is therefore greater (120mm) than that normally recommended (45 mm)

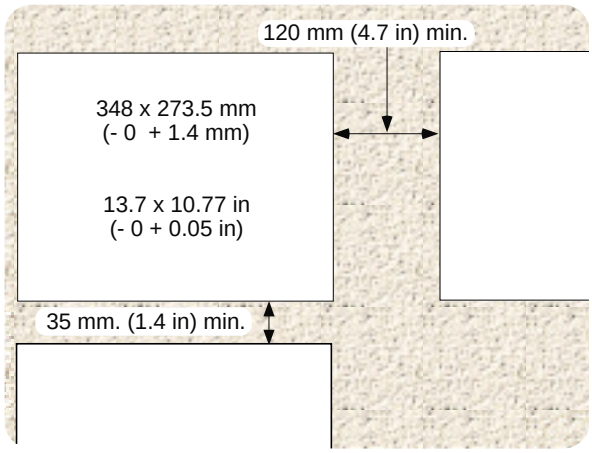


Figure 1.1.1 Panel cutout and minimum inter-recorder distances (250 mm graphics recorder)

1.1.2 Electrical installation

Electrical installation is as shown in the Installation and Operation manual supplied.

1.1.3 Operator interface

The major difference is the fact that the graphics recorder does not have an upper keyboard / display; the functions of this being taken over by the graphics panel in the door. The Secret-'til-lit keyboard functions are also mimicked by the graphics panel using a full QWERTY keyboard. A full description of the graphics panel appears as section 2 of this document. Continue at section 1.5 (Cleaning)

1.2 INTRODUCTION TO THE 180MM GRAPHICS RECORDER

This instrument is essentially a standard 180mm chart recorder with the addition of a sophisticated, touch-sensitive graphics screen to replace the 80-character display and associated keyboard. The basic information needed to operate the recorder is contained in the Installation and Operation Manual and the Memory Card Manual supplied with the recorder.

This manual explains the differences between the Graphics recorder and the standard unit.

Note: In order to simplify the text, process variables (i.e. Measuring channels, Derived channels, Totaliser, Counter and Timer values) are referred to as 'points'.

1.2.1 Mechanical installation

The graphics door is thicker than that of the standard recorder,, and the recommended inter-recorder distance (horizontal) is therefore greater (120mm) than standard (45 mm)

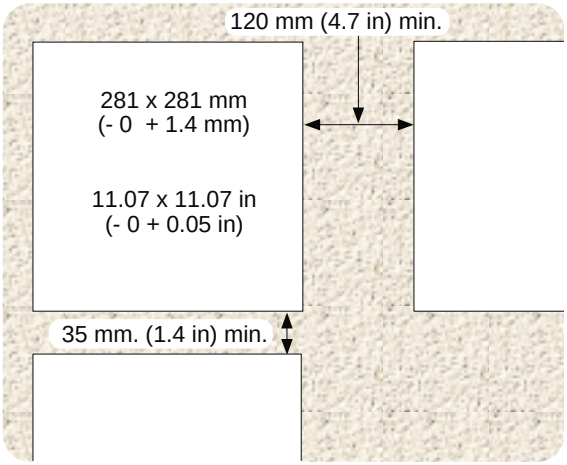


Figure 1.2.1 Panel cutout and minimum inter-recorder distances (180 mm. graphics recorder)

1.2.2 Electrical installation

Electrical installation is as shown in the Installation and Operation manual supplied.

1.2.3 Operator interface

The major differences are

1. The graphics recorder does not have an upper keyboard / display; the functions of this being taken over by the graphics panel in the door.
2. A QWERTY keyboard appears when the OPERATOR key is pressed. This simplifies data entry, in particular, of text strings.

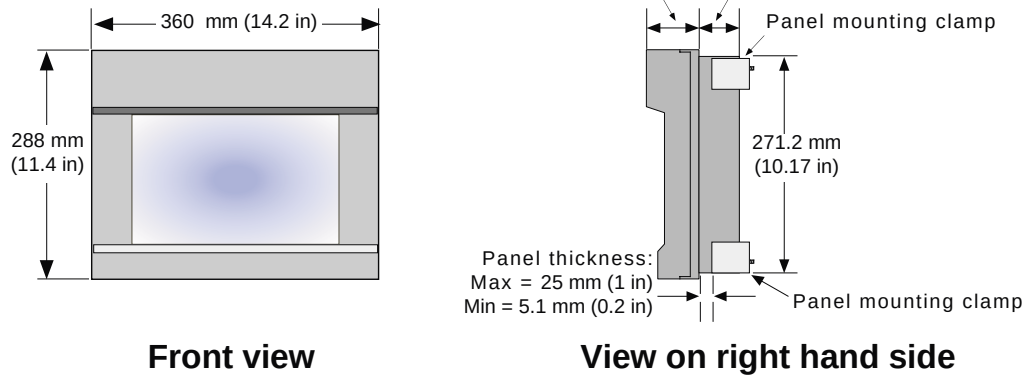
Continue at section 1.5 (Cleaning)

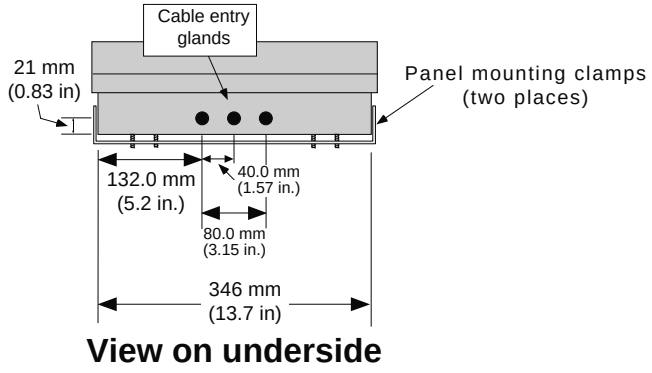
1.3 INTRODUCTION TO THE GRAPHICS DISPLAY UNIT

This wall or panel mounted graphics panel can be used as a control/display unit for one or more instruments, such as I/O racks and chart recorders. When connected to a single unit, the graphics display is considered to be a part of that unit; when connected to more than one unit, it is considered to be part of a network.

The main operating procedures are to be found in the Installation and Operation Manual(s) associated with the unit(s) to which the graphics panel is connected. This manual explains only the use of the graphics panel.

1.3.1 Mechanical Installation





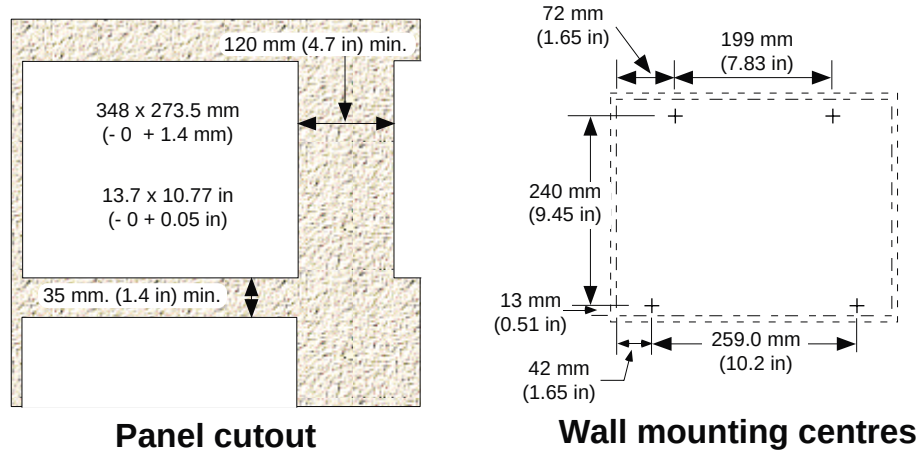


Figure 1.3.1a Graphics Display Unit mechanical installation

1.3.1 Graphics Display Unit Mechanical installation (Cont.)

Panel mounting

The fixing method is to insert the display unit through the sealing gasket (if supplied) into a suitable aperture, and then to secure it using the clamps supplied. The clamps are interchangeable, with two pairs of fixing holes, one pair on 199 mm centres (used for the top clamp); the other pair on 259 mm centres, used for the bottom clamp.

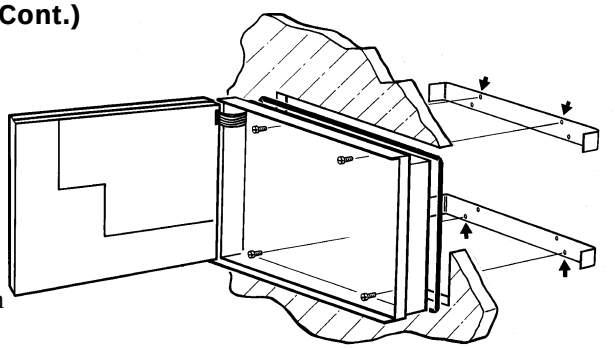


Figure 1.3.1b Panel mounting

As shown in figure 1.3.1b, the clamps secure the display unit to the panel by means of four screws which are passed from the front of the unit through fixing holes in the unit's back plate, and then tightened into the relevant tapped holes (M4) in the clamps.

WALL MOUNTING

The unit is screwed to the wall using four screws of up to 4 mm diameter. The fixing centres are as shown in figure 1.3.1c

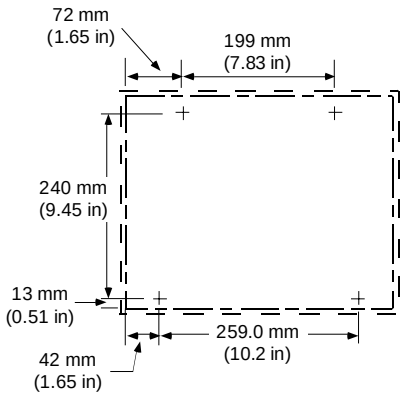


Figure 1.3.1c Wall mounting centres

1.3.2 Electrical installation

Supply voltage wiring

As shown in figure 1.3.2a, the supply voltage cable is terminated at a terminal block, revealed (behind a transparent plastic cover) when the door is opened.

TO MEET ELECTRICAL SAFETY STANDARDS, THE **OVERALL DIAMETER** OF THE LEAD SHOULD BE **NO LESS THAN 4 mm** AND **NO GREATER THAN 8 mm**

WHILST PREPARING THE MAINS LEAD FOR TERMINATION, THE **EARTH CORE** MUST BE LEFT AT LEAST **10 mm LONGER** THAN THE LINE AND NEUTRAL CORES.

SUPPLY VOLTAGE SELECTION

Selection of supply voltage is made using the slider switch located behind the plastic cover as shown in figure 1.3.2a. The slider switch is moved upwards for 90 to 132 Volts (110V displayed at the switch) or downwards for 180 to 264 V ac (240 V displayed). The recorder adjusts to 50 or 60 Hz working automatically.

CAUTION

THE ABOVE INFORMATION IS CORRECT AT TIME OF WRITING, BUT THE SWITCH INDICATION (110V or 240 V) SHOULD ALWAYS BE CHECKED BEFORE APPLYING POWER.

1.3.2 Graphics Display Unit Electrical installation (Cont.)

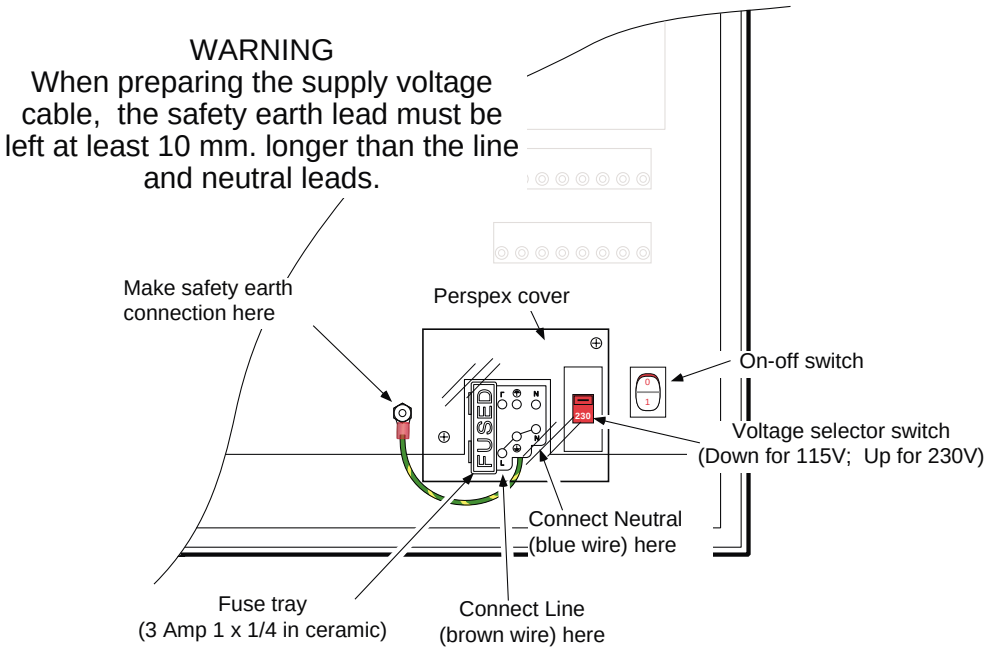


Figure 1.3.2 Graphics panel supply voltage components

1.4 COMMUNICATIONS WIRING

1.4.1 Graphics Display Unit

As shown in figure 1.4.1, the unit is fitted with two. 8-way terminal blocks. One of these blocks is used to communicate with a host computer using MODBUS protocol (upper terminal block). This can be set to RS232C or RS422/485 as required, using the set-up switches accessed through a slot near the LOWER terminal block. The other (lower) terminal block is always set to RS422/485 (independently of the switch setting mentioned above), and is used to connect to one or more recorders and/or I/O racks.

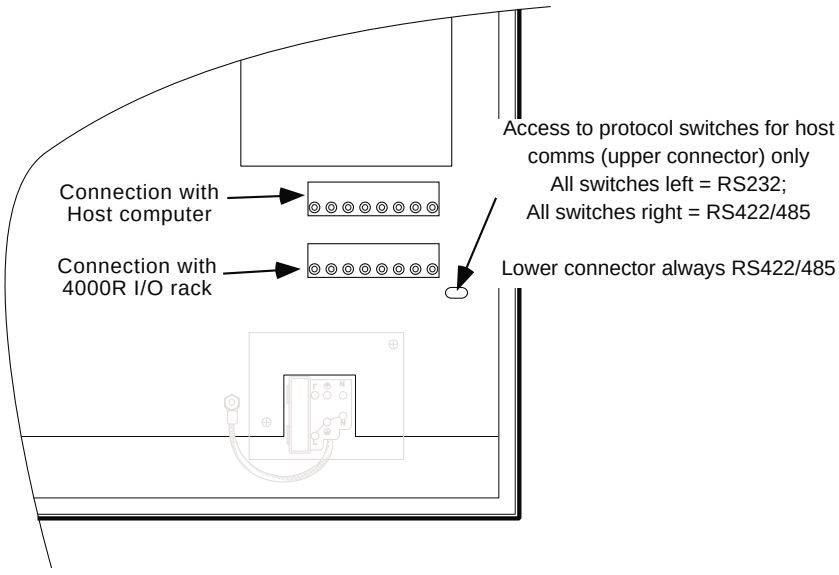


Figure 1.4.1 Communications wiring (Graphics Display Unit)

1.4.2 180/250 mm recorders

The communications module is located at the rear of the recorder, and is fitted with two 9-way D-type connectors of which the male connector only, is used.

Pin	Function
1	5V via 1k0
2	RX
3	TX
4	DTR
5	Signal ground
6	DSR
7	RTS
8	CTS
9	Not connected

RS232 Pin out
(Switches up)
(Fixed plug only)

Pin	Function
1	5V via 1k0
2	TXA
3	TXB
4	Not connected
5	Signal ground
6	Not connected
7	RXB
8	RXA
9	Not connected

RS422/485 Pin out
(Switches down)
(Plug or socket)

Figure 1.4.2 D-type pinouts

The pin-out of the D-type sockets is shown in figure 1.4.2 Pin 1 is connected to recorder 5 V *via* a 1 kΩ resistor. TX should be connected to the host's RX terminal and *vice-versa*.

CAUTION

The 0 V (Signal ground) line must be tied to earth at a single point only, in the circuit. Before connecting to the host, check to see if its signal ground is earthed. Multiple earthing can result in large circulating current loops.

1.4.3 Host computer termination and biasing

When not communicating, recorder etc. outputs go to a high-impedance state to allow multi-drop connection without crosstalk. This will cause a problem if the host computer is not fitted with biasing resistors to pull these essentially open-circuit lines to their idle states as defined in the RS422/485 standards. To overcome such problems, external resistors can be fitted as shown in figure 1.4.3a below.

With long cable runs it may also be necessary to terminate the transmission line. Figure 1.4.3b shows how this may be done using external resistors, if the host has no pull-up/down resistors fitted internally. Where the host computer has its own pull-up/down resistors, the fitting of a 220 Ω resistor across the hosts receive inputs (figure 1.4.3c) will terminate the line correctly.

1.4.4 Communications mode selection

A number of small lever switches are located between the two 9-way D-type connectors. A pencil or small screwdriver inserted through an appropriate aperture in the cover is used to switch all the levers upwards (RS232) or all downwards (RS422/485)

1.4.5 Communications protocol

Communications with a host computer can take place using MODBUS protocol only. For further information, consult Annex B of this manual.

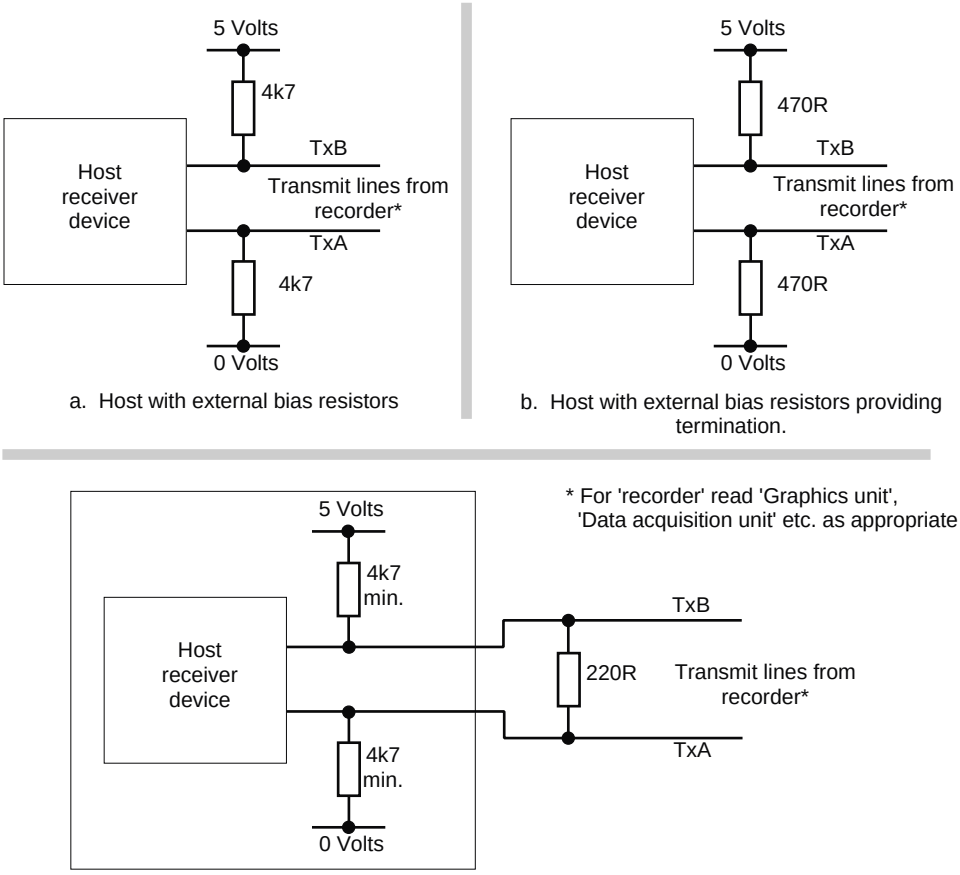


Figure 1.4.3 Host computer biasing and termination

1.5 CLEANING

Foaming cleansers or proprietary window cleaners may be used to clean the graphics screen. ***Abrasive cleaning materials must be avoided.***

1.6 ILLUMINATION

The graphics panel is a back-lit liquid crystal display. Should the backlighting eventually fail, the local service centre should be contacted - there are no user serviceable parts associated with the door.

1.7 MEMORY CARD LOCATION

The memory card slot is located on the inside of the door as shown on the inside covers of this document. Every graphics unit is fitted with a memory card driver, and 'Configuration Save and Restore' software. Data archiving options are also available at extra cost.

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2.0 GRAPHICS PANEL OPERATION (SINGLE UNITS ONLY)

For networked systems, see section 5 instead of section 2.

2.1 INITIAL DISPLAY

At first switch-on, a display page 'PLANT SUMMARY' appears at the graphics panel (see figure 2.1a). This contains:

a. Icons showing one group for each I/O board fitted.
b. Active alarm indicator, and chart off-line indicator
c. An alarm status display bar
d. A number of hard keys for controlling the display.

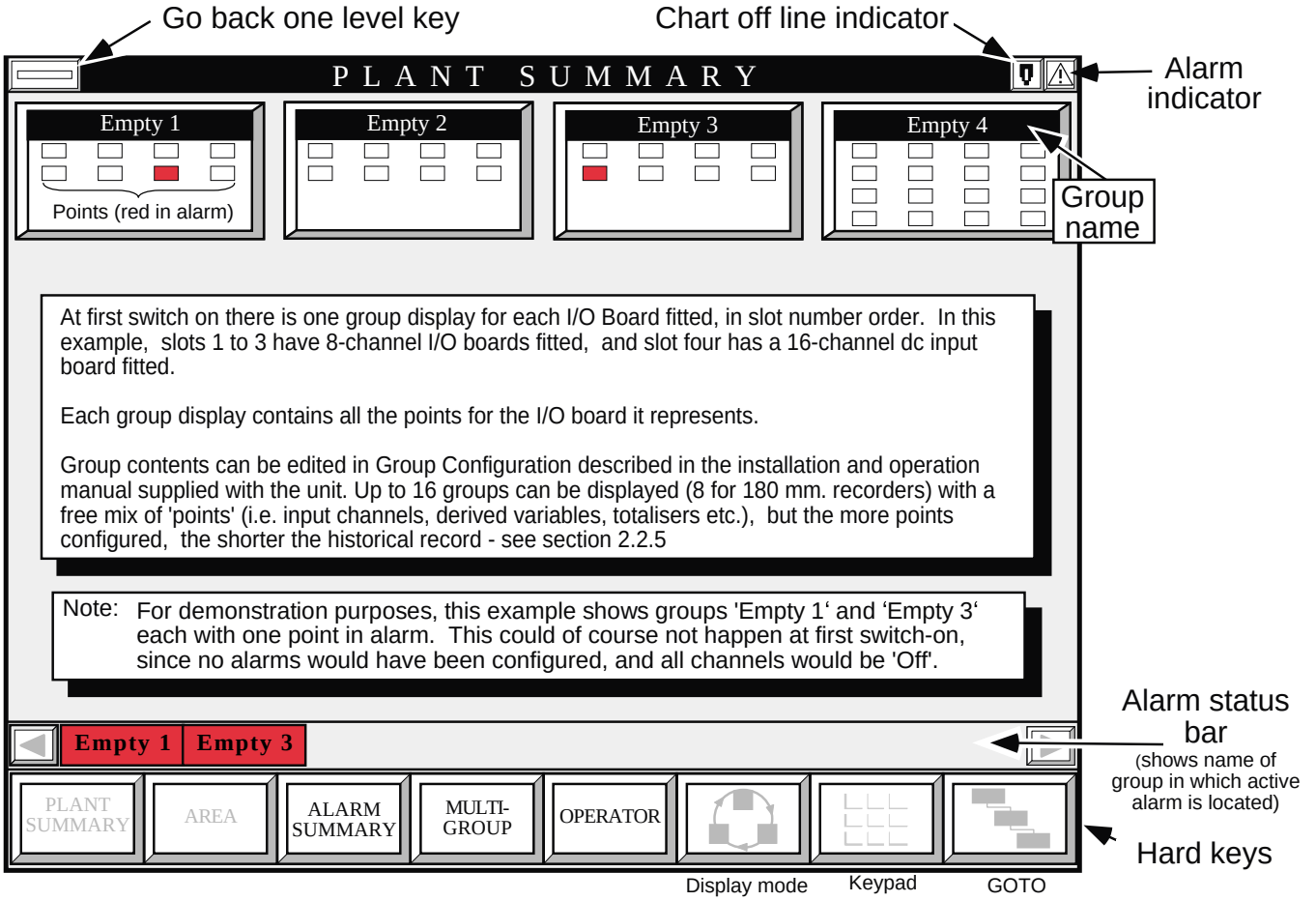


Figure 2.1a Plant Summary display (250mm recorder)

2.1.1 GROUP ICONS

Note: 250 mm recorders have 17 groups. One of these is called 'Everything' and operates in the same way as for the non-graphics version BUT IT CANNOT BE DISPLAYED ON THE GRAPHICS SCREEN. 180mm recorders are similar, but have 9 groups, 8 of which can be displayed.

After group configuration (see the Installation and Operation manual) each group icon can have up to 16 points displayed. Although each group can have all process variables allocated to it (for logging or archiving purposes), only the first 16 can be displayed.

Any process variable in alarm is displayed in red; steadily if the alarm has been acknowledged or flashing if not.

2.1.1 Group Icons (Cont.)

GOTO Key

Touching one of the group icons causes it to be outlined in yellow, and a new hardkey (called GO TO) to appear. Touching this key causes the contents of the selected group to be displayed in detail, and a new hard key to appear (called the Display Mode key).

DISPLAY MODE KEY

This key allows one of three group display modes to be selected. These display modes are called 'Group Panel Display', Group Bargraph Display' and 'Group Trend Display' and are described in detail in sections 2.2.2, 2.2.3 and 2.2.4 respectively, below.

To return to the plant summary page, the PLANT SUMMARY key at the bottom left can be operated, or the 'Go back one level' key () at the top left of the page can be operated.

For further details refer to section 2.2.

2.1.2 Alarm status bar

Below the group displays is an alarm status bar, which will be empty at first switch-on. After configuration, any active alarm in a group causes the name of the group to appear in black on a red background.

For non-latching alarms, this background will flash until the alarm is acknowledged (when it will remain red continuously), or until the cause of the alarm returns to a non-alarm state.

For latching alarms, the background will flash until acknowledged, after which it remains red continuously until the cause of the alarm returns to a non-alarm state.

Touching an alarm icon causes the name of the group to change from black to yellow, and the GO TO key to appear. Touching the GO TO key causes the relevant group to be displayed in whichever one of the three display modes (Section 2.2 of this document) the group was last displayed. In group panel or bargraph modes, the item(s) in alarm can be seen (displayed in red) and acknowledged using the ACK key at the top right of the screen.

2.1.3 Hard keys

There are eight positions for fixed-function keys, at the bottom of the page.

PLANT SUMMARY

Returns the user from any page to the PLANT SUMMARY page (figure 2.1a above). The legend is invisible when the Plant summary page itself is displayed.

ALARM SUMMARY HARDKEY

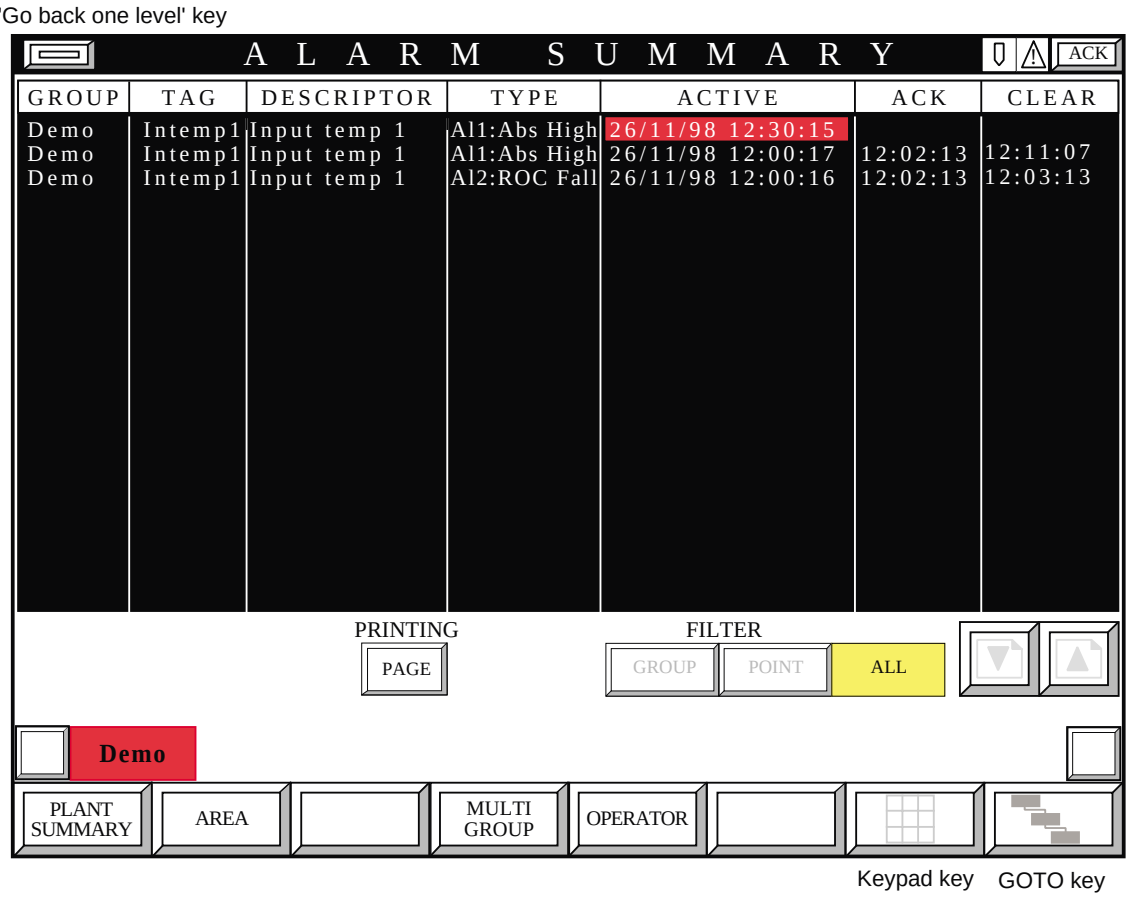


Figure 2.1.3 Alarm summary page

Operation of this hardkey causes a display to appear (figure 2.1.3) showing the latest 16 alarms to have been active in all groups. For simplicity, only one group is shown in the figure. Referring to the figure, the time and date in the active column have a flashing red background if the alarm is active but not acknowledged, or a solid red background if active and acknowledged.

To display all the alarms in a particular group, the group name should be highlighted by touching it in the GROUP/ TAG column, then by touching the GROUP key which appears below the 'Type' column.

Similarly, to display all the alarms associated with a particular point, the Group/tag column should be touched at the appropriate point, and the POINT key touched.

If there are more than 16 active alarms, a downwards pointing arrow key appears to the right of the screen allowing further alarms to be displayed. On any but the first page, an upwards-pointing arrow also appears, allowing previous pages-full of alarms to be scrolled through.

New alarms are added to the top of the display as they occur, the older ones moving down the list until the list is full (512 alarm events) after which the oldest alarm is discarded.

One or more alarm pages can be printed onto the chart - see section 3 of this document.

2.1.3 HARDKEYS (Cont.)

MULTI GROUP HARDKEY

This hard key causes a display of 4 groups to appear at the graphics panel. To select a different group for display, touch the group that you want to change, then touch the 'Keypad' hardkey . This will fill the Group Panel Display with the names of the displayable groups. Touch the required group name, (or, if the alarm summary page is required, touch the ALARM SUMMARY key in the pop-up window) then touch the OK key.

Each of the displayed groups can appear in any of the three display modes described in sections 2.2.2, 2.2.3 and 2.2.4 below, so if required, a single group can be displayed in three different windows in Group Panel, Bar graph and Group trend display.

The alarm summary page can appear only once, and the ALARM SUMMARY key legend does not appear in the pop-up window if the page is already on display.

OPERATOR HARD KEY

This hardkey causes the first of the Operator top level menu pages described in section 3 of the recorder manual to appear at the top of the page. The operation pages are identical with those of the non-graphics recorder except that the DISPLAY softkey and its sub menu do not appear. The configuration menu structure is entered from the CONFIG softkey, followed by entry of the password (10 when despatched from the factory)

GROUP DISPLAY MODE

This key allows the user to scroll through the three display modes available for groups. See section 2.2 for full descriptions

KEYPAD HARDKEY

This key has the following functions:

1 Allows a new group to be selected for display in the multi-group display page.

2 In Group Trend mode (section 2.2.4 below), changes the real-time trend display to a 'historical' display which includes extra hard keys for scrolling backwards and forwards through the group history, for changing the time scale of the historical display, and for printing the screen onto the chart.

GO TO HARDKEY

This key generally takes the operator 'down' one level in the display structure.

2.2 GROUP DISPLAYS

2.2.1 Plant summary display

For non-networked instruments, the recorder displays all configured groups, with group points represented by small rectangles which are normally white, but are red or flashing red when in alarm. See figure 2.1a.

For networked instruments, see section 5.

To see a particular group in more detail, touch the group and then the 'GO TO' button. This will result in a display such as that depicted in figure 2.2.2 (Group Panel Display), figure 2.2.3 (Group Bargraph display) or figure 2.2.4a (Group Trend Display), according to which of these three modes was selected for the group last time. In order to see a particular point in more detail, the point can be touched, followed by the GO TO key. This will result in the point display described below (section 2.2.5).

2.2.2 Group panel display

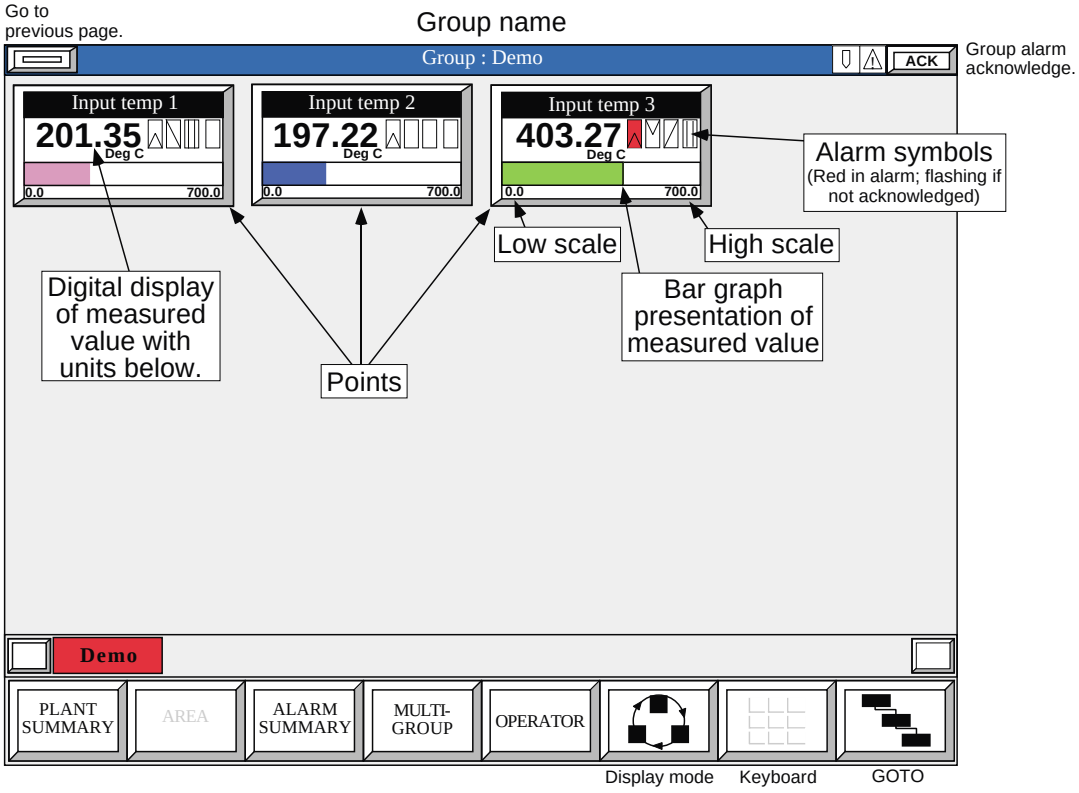


Figure 2.2.2a Group panel display

The group panel display depicted above, shows all three channels as dc-type inputs. Figure 2.2.2b (below) shows the different group panel point displays which can appear.

2.2.2 Group Panel Display (Cont.)

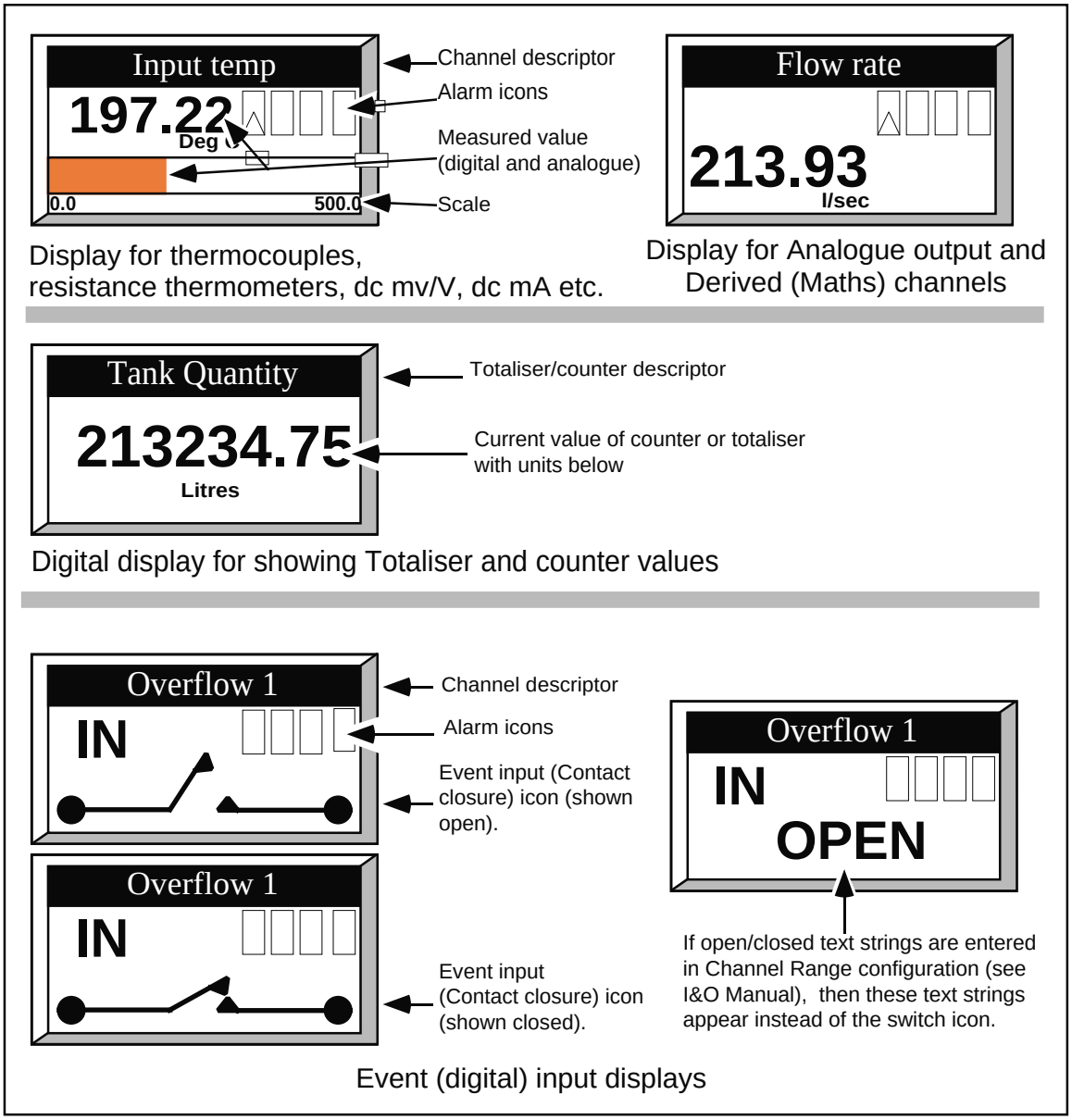


Figure 2.2.2b Point display types

ALARM SYMBOLS

The following table shows the icons associated with the different types of alarm available for use with the recorder.

Absolute high	Rate of change (rising)
Absolute low	Rate of change (falling)
Deviation in/out	

Table 2.2.2 Alarm icons

2.2.3 Group bargraph display

From the group panel display, touch the Display Mode key. The group is now displayed with its points in bar-graph format as depicted in figure 2.2.3 In order to see a particular point in more detail, the point can be touched, followed by the GO TO key. This will result in the point display described below (section 2.2.5)

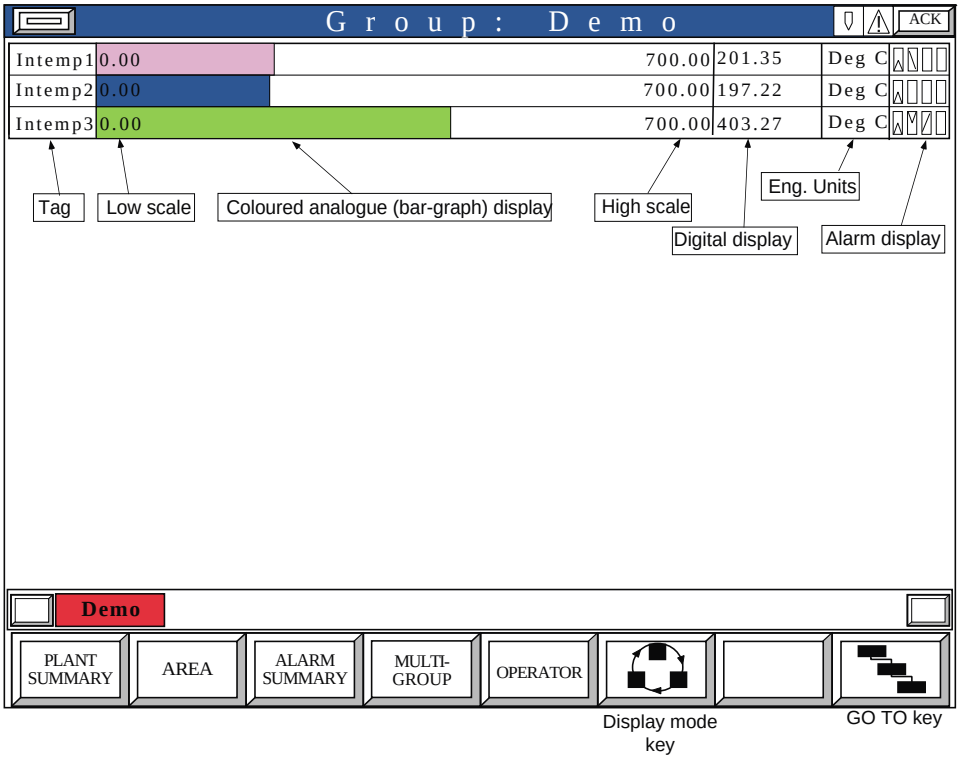


Figure 2.2.3 Group bargraph display

2.2.4 Real-time group trend display

From the group bargraph display, touch the display mode key. The group points are now displayed as if being traced on a chart as depicted in figure 2.2.4a. The height of the chart page is equivalent to 338 sample intervals, where the sample interval is a part of the group configuration. Table 2.2.4 below shows the available sample intervals and the page height (in time).

Interval	Time per page
1 second	338 seconds (5 min 38 secs)
2 seconds	676 seconds (11 min 16 secs)
10 seconds	3,380 seconds (56min 20 secs)
30 seconds	10,140 seconds (2 hrs 49 min)
60 seconds	20,280 seconds (5 hrs 38 min)
120 seconds	40,560 seconds (11hrs 16 min)
300 seconds	101,400 seconds (28 hrs 10 min)
600 seconds	202,800 seconds (56 hrs 20 min)
1800 seconds	608,400 seconds (7 days 1hr)
3600 seconds	1,216,800 seconds (14 days 2hrs)

Table 2.2.4 Equivalent chart speeds

As can be seen, in figure 2.2.4a, each of the traces has a pointer associated with it, either a 'down' (half) pointer, or for one trace only an 'up/down' (full) pointer which indicates a value on the scale above the pointer.

The trace with the full pointer is the 'current' trace, and its tag, descriptor, units and scale are displayed above the 'chart' for approximately 15 seconds, after which the next trace in the group becomes 'current' for 15 seconds and so on.

2.2.4 GROUP TREND DISPLAY (Cont.)

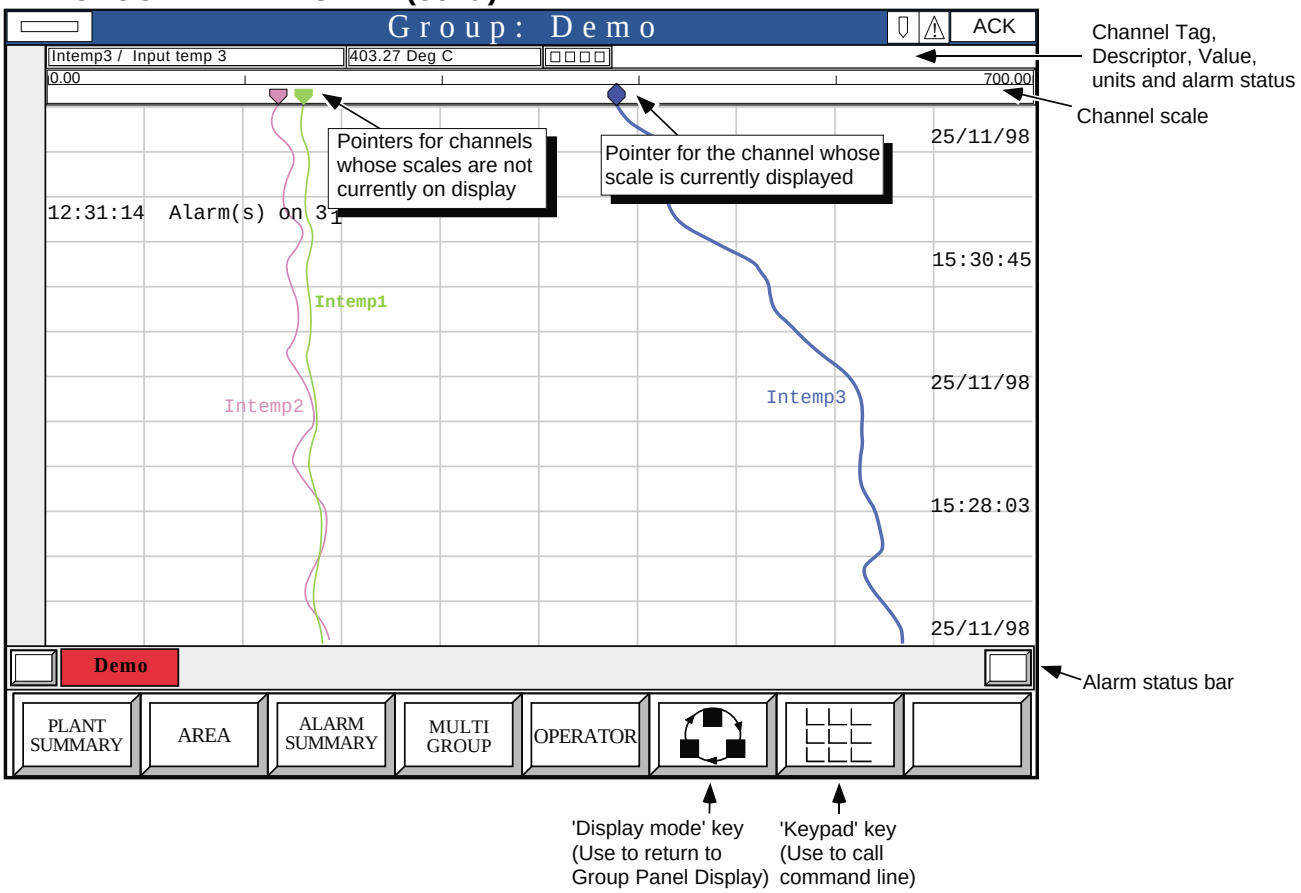


Figure 2.2.4 Real-time Group Trend display

2.2.5 History group trend display

COMMAND MENU

Touching the KEYPAD key causes a command menu to appear, which contains History, Time, Trend and Print Select keys (figure 2.2.5) the functions of which are described below. Although the display chart stops rolling at the time the keypad is touched, the recorder continues to store the traces in its memory. This ‘new’ tracing can be viewed using the history down arrow key.

HISTORY

Operating the history up arrow key causes the display to ‘roll’ backwards so the history of the group can be seen. The History down arrow key can be used to scroll forward to present time. Wherever a power off has occurred, a black line is drawn across the 'chart' to indicate what has happened. Data for the last 20 power-off events is saved; power-off event 21 causing data prior to power-off event 1 to be lost, and so on.

The amount of history maintained within the recorder’s memory depends on the total number of points configured in all the groups. Examples of approximate maximum numbers of stored pages for the two available memory options (10MB or 20MB as specified at time of order) are given in table 2.2.5 . The figures are approximate because different point types take up different amounts of memory.

No. of groups	Points/ group	No. of pages	
		10MB	20MB
2	4	550	1100
8	8	70	145
8	16	30	70
16	16	15	35

Table 2.2.5
Maximum number of pages per group

2.2.5 HISTORY GROUP TREND DISPLAY (Cont.)

A vertical bar is displayed at the left side of the display. The height of the bar represents the proportion of the stored data that the current page represents. For example if the bar is 1/4 the height of the page, then there are three pages of history which can be rolled through, in addition to the current page. The position of the bar represents where the current page lies in the historical record. For example, if the top of the bar is at the top of the page, then this page is the latest page. The bar can be moved up and down by touching and dragging it, and can therefore be used as an alternative to the history keys.

TIME

Each touch of the time [−] key doubles the amount of chart displayed. For example, a single operation would change the amount of 'chart' on display from 5 to 10 minutes. A further operation would change it to 20 mins. The time [+] key reverses this operation.

TREND SELECT

Operation of one of these keys causes one point's trend to be selected, and to start flashing. To select the next point, use the right arrow key; to select the previous point use the left arrow key. See also the 'CURSOR' section below.

PRINTING

The Printing PAGE key allows the current page to be printed on the chart if the printer is on-line. See section 3 for more details.

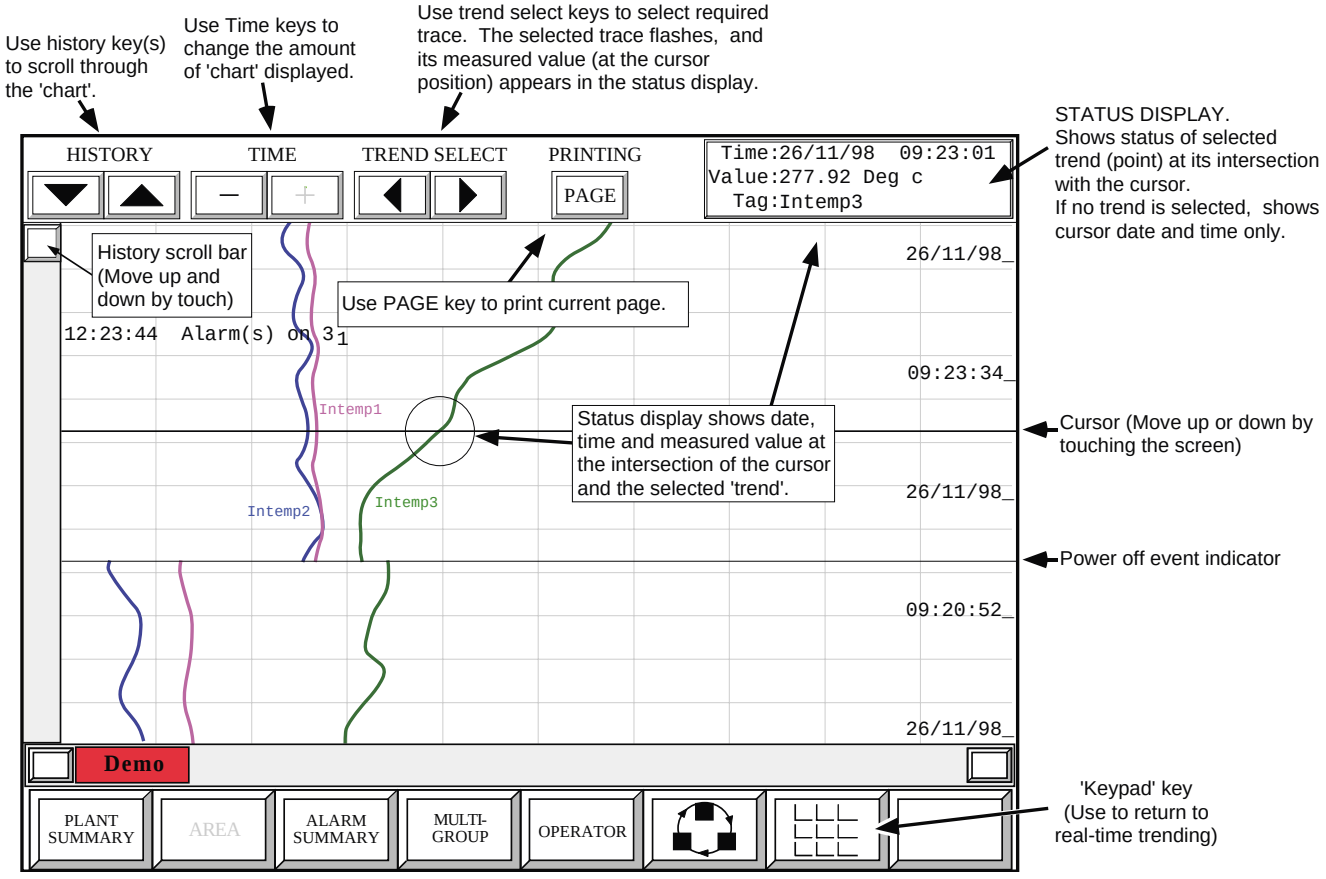


Figure 2.2.5 History Group Trend display

2.2.5 HISTORY GROUP TREND DISPLAY (Cont.)

THE CURSOR

Touching the screen anywhere within the tracing area causes a horizontal cursor to move to the point where the screen was touched. This cursor can be moved up and down by touching and dragging.

The status box at the top right-hand corner of the display shows the date and time that the cursor position represents, so by watching the time display as you drag, you can position the cursor to the exact time you require.

If a point is selected using the Trend Select key(s) then the tag and the measured value of that point, at the cursor time are displayed, and will reflect any change you make to the cursor position. It is thus possible to find the value of any point at any time in the historical record.

2.2.6 Point display

From the Group Panel or Group Bargraph Display in order to see a particular point in more detail, touch the point, then the GOTO key. This results in a display such as that depicted in figure 2.2.6 below. This display gives details of the point's configuration together with a 'trace' on the screen.

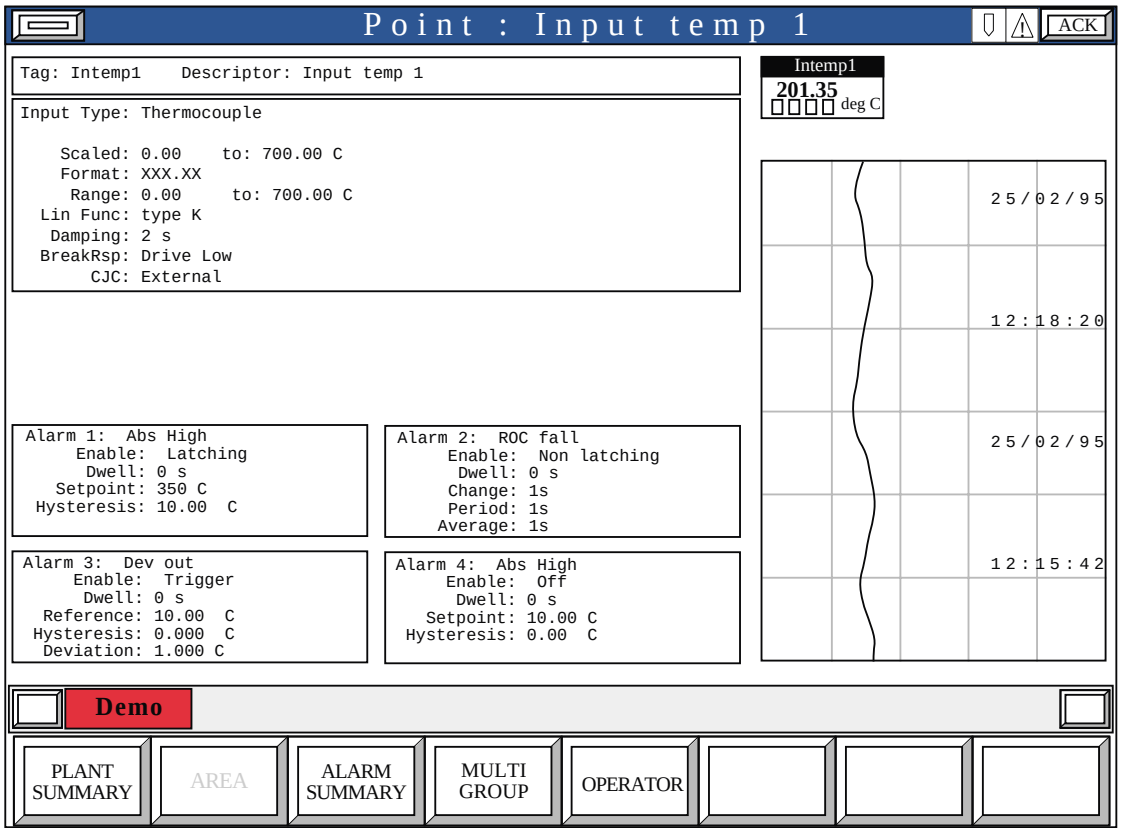


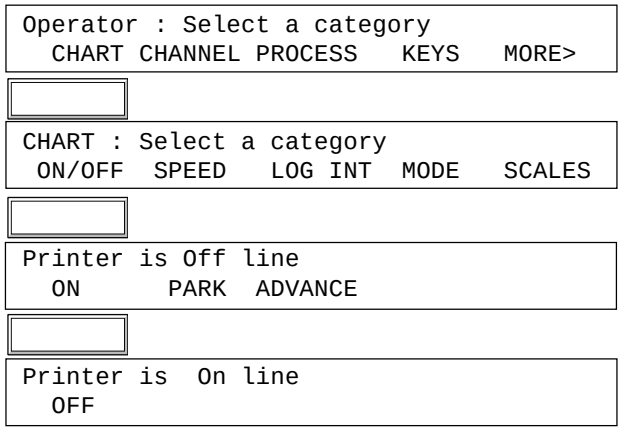
Figure 2.2.6 Point Display

3 PRINTING DISPLAY PAGES

3.1 SWITCHING THE PRINTER ON-LINE

The printer must be on-line before the print request is made. If your printer is off-line, you can turn it on-line as follows:

1. Operate the OPERATOR hard key.
2. Operate the CHART softkey.
3. Operate the ON/OFF softkey
4. Operate the ON softkey



3.2 PRINTING TREND HISTORY

3.2.1 Page printing

The command menu of the Group Trend Display page (section 2.2.4), contains a PRINTING key labelled 'PAGE'. Operation of this key calls a 'window' to the display asking whether scales are to be printed (figure 3.2.1a).

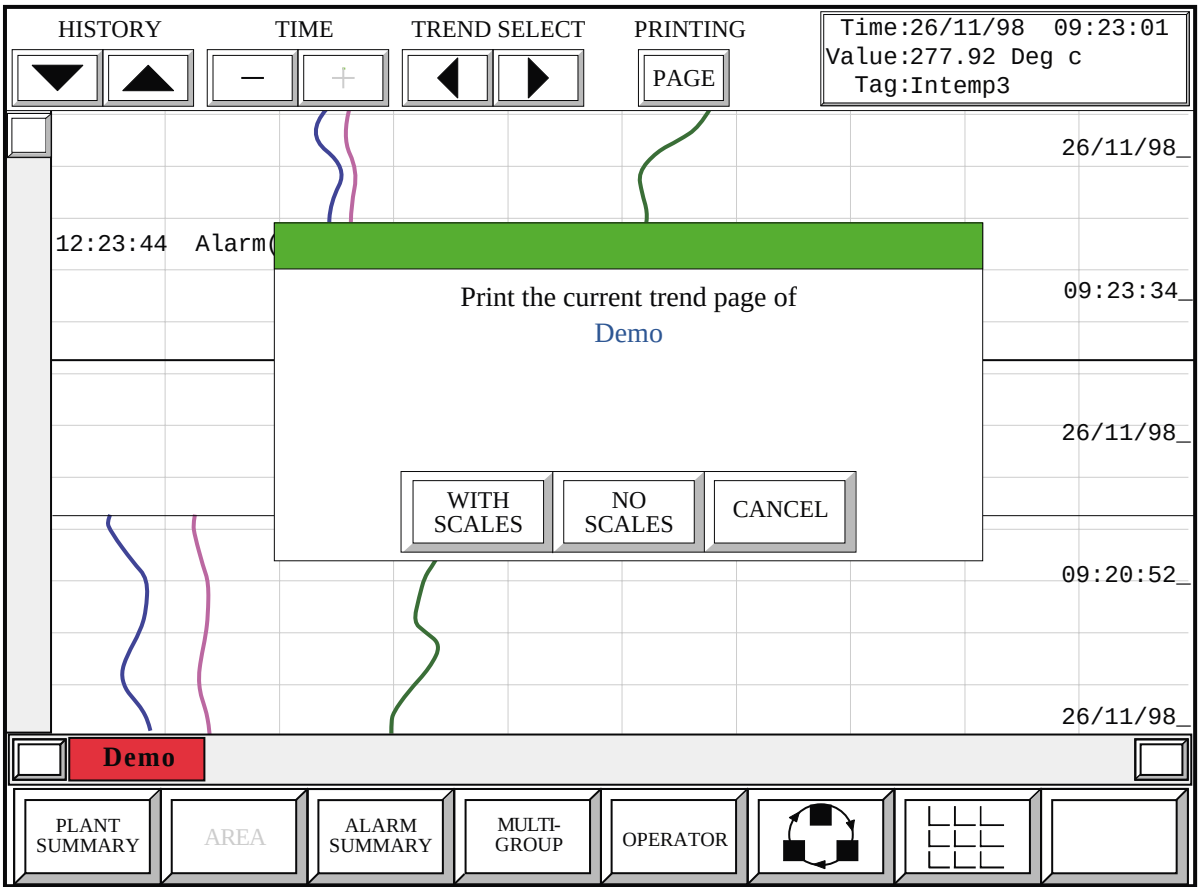


Figure 3.2.1a Trend-print window (non-networked instruments)

3.2 PRINTING TREND HISTORY (Cont.)

3.2.1 PAGE PRINTING (Cont.)

At the start of printing, a message is printed on the chart as follows (where 'Demo' is the name of our group):

```
******************** START: Trend Print of GROUP Demo ********************
```

In order to make the printed trace as easily interpretable as possible, a time mark is printed at the beginning and just before the end of trend printing, and where possible, every 55 mm in between. These time markings are accurate to the chart history record, but they will not normally tally with the time markings on the display screen.

To stop printing, the page key is operated again and the ABORT PRINT key operated.

At the end of printing, or if printing is aborted, a message is printed on the chart followed as quickly as possible by a time stamp.

```
******************** END: Trend Print of GROUP Demo ********************
```

3.2.2 Continuous trace printing

With instruments with a 'network' address set up in their 'INSTRUMENT - CARDS' configuration, an extra option (CONT.) is offered, which allows the tracing of the displayed group continuously, rather than just the currently displayed page (as described in section 3.2.1 above). This allows, for example, a group from an I/O rack to be displayed at the master unit and printed on the chart either of the master unit (if this is a graphics recorder) or of that recorder with Network address = 1, if the master is purely a display panel (i.e. without a chart). Operation of the CONT. key calls the following page to the display:

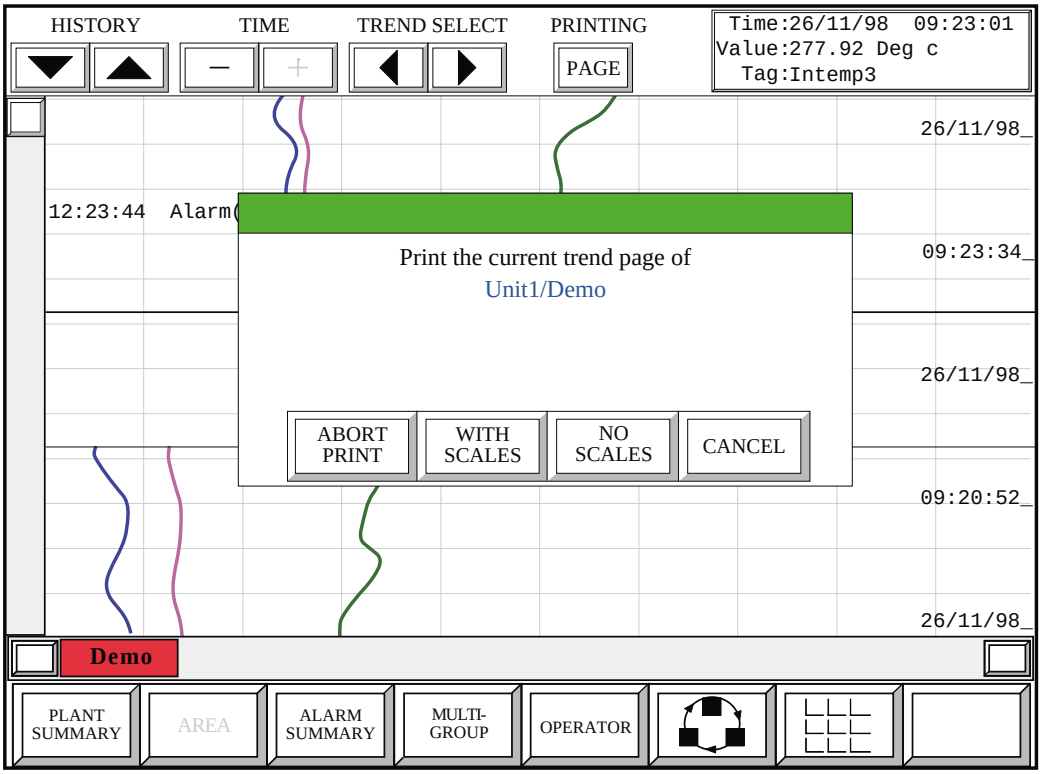


Figure 3.2.2 Continuous trend-print window (networked instruments)

3.2.2 CONTINUOUS TRACE PRINTING (Cont.)

If a group is being trended, and the operator wishes to stop it, or to print another group a further operation of the CONT. key calls a new dialogue window, which allows you to stop the current group printing, before operating the CONT. key again to start printing the new group.

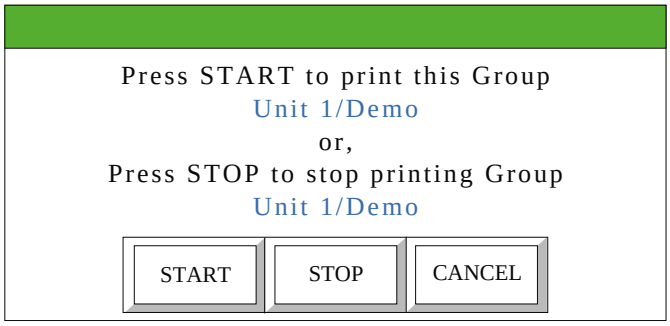


Figure 3.2b Stop printing window (networked instruments only)

3.3 ALARM SUMMARY PRINTING

This feature allows the printing of all or part of the alarm history of a single channel (point), a single group, of single instrument within a networked system (Area) or of all alarms. See section 2.1.3 (single instrument) or 5.2.1 (networked instruments) for further details.

Note: The printer must be ON-LINE before the print request is made. To set the printer ON-LINE see section 3.1

3.3.1 Single instruments

It is possible to print alarms of one point only, one group only or of all points. For example, if only alarms associated with channel 'Intemp 1' are required, then one of the entries for 'Intemp 1' in the GROUP/TAG columns should be touched, followed by the POINT hardkey.

Operation of the PAGE key then calls the 'Print the Alarm Summary' dialogue box as shown in figure 3.3.1a. As can be seen, there is the choice of ALL or CURRENT PAGE. Operation of either key results in the initiation of printing. If many alarms are involved, a 'Preparing data for printing - Please wait!' message may appear in a further dialogue box, before printing starts.

At the start of printing, a message is printed on the chart as follows:

```
PRINT: All Pages, FILTER: ALL
********************* START: Alarm summary print *********************
```

Where PRINT is either 'All pages' or 'Current Page' and FILTER is 'ALL', 'POINT' or 'GROUP'

A similar message is printed at the end of printing, or if printing is aborted, followed as quickly as possible by a time stamp.

To stop printing, a further operation of the PAGE key calls a further dialogue box, incorporating an ABORT PRINT key, as shown in figure 3.3.1b.

3.3.1 SINGLE INSTRUMENTS (Cont.)

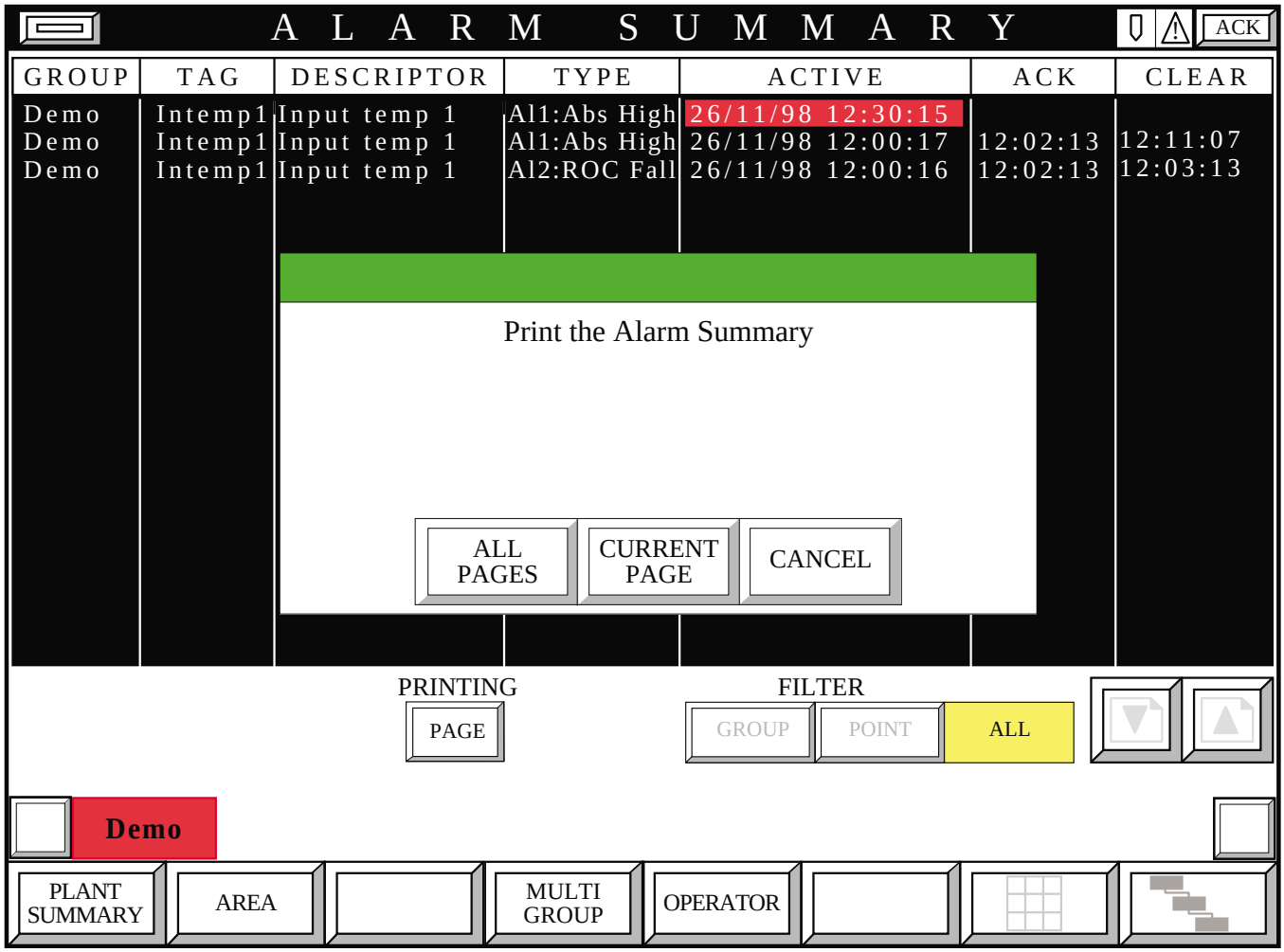


Figure 3.3.1a Alarm Summary print window (non-networked instruments)

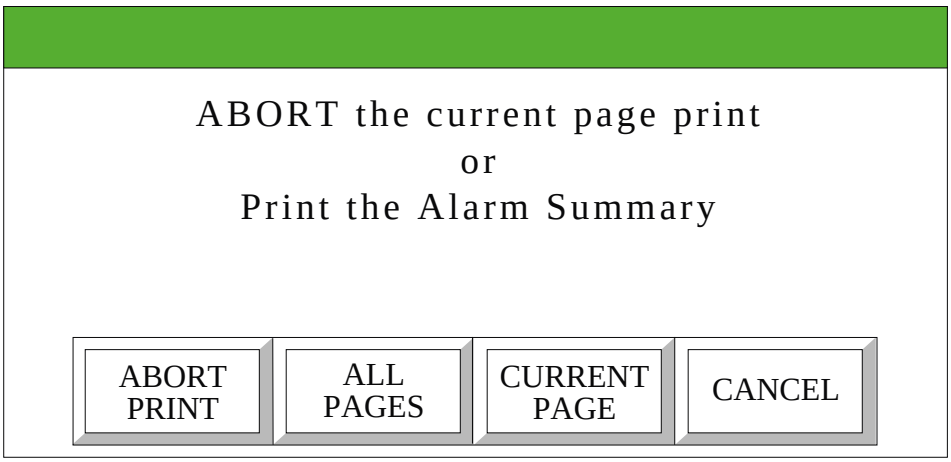


Figure 3.3.1b Abort print page

3.3.2 Networked instruments

Alarm summary printing for networked instruments is similar to that for single instruments, the only difference being that AREA (i.e. all the alarms associated with a particular network instrument) can be selected for printing, as well as the normal ALL, GROUP and POINT options.

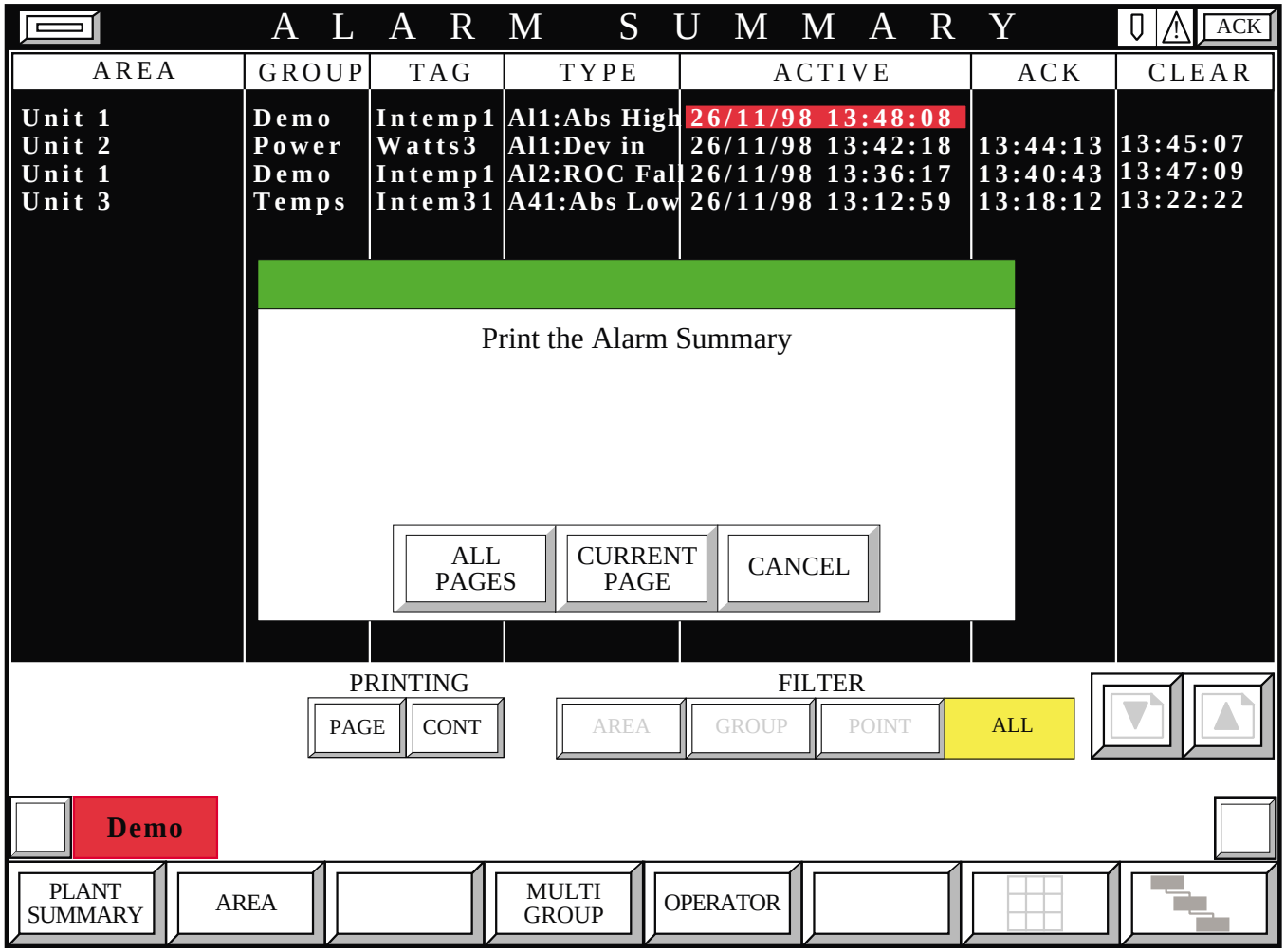


Figure 3.3.2 Alarm summary print window (networked instruments)

This page is deliberately left blank

4 QWERTY KEYBOARD USAGE

The keyboard which appears when either the Operator or Configuration hardkey is pressed is similar in operation to the secret-'til-lit keyboard of the standard 250 mm recorder, and this is well documented in the Installation and Operation Manual for that product. The only real difference is that the graphics keyboard is in the familiar QWERTY style, whereas the secret-'til lit is alphabetic in layout.

For the 180mm recorder user, operation of the keyboard simplifies operation in general, and text entry in particular.

4.1 CHARACTER SETS

There are four alternative character sets as shown in figures 4.1a, 4.1b and 4.1c and in the list below which is accessed by operation of the +/- key for each individual text character.

² ³ ! " ' [\ ] ^ ` { | } ~ ç â å ë ï î ì Å É æ Æ ò û ÿ ¢ ¥ á í ó ú ñ Ñ a o ¿ ¡ « » α Γ π σ τ φ θ ∞ ∈ ∩ ≡ ± ≥ ≤ + ≈ • √ η

The characters shown in figure 4.1a are those which appear when the keyboard is first called up.

The characters in figure 4.1b appear when the up arrow key to the left of the keyboard is operated. This key is a latching key i.e. once touched, it remains operative until it is touched again (return to lower case set) or until the adjacent down arrow key is operated to call up the 'international' set.

The characters in figure 4.1c appear when the down arrow key towards the left of the keyboard is operated. This key is a latching key i.e. once touched, it remains operative until it is touched again (return to lower case set) or until the adjacent up arrow key is operated to call up the Capitals set

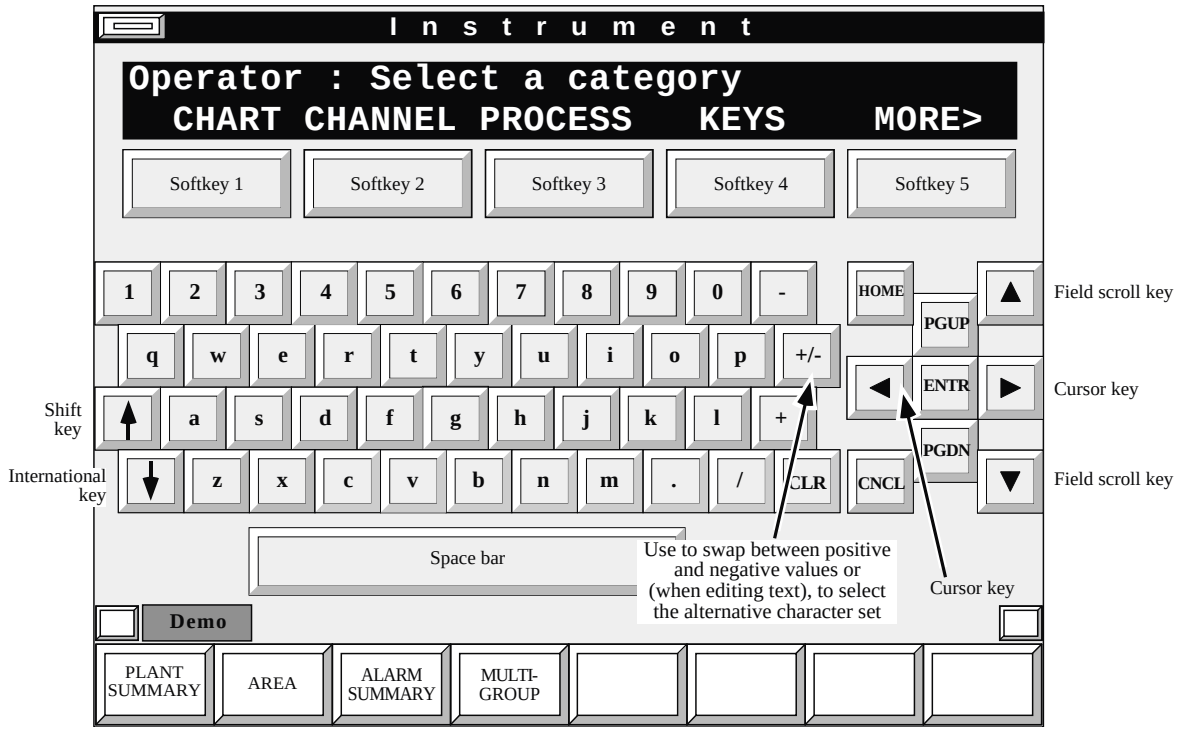


Figure 4.1a Operator page showing default keyboard

The hardkeys Home, PGUP (Page scroll up), PGDN (Page scroll down) CLR (Clear) and Cancel (CNCL) are as described in the relevant recorder's Installation and Operation manual. (CLR is the 'C' key and CNCL is the X key)

4.1 CHARACTER SETS (Cont.)

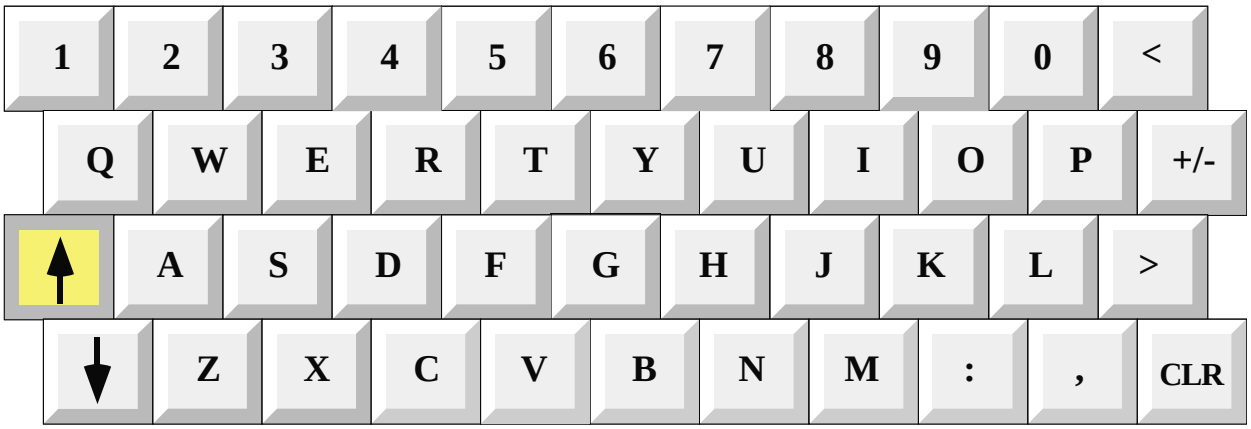


Figure 4.1b 'Capitals' keyboard

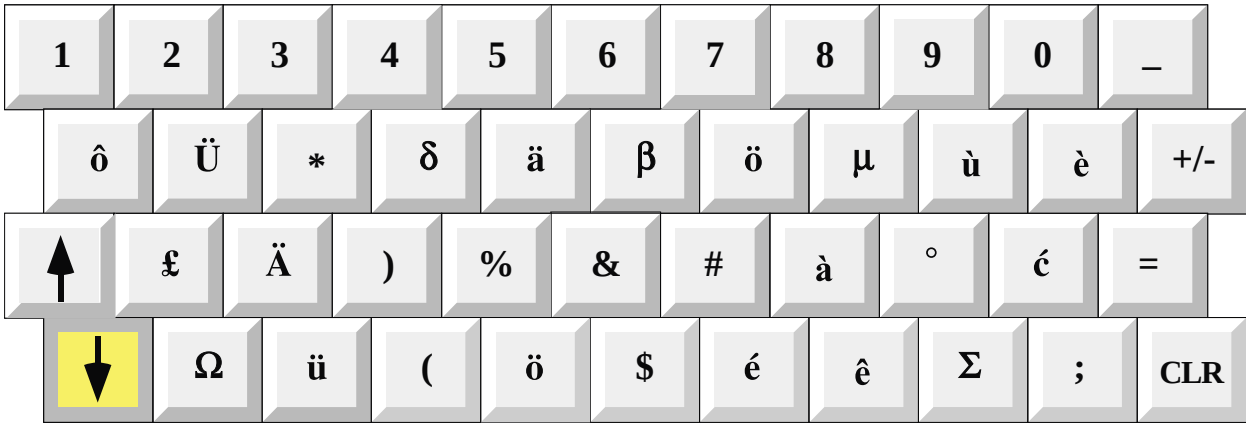


Figure 4.1c 'International' keyboard

5.0 GRAPHICS PANEL OPERATION (NETWORKED UNITS ONLY)

For non-networked instruments (e.g. a single graphics recorder or a graphics unit with single recorder or I/O rack) see section 2 instead of this section.

5.1 INTRODUCTION

Instruments can be networked together under a 'Master' graphics unit, either a graphics recorder (up to seven 'slaves'), or a remote graphics display unit with up to eight 'slaves'.

5.1.1 Communications wiring

The interconnections amongst networked instruments using a) a graphics display unit and b) a 250 mm graphics recorder as the 'Master' are shown below, in figure 5.1.1a./b All slave units should be 'daisy-chained' together, with all TxAs connected together, all TxBs connected together etc. The slave units' Txs should be connected to the master unit's Rxs and *vice-versa.*

For communicating with a host computer, RxA at the computer is connected to TxA at the Master and RxB connected to TxB and *vice-versa*. (For RS232, Rx at the computer should be connected to Tx at the 'Master' and *vice-versa*.)

It should be noted that the figure assumes isolated communications modules are fitted to instruments. Older instruments may be fitted with non-isolated communications, in which case, there is only one (25-way) connector, not two 9-way connectors as shown.

Figure 5.1.1c shows pinouts for the various communications modules.

Note. The 0V (Signal ground) line must be tied to earth AT A SINGLE POINT in the circuit. If a host computer is to be a part of the circuit, check that the signal ground is not also earthed. Multiple grounding can result in large circulating current loops

5.1.2 Address and Ident

On despatch from the factory, each instrument with Networking software fitted has an address of 255. For each instrument, it is necessary to change this to an address which is unique within the network (i.e. no two instruments in a network may have the same address).

Each instrument is also supplied with a legend (IDENT) describing the type of instrument. This can be edited as required, but it should be remembered that in many cases only the first eight characters of the IDENT appear on the screen.

SUGGESTED ADDRESSING TECHNIQUE

Once all the instruments have been wired up, apply power to the Master unit, and to ONE of the Slave units. If the Master unit is a graphics recorder, its address is set to 1, and cannot be changed. If the Master unit is a Display unit only, it does not have an address at all.

Continued

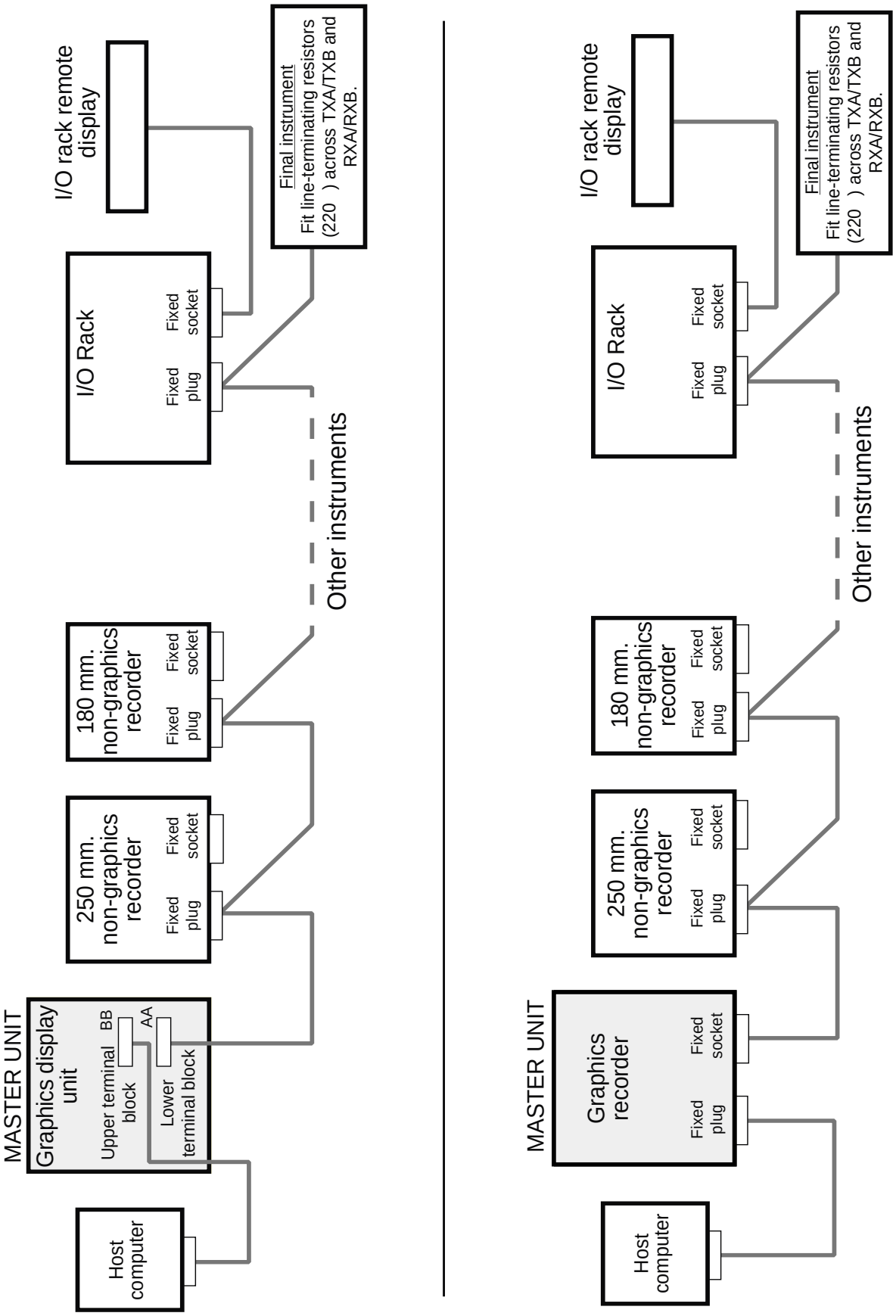


Figure 5.1.1a Typical network interconnections

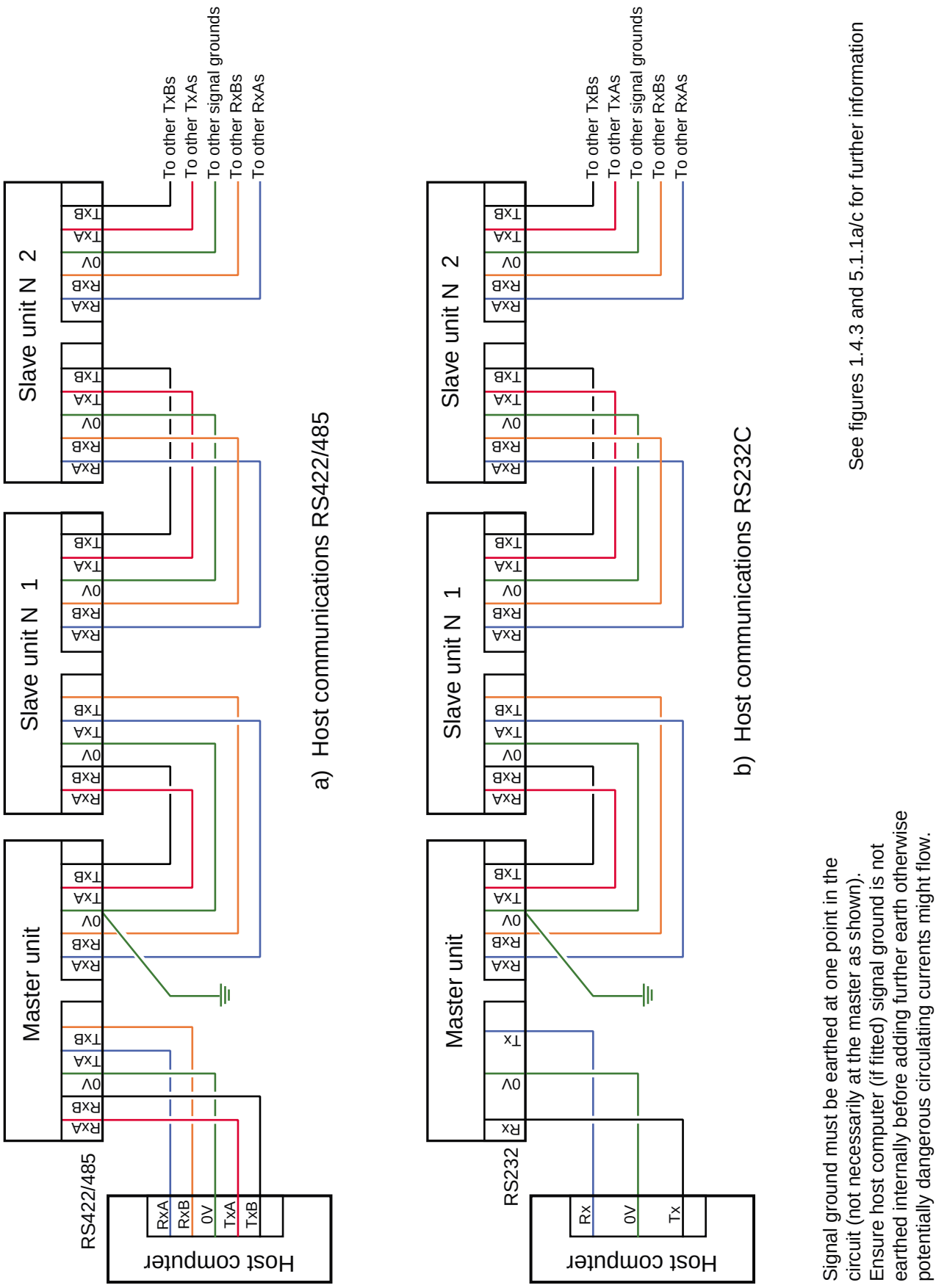


Figure 5.1.1b Communications wiring

Isolated Comms
(2 x 9-way D-types)

Pin	Function
1	5V via 1k0
2	RX
3	TX
4	DTR
5	Signal ground
6	DSR
7	RTS
8	CTS
9	Not connected

RS232 Pin out
(Switches up)
(Fixed plug only)

Pin	Function
1	5V via 1k0
2	TXA
3	TXB
4	Not connected
5	Signal ground
6	Not connected
7	RXB
8	RXA
9	Not connected

RS422/485 Pin out
(Switches down)
(Plug or socket)

Comms pinouts for current recorders and I/O (data acquisition) racks.
(I/O racks may use only the fixed male connector (plug) for the serial link)

RS232 Terminations

5v*	Rx	Tx	DTR	0V	DSR	RTS	CTS

RS232 available with upper connector only (all switches left)

RS422/485 Terminations

5v*	TxA	TxB	NC	0V	NC	RxB	RxA

Lower connector always RS422/485. Upper connector selectable RS232 (all switches left) or RS424/485 (all switches right)

Comms pinouts for Graphics Display Units

Non-Isolated Comms
(25-way D-type)

Pin	Function
1	Protective ground
2	TX
3	RX
4	RTS
5	CTS
6	DSR
7	Signal ground
19	5V via 1k0
20	DTR

RS232 Pin out
(Switches right)

Pin	Function
1	Protective ground
2	TXB
3	TXA
4	RXB
5	RXA
6	Not connected
7	Signal ground
19	5V via 1k0
20	Not connected

RS422/485 Pin out
(Switches left)

Comms pinouts for previous recorder versions

Figure 5.1.1c Communications pin allocations

5.1.2 ADDRESS AND IDENT (Cont.)

If the slave unit still has address 255 (as despatched from the factory), then once the Master unit has initialised, the enter password page (see below) appears.

If an address of 1 to 8 has previously been entered, press the OPERATOR button at the bottom of the screen, then operate the MORE softkey until the legend CONFIG appears on the bottom line.

Operate the CONFIG softkey

Enter 10 from the keyboard. Operate the ENTER softkey

Operate the INSTRM softkey

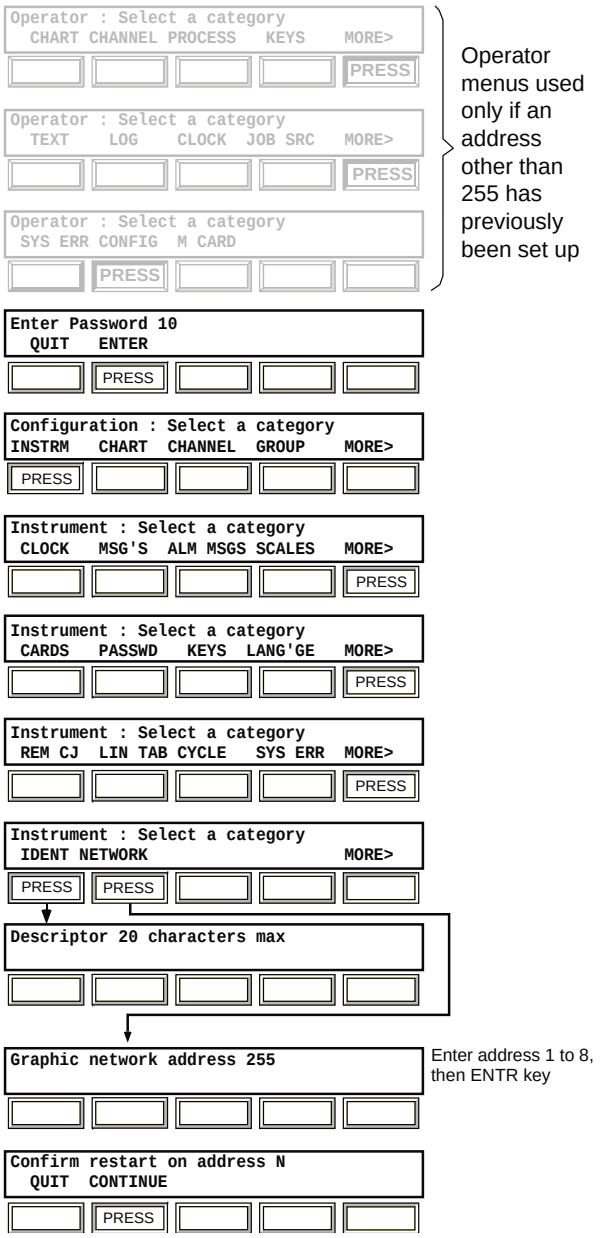
Operate the MORE> key until the legends IDENT and NETWORK appear at the bottom line.
Operate the IDENT softkey, then use the keyboard to enter a descriptor of up to 20 characters.

Operate the ENTR key on the keyboard

Operate the NETWORK softkey and enter an address between 1 and 8 (1 not available if the master unit is a graphics recorder).

Operate the ENTR key on he keyboard, then confirm the new address, The unit will now initialise, and the Plant Summary page will be returned to.

In the case of a Graphics display unit, the plant summary page will, at this stage, be similar to that shown in figure 2.1a because with only one 'slave', it does not consider itself to be networked.



A further instrument should now be powered up, and its address can be set up as described above. The process should be repeated until all instruments have been set up. After each instrument has initialised, a Plant summary page will appear similar to that shown in figure 5.2.1a.

Note: All network printing (trending or logging to chart) is sent to that instrument which has address 1. This means that with a Graphics recorder Master, the Master unit carries out all network printing. With a Graphics Display Unit, address 1 must be allocated to a chart recorder (rather than an I/O rack) for network printing to work. See section 5.3 for network printing details.

5.2 OPERATION

5.2.1 Plant Summary page

The plant summary page contains icons of all currently active instruments connected to the network. (It can also contain 'greyed' icons for instruments that have ceased communicating, or for addresses which have been 'missed out').

The bottom section of the display also contains

a. An alarm status display bar
b. A number of hard keys for controlling the display.

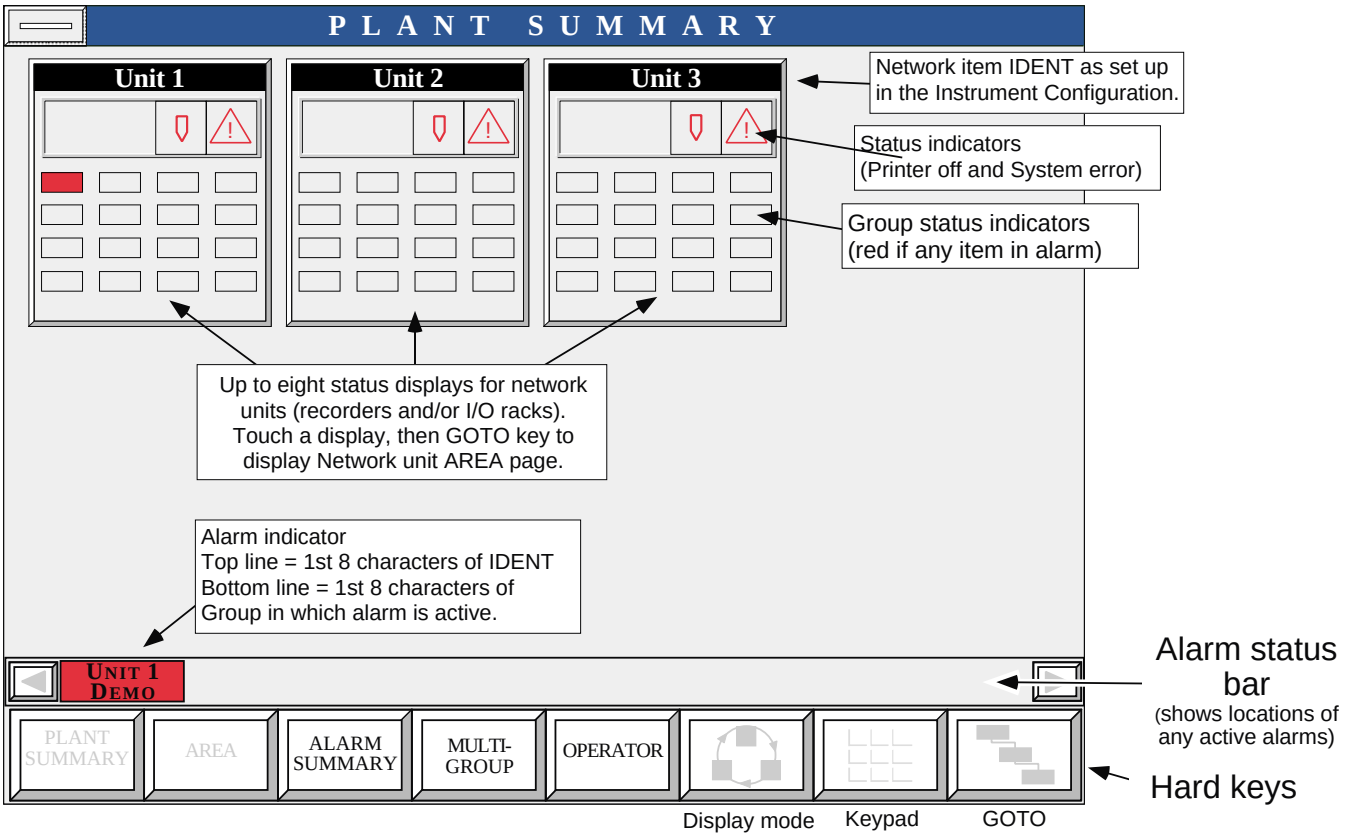


Figure 5.2.1a Plant Summary display

Unit icons

Each active instrument in the network has an icon headed by the first 17 characters of the instrument IDENT.

Below the header is an area in which the instrument's status can be displayed. Currently, only two status icons can be displayed, one indicating that the relevant unit's printer is off-line, the other indicating any system errors which may have occurred in the unit. (See section 2 of the Installation and Operating manual supplied with the unit in question).

Below this, there are either 8 or 16 group symbols (according to model) which are either background colour, or red if any point in the group is in alarm. If in alarm, the red symbol will flash until acknowledged, or, for 'unlatched' alarms only, until the point returns to a non-alarm state.

5.2.1 PLANT SUMMARY PAGE (Cont.)

Alarm status bar

Below the unit displays is an alarm status bar. Any active alarm causes the first 8 characters of the instrument IDENT and the first 8-characters of the name of the group to appear in black on a red background.

For non-latching alarms, this background will flash until the alarm is acknowledged (when it will remain red continuously), or until the cause of the alarm returns to a non-alarm state.

For latching alarms, the background will flash until acknowledged, after which it remains red continuously until the cause of the alarm returns to a non-alarm state.

Touching an alarm icon causes the name of the group to change from black to yellow, and the GO TO key to appear. Touching the GO TO key causes the relevant group to be displayed in whichever of the three display modes (section 5.2.3) it was in last time it was active. In Group panel and Bargraph modes, the item(s) in alarm can be seen (displayed in red) and acknowledged using the ACK key at the top right of the screen.

Hard keys

There are eight positions for fixed-function keys, at the bottom of the page.

PLANT SUMMARY

Returns the user from any page to the PLANT SUMMARY page (figure 5.2.1a above). The legend is invisible when the Plant summary page itself is displayed.

AREA

Returns the user from the current instrument's screens to the Area Page described in section 5.2.2 below. The legend is invisible unless a display page for a particular instrument is being viewed. For example the AREA legend is invisible whilst the Plant Summary and Alarm Summary pages are being displayed, since both these deal with all the instruments in the network, not with one instrument in particular.

ALARM SUMMARY

Operation of this hardkey causes a display to appear (figure 5.2.1b) showing the latest 16 alarms to have been active in all instruments (areas) in the network. Referring to the figure, the time and date in the active column have a flashing red background if the alarm is active but not acknowledged, or a solid red background if active and acknowledged.

To display all the alarms associated with a particular instrument, the instrument name should be highlighted by touching it in the AREA column, then by touching the AREA key which appears below the 'Type' column.

Similarly, to display all the alarms associated with a particular point, the Group/tag column should be touched at the appropriate point, and the POINT key touched.

If there are more than 16 active alarms, a downwards pointing arrow key appears to the right of the screen allowing further alarms to be displayed. On any but the first page, an upwards-pointing arrow also appears, allowing previous pages-full of alarms to be scrolled through.

New alarms are added to the top of the display as they occur, the older ones moving down the list until the list is full (512 alarm events) after which the oldest alarm is discarded.

One or more alarm pages can be printed onto the chart - see section 3 of this document.

5.2.1 PLANT SUMMARY PAGE (Cont.)

'Go back one level' key

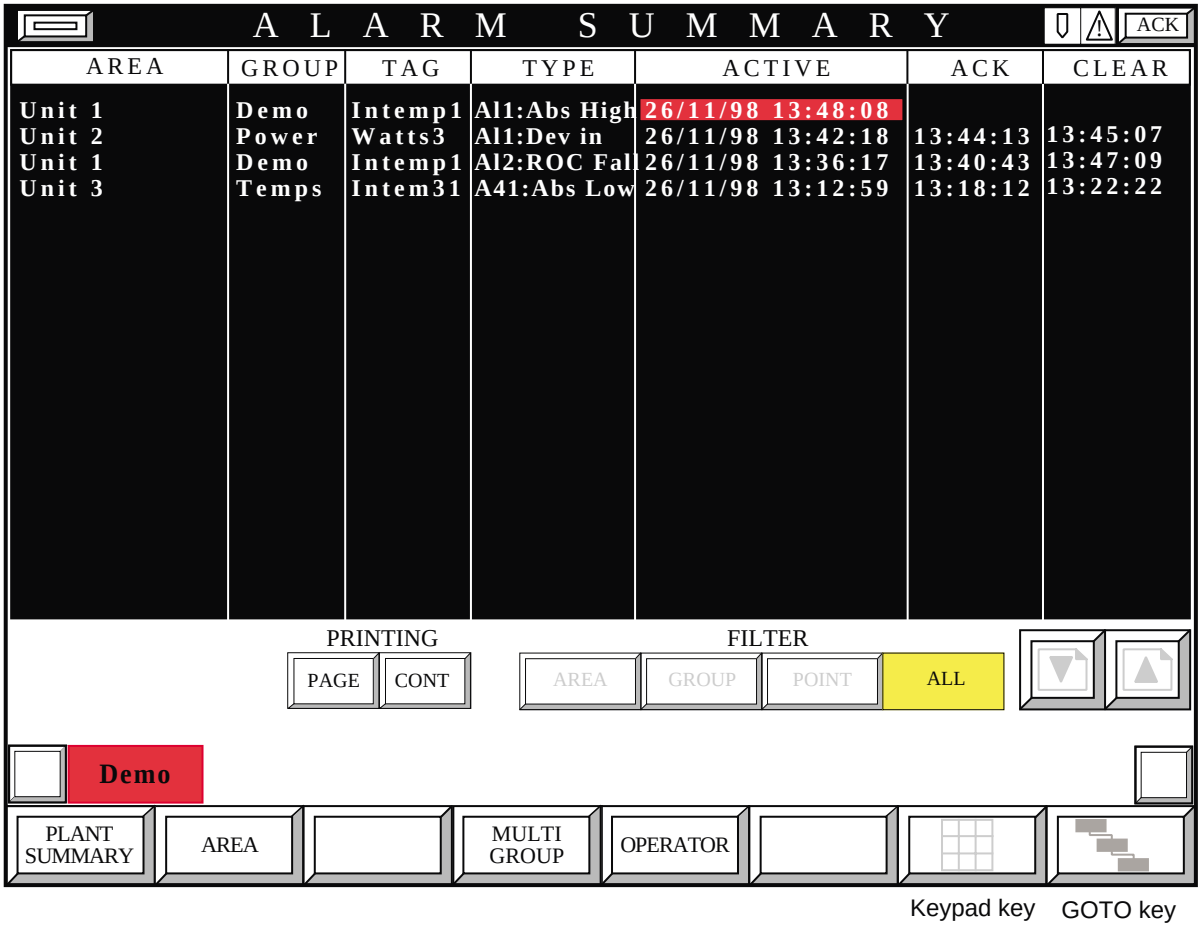


Figure 5.2.1b Alarm summary page for networked instruments

MULTIGROUP HARDKEY

This hard key causes a ‘select area’ pop-up page to appear (figure 5.2.1c). Once the required instrument has been selected and the OK key pushed, 4 groups appear at the display. Each group can be in any of the three display modes (Group Panel, Bar graph or Group trend) as described in section 5.2.3 below.

To select a different group for display, touch the group that you want to change, then touch the ‘Keypad’ hardkey. A pop-up window appears, containing all the available groups and (unless it is already being displayed in one of the windows) an ‘Alarm summary’ key. Touching any group or the Alarm Summary key, followed by ‘OK’, causes the new selection to appear in the window.

OPERATOR HARDKEY

Operation of this key calls a ‘Select an Area’ page to appear (figure 5.2.1c), showing instrument icons. Select the required instrument by touching its icon, then press the OK key. This causes the first of the Operator top level menu pages described in section 3 of the relevant manual to appear at the top of the page. The operation pages are identical except that the DISPLAY softkey and its sub menu do not appear. The configuration menu structure is entered from the CONFIG softkey, followed by entry of the password (10 when despatched from the factory).

5.2.1 PLANT SUMMARY PAGE (Cont.)

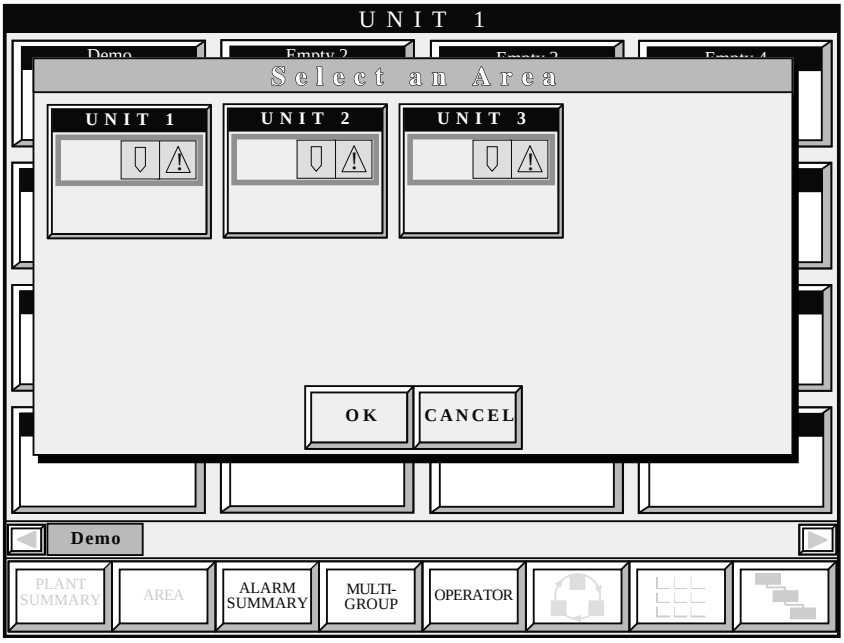


Figure5.2.1c Select Area Page

DISPLAY MODE KEY

This key allows the user to scroll through the three display modes available for groups. See section 5.2. 3 for full descriptions

KEYPAD HARDKEY

This key has the following functions:

1 Allows a new group to be selected for display in the multi-group display page.

2 In Group Trend mode (section 5.2.3 below), changes the real-time trend display to a 'historical' display which includes extra hard keys for scrolling backwards and forwards through the group history, for changing the time scale of the historical display, and for printing the screen onto the chart.

GOTO HARDKEY

This key generally takes the operator 'down' one level in the display structure.

5.2.2 Area Page

In order to look at a particular instrument in detail, operate the Plant summary key, touch the required instrument's icon, then touch the GOTO key (bottom right of the display screen). This brings what is called the Area Page to the display. This is similar to the Plant Summary page for non-networked instruments, but has the instrument Ident as its title.

The area page (figure 5.2.2a) contains:

a. Group icons showing (as despatched from the factory) one group for each I/O board fitted, though this is configurable in Group configuration.
b. Actve alarm indicator and chart off-line indicator.
c. Alarm status bar as described for the plant summary page (section 5.2.1)
d. Hardkeys for controlling the display, as described for the plant summary page (section 5.2.1)

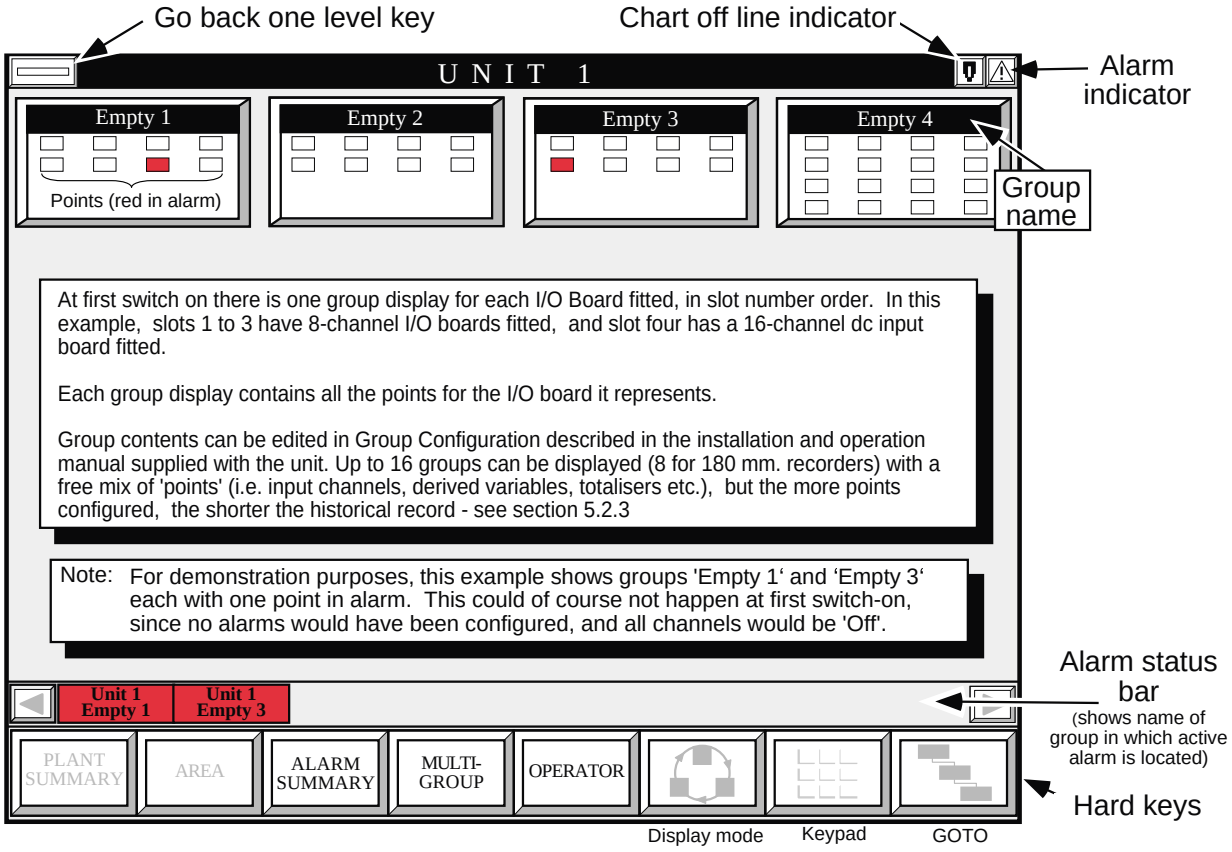


Figure 5.2.2a Area Display page

GROUP ICONS

Note: 250 mm graphics recorders have 17 groups. One of these is called 'Everything' and operates in the same way as does the non-graphics recorder BUT IT CANNOT BE DISPLAYED ON THE GRAPHICS SCREEN. 180mm instruments are similar, but have 9 groups, 8 of which can be displayed.

After group configuration (see the Installation and Operation manual) each group icon can have up to 16 points displayed. Although each group can have all process variables allocated to it (for logging or archiving purposes), only the first 16 can be displayed.

Any process variable (in any of the network instruments) in alarm is displayed in red; steadily if the alarm has been acknowledged or flashing if not.

5.2.2 AREA PAGE (Cont.)

GOTO Key

Touching one of the group icons causes it to be outlined in yellow, and a new hardkey (called GO TO) to appear. Touching this key causes the contents of the selected group to be displayed in detail, and a new hard key to appear (called the Display Mode key).

DISPLAY MODE KEY

This key allows one of three group display modes to be selected. These display modes are called 'Group Panel Display', Group Bargraph Display' and 'Group Trend Display' and are described in detail in section 5.2.3, below.

To return to the Area page, the AREA key at the bottom left can be operated, or the Go back one level' key () at the top left of the page can be operated.

5.2.3 Group displays

To see a particular group in more detail, touch the group and then the 'GO TO' button. This will result in a display such as that depicted in figure 5.2.3a (Group Panel Display), figure 5.2.3c (Group Bargraph display) or figure 5.2.3d (Group Trend Display), according to which of these three modes was selected for the group last time. Use the Display mode key to scroll through the three types of display.

In order to see a particular point in more detail, the point can be touched, followed by the GO TO key. This will result in the point display described below (section 5.2.4).

Group panel display

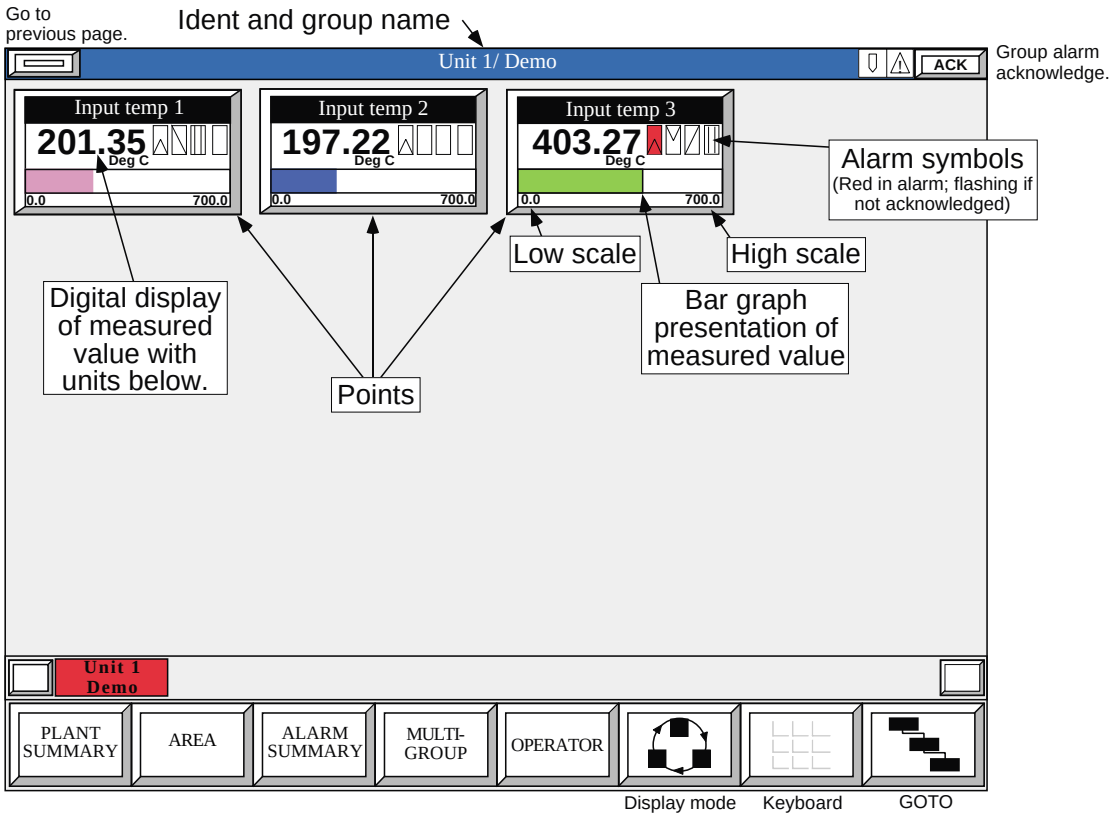


Figure 5.2.3a Group Panel display

5.2.3 GROUP DISPLAYS (Cont.)

The group panel display depicted above, shows all three channels as dc-type inputs. Figure 5.2.3b (below) shows the different group panel point displays which can appear.

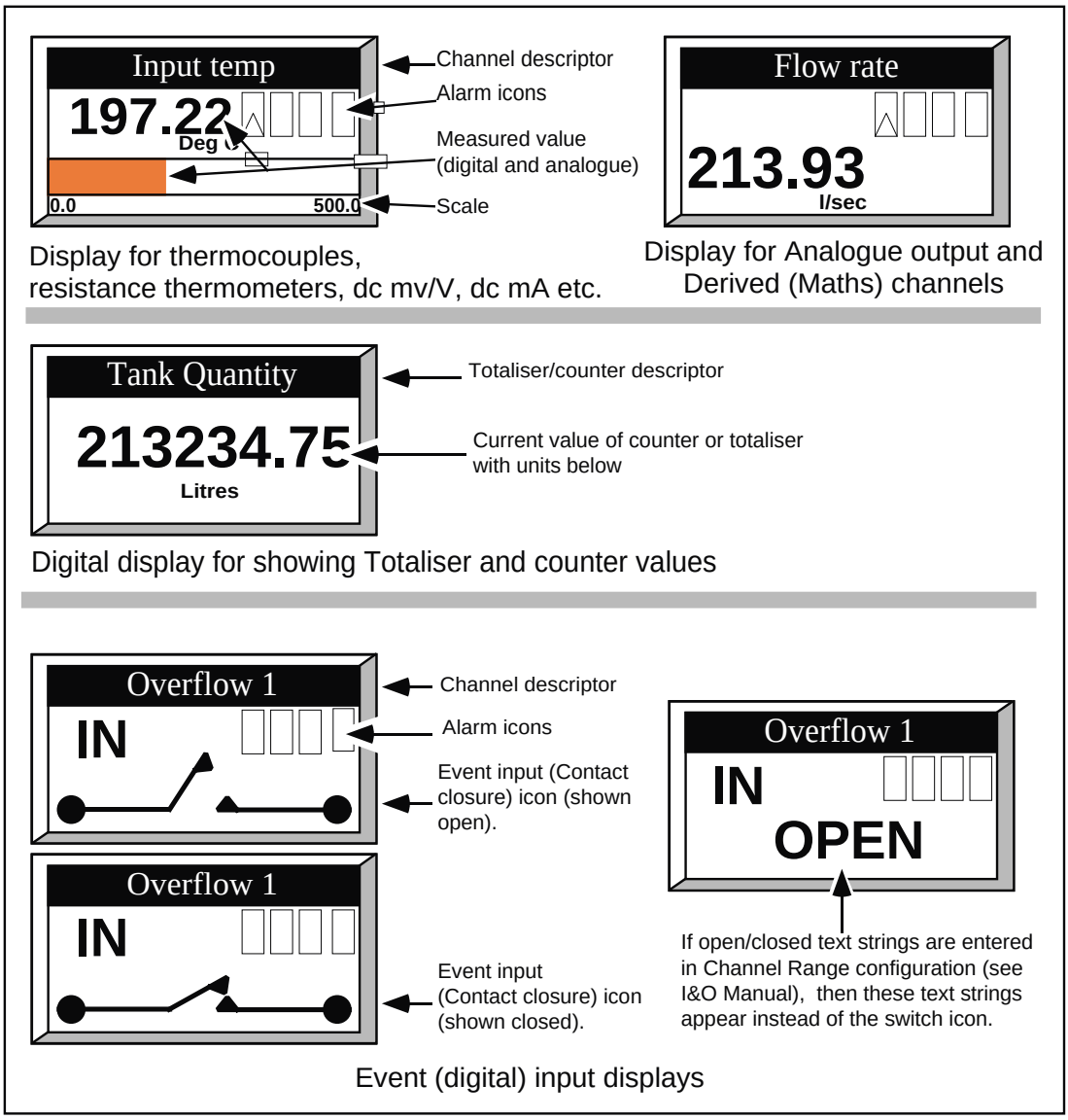


Figure 5.2.3b Point display types

ALARM SYMBOLS

The following table shows the icons associated with the different types of alarm available for use with the recorder.

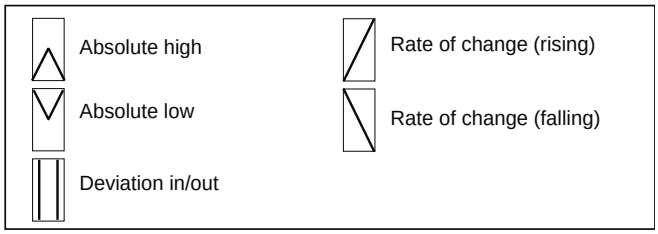


Table 5.2.3a Alarm icons

5.2.3 GROUP DISPLAYS (Cont.)

Group bargraph display

From the group panel display, touch the Display Mode key. The group is now displayed with its points in bargraph format as depicted in figure 5.2.3c In order to see a particular point in more detail, the point can be touched, followed by the GO TO key. This will result in the point display described in section 5.2.4 below.

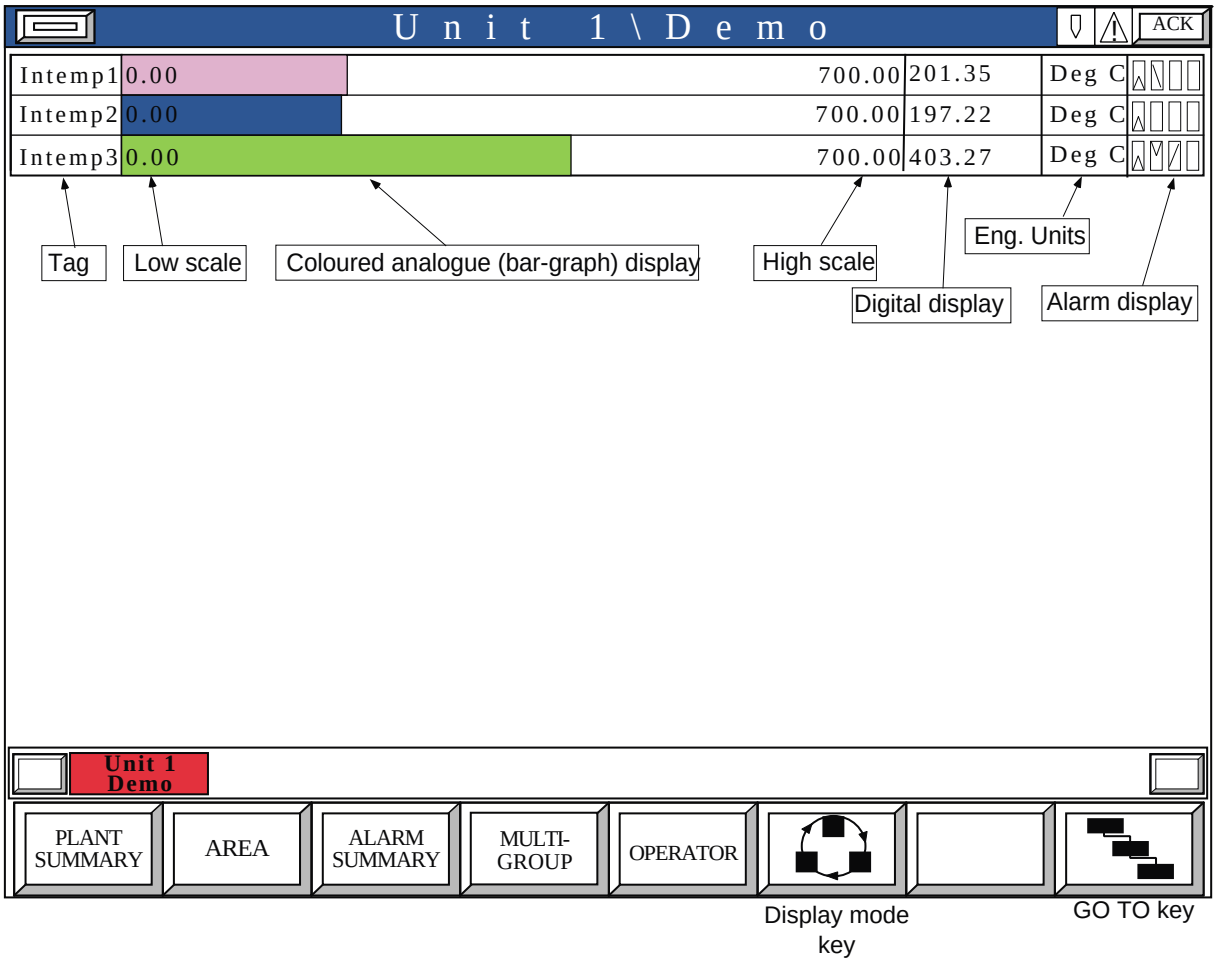


Figure 5.2.3c Group bargraph display

5.2.3 GROUP DISPLAYS (Cont.)

Real-time group trend display

From the group bargraph display, touch the display mode key. The group points are now displayed as if being traced on a chart as depicted in figure 5.2.3d. The height of the chart page is equivalent to 338 sample intervals, where the sample interval is entered as a part of the group configuration. Table 5.2.3b shows the available sample intervals and the page height (in time).

Interval	Time per page
1 second	338 seconds (5 min 38 secs)
2 seconds	676 seconds (11 min 16 secs)
10 seconds	3,380 seconds (56min 20 secs)
30 seconds	10,140 seconds (2 hrs 49 min)
60 seconds	20,280 seconds (5 hrs 38 min)
120 seconds	40,560 seconds (11hrs 16 min)
300 seconds	101,400 seconds (28 hrs 10 min)
600 seconds	202,800 seconds (56 hrs 20 min)
1800 seconds	608,400 seconds (7 days 1hr)
3600 seconds	1,216,800 seconds (14 days 2hrs)

Table 5.3.2b Equivalent chart speeds

As can be seen, in figure 5.2.3d, each of the traces has a pointer associated with it, either a 'down' (half) pointer, or for one trace only an 'up/down' (full) pointer which indicates a value on the scale above the pointer.

The trace with the full pointer is the 'current' trace, and its tag, descriptor, units and scale are displayed above the 'chart' for approximately 15 seconds, after which the next trace in the group becomes 'current' for 15 seconds and so on.

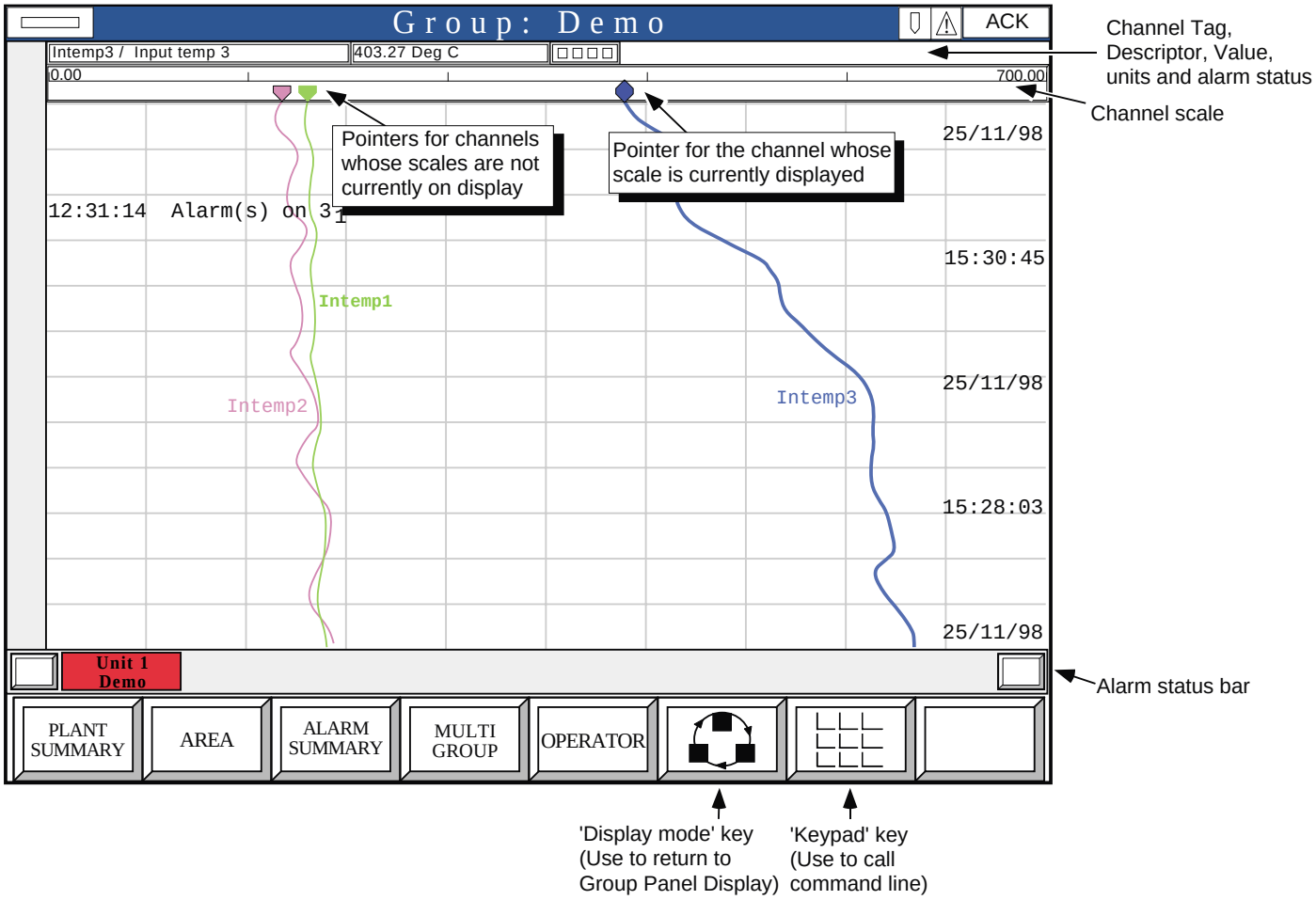


Figure 5.2.3d Real-time Group Trend display

5.2.3 GROUP DISPLAYS (Cont.)

History group trend display

COMMAND MENU

Touching the KEYPAD key causes a command menu to appear, which contains History, Time, Trend and Print Select keys (figure 5.2.3e) the functions of which are described below. Although the display chart stops rolling at the time the keypad is touched, the recorder continues to store the traces in its memory. This 'new' tracing can be viewed using the history down arrow key.

HISTORY

Operating the history up arrow key causes the display to 'roll' backwards so the history of the group can be seen. The History down arrow key can be used to scroll forward to present time. Wherever a power off has occurred, a black line is drawn across the 'chart' to indicate what has happened. Data for the last 20 power-off events is saved; power-off event 21 causing data prior to power-off event 1 to be lost, and so on.

The amount of history maintained within the recorder's memory depends on the total number of points configured in all the groups. Examples of approximate maximum numbers of stored pages for the two available memory options (10MB or 20MB as specified at time of order) are given in table 5.2.3 . The figures are approximate because different point types take up different amounts of memory.

No. of groups	Points/ group	No. of pages	
		10MB	20MB
2	4	550	1100
8	8	70	145
8	16	30	70
16	16	15	35

A vertical bar is displayed at the left side of the display. The height of the bar represents the proportion of the stored data that the current page represents. For example if the bar is 1/4 the height of the page, then there are three pages of history which can be rolled through, in addition to the current page. The position of the bar represents where the current page lies in the historical record. For example, if the top of the bar is at the top of the page, then this page is the latest page.

The bar can be moved up and down by touching and dragging it, and can therefore be used as an alternative to the history keys.

TIME

Each touch of the time [–] key doubles the amount of chart displayed. For example, a single operation would change the amount of 'chart' on display from 5 to 10 minutes. A further operation would change it to 20 mins. The time [+] key reverses this operation.

TREND SELECT

Operation of one of these keys causes one point's trend to be selected, and to start flashing. To select the next point, use the right arrow key; to select the previous point use the left arrow key. See also the 'CURSOR' section below.

5.2.3 GROUP DISPLAYS (Cont.)

PRINTING

The PRINTING - PAGE key allows the current page to be printed on the chart of the device with network address 1, provided its printer is on-line. Alternatively the displayed group can be continuously trended on the chart (CONT. key). See section 3 for more details.

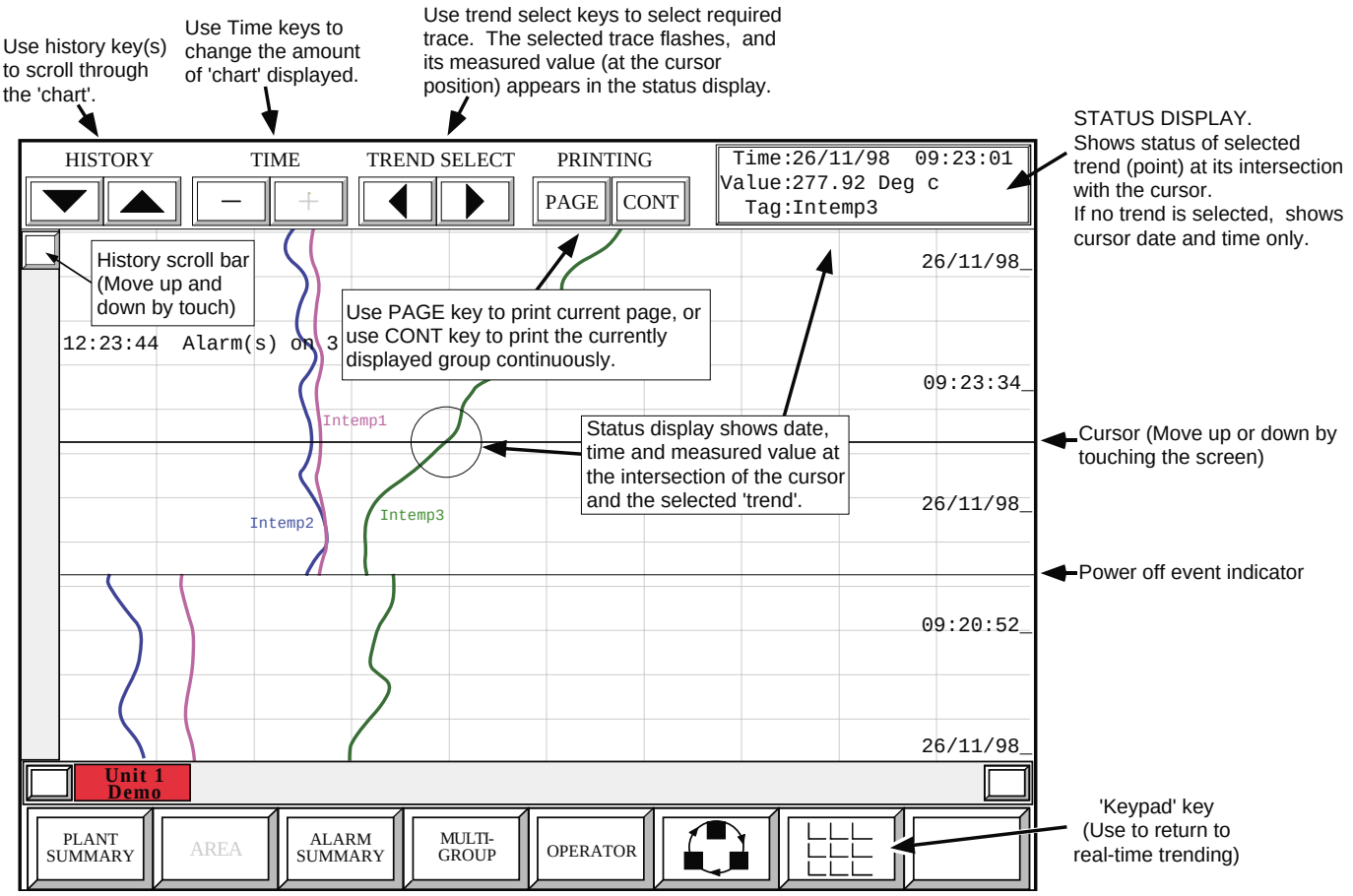


Figure 5.2.3e History Group Trend display

THE CURSOR

Touching the screen anywhere within the tracing area causes a horizontal cursor to move to the point where the screen was touched. This cursor can be moved up and down by touching and dragging.

The status box at the top right hand corner shows the date and time that the cursor position represents, so by watching the time display as you drag, you can position the cursor to the exact time you require.

If a point is selected using the Trend Select key(s) then the tag and the measured value of that point, at the cursor time are displayed, and will reflect any change you make to the cursor position. It is thus possible to find the value of any point at any time in the historical record.

5.2.4 Point display

From the Group Panel or Group Bargraph Display in order to see a particular point in more detail, touch the point, then the GOTO key. This results in a display such as that depicted in figure 5.2.4 below. This display gives details of the point's configuration together with a 'trace;' on the screen.

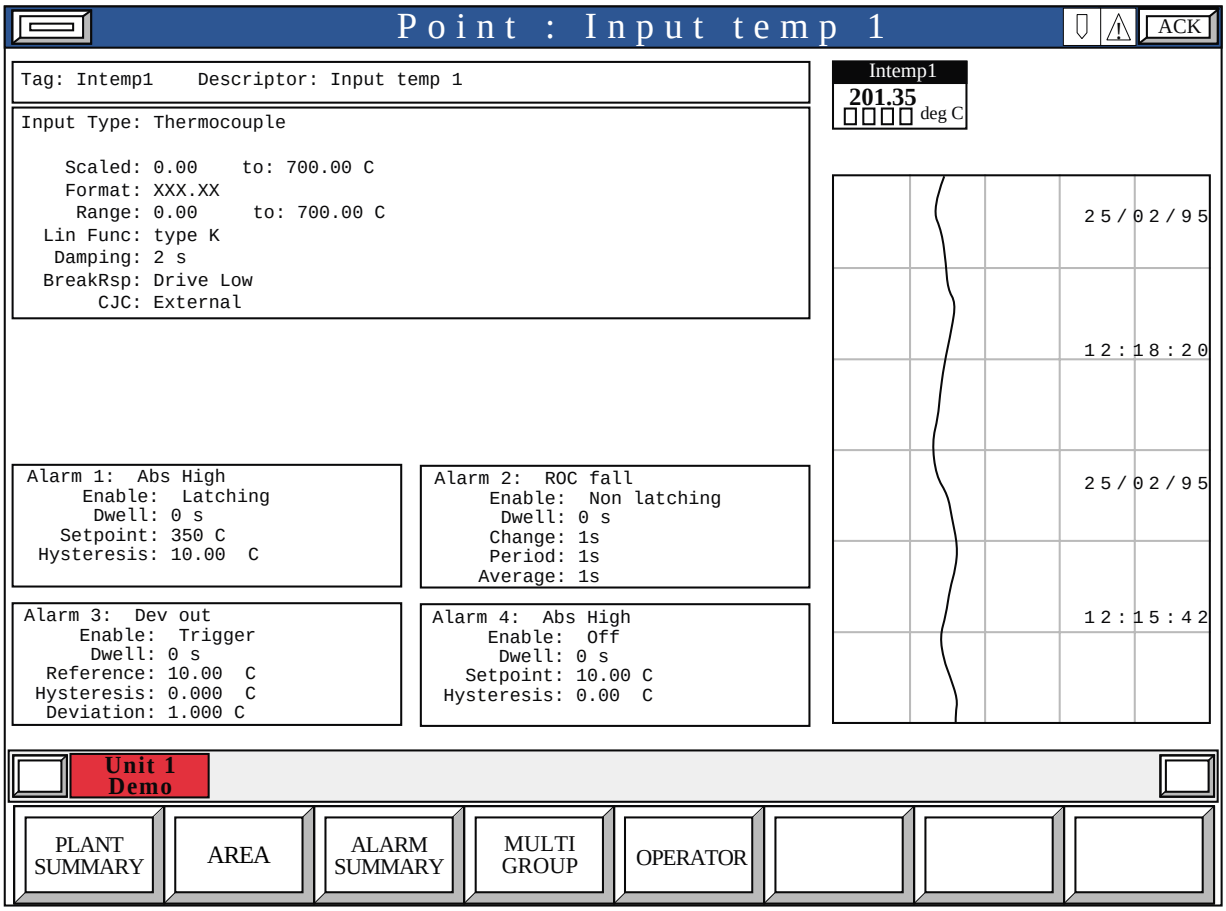


Figure 5.2.4 Point Display

5.3 NETWORK PRINTING

5.3.1 Group printing

This allows a group from any networked instrument (including I/O racks) to be traced on a chart, by displaying the relevant group as a History Group trend display (see figure 5.2.3e above), then operating the CONT. print key.

RULES

1. The recorder which does the printing (called the network printer) must have network address 1. When a graphics recorder is being used as the master, its address is preset to 1 and cannot be changed. Thus in such a case, the master unit is always the network printer,
2. In the INSTRUMENT configuration of the network printer, one of the CARDS slots must be set to 'network'. This takes up two addresses, and the 16-channels associated with these addresses are the channels used to trace the incoming group's channels. The network printer's total number of measuring channels is thus reduced by 16. See table 5.3 for address/channel cross reference.
3. If a second group is selected for network printing, a message will be displayed on the screen, asking if you want to abandon printing of the current group.

See Section 3 for full details of printing.

5.3 NETWORK PRINTING (Cont.)

Address	Channel numbers	
	250 mm recorder/ I/O rack	180 mm recorder
1	1 to 8	1 to 8
2	9 to 16	9 to 16
3	17 to 24	17 to 24
4	25 to 32	25 to 32
5	33 to 40	33 to 40
6	41 to 48	41 to 48
7	49 to 56	Relay only
8	57 to 64	Relay only
9	65 to 72	Relay only
A	73 to 80	N/A
B	81 to 96	N/A

Table 5.3 Channel / Address cross reference

As can be seen from the table above, if the card address 3 is selected to 'Network', then the 16 points from the group to be printed will appear as channels 17 to 32 on the net printer chart. If an input card has previously been allocated address 3 (or 4), then the input channels associated with this card will not be traced, nor can they be configured. ('Config not available this channel' message appears.)

5.3.2 Log printing

Logs can be printed to the network printer, by setting their destination to 'Net printer'. A second page (accessed by using the page up/down key) allows a line length (number of characters) to be set up. It is recommended that this be set to 77 for 180 mm. printers or to 104 for 250 mm printers.

5.4 MULTIPLE CONTROL PANELS

Where one or more slave units have associated control panels / displays, then the following rules apply:

1. When the master unit is in OPERATOR or CONFIG mode, then the associated slave unit top-level Operator Menu is limited to:

```
Operator : Select a category
DISPLAY  ALARM  CHANNEL PROCESS  CLOCK
```

   which operate as described in Section 3 of the relevant Installation and Operation manual.

2. When a slave unit is in Operator or Configuration modes, then if the Operator/Configuration page for that slave is on display at the master unit, the top line at the master unit reads:

```
Operator at instrument
```

   and no Operator or Configuration actions can take place at the master unit.

3. After 4 minutes of inaction, Operator/Configuration pages 'time-out', and the slave display returns to the background display and the master returns to the Plant Summary or Operator page unless:

   a. The operator is in one of the DISPLAY, ALARM, CHANNEL, PROCESS or CLOCK submenus
   b. Instrument CARDS or NETWORK configuration changes being confirmed
   c. Auto configuration is in progress
   d. Configuration save or restore is in operation
   e. A memory card is being formatted
   f. The memory card is off-line
   g. Configuration print is in progress
   h. Channel copying is taking place
   i. Input adjust, Input calibration or CJ calibration is being carried out
   j. Diagnostics is being run.

4. If diagnostics is entered at the master unit, a message 'In diagnostics' appears at the slave unit, and *vice-versa.*

5.5 NETWORK CONFIGURATION LIMITS

With two 250mm recorders in the network, it is possible to configure up to 512 points. As further instruments are added, this figure is reduced.

Should too many points be configured, a 'Configuration too complex' message will be displayed. To resume normal operation, the number of points must be reduced, and the master unit then powered off, then on again.

Typical guidelines are:

2 x 250 mm recorder or 4 x 180 mm recorder: 512 points.
4 x 250 mm recorder or 8 x 180 mm recorder: 460 points
8 x 250 mm recorder: 350 points.

5.6 BANDWIDTH LIMITS

Because of the amount of processing involved, it is not possible to have every point and group in a network system configured, and maintain a 1 or 2 second group sample rate. The relationship between processing time, number of instruments, number of groups and number of points is complex, but some typical examples are shown in figure 5.6 below.

It should also be noted that other factors such as host communications activity, use of the memory card or network printing will reduce the amount of processing time available. Where the group sample rate is not being maintained for any reason, some degradation of the traces on the screen will be observable.

In some cases an improvement can be made by reducing the number of groups into which the points are distributed.

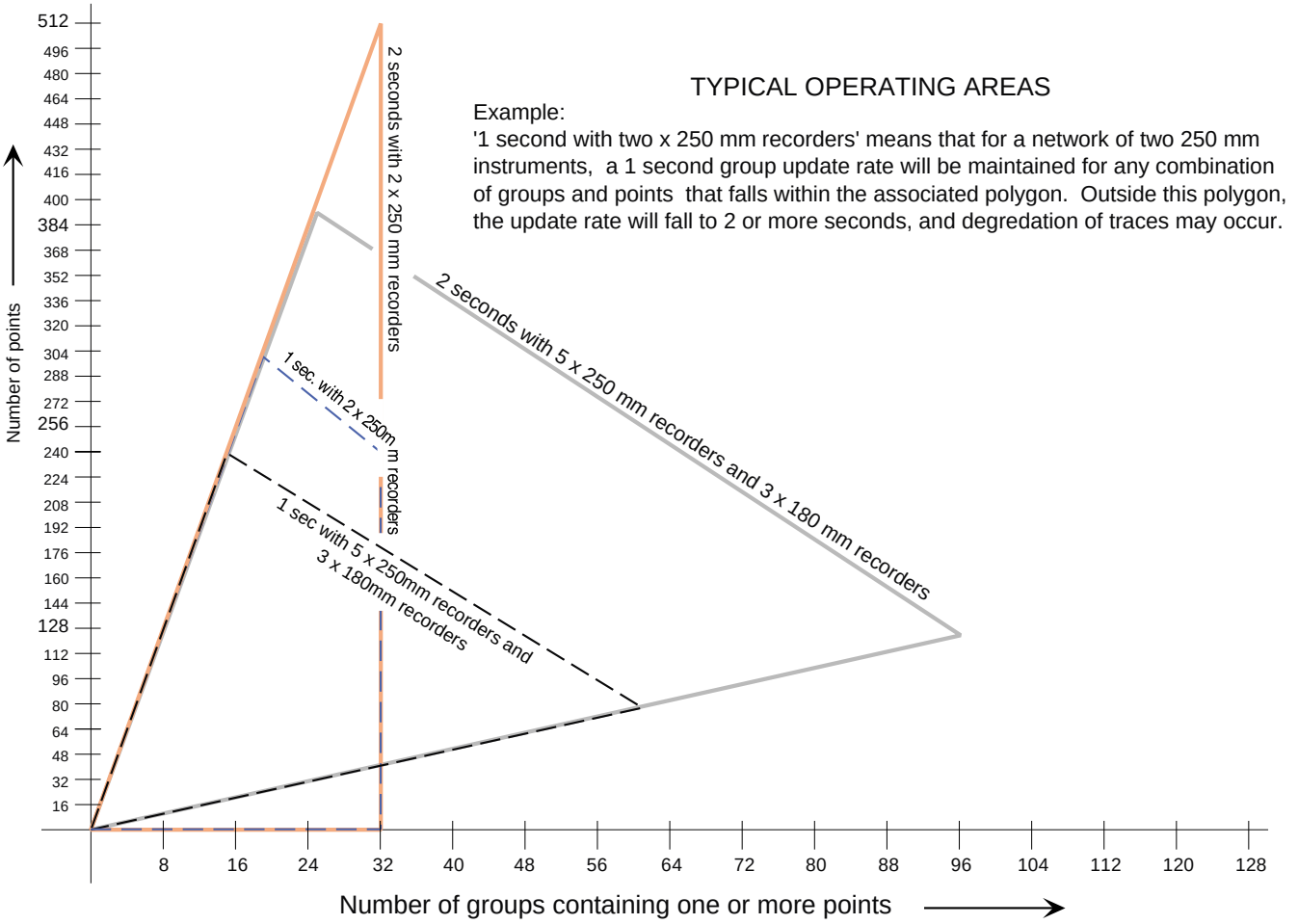


Figure 5.6 Typical operating areas for iteration rates of 1 and 2 seconds.

ANNEX A GRAPHICS DISPLAY UNIT SPECIFICATIONS

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. I.E. The equipment is supplied from the fixed installation (IEC664)

POLLUTION DEGREE 2
Normally, only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation shall be expected.

Environmental Performance

Temperature limits	Operation:	0 to + 40 ˚C
	Storage:	-20 to +70 ˚C
Humidity	Operation/Storage:	5 to 85% RH; non-condensing
Protection		IP65
Shock		BS EN61010
Vibration		2g peak at 10 to 150 Hz
Altitude (max)		<2000 metres

Electromagnetic compatibility (EMC)

	Emissions	BS EN50081-2
	Immunity	BS EN50082-2
Electrical Safety		BS EN61010 Installation category II; Pollution category 2

Physical

Bezel size	288 mm. high x 360 mm. wide x 68 mm. deep.
Panel cutout size	273.5 mm high x 348 mm. wide. (+ 1.4 mm. - 0 mm.)
Depth behind bezel rear face	50 mm.
Weight	5 kg. max.

Power requirements:

Line voltage (45 to 65 Hertz)	90 to 132 Volts or 180 to 264 Volts (User selectable).
Maximum power	120 W
Fuse type	Ceramic 1 x $^{1}/_{4}$ in. 3 Amp.
Interrupt protection	100 ms

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Annex B

GOULD MODICON MODBUS PROTOCOL

Note: For the sake of simplicity, the word 'recorder' is used here to mean any recorder, graphics panel or I/O rack which is able to support serial communications with a host computer.

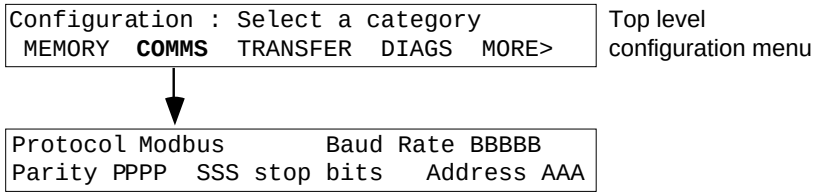
B1 INTRODUCTION

When connected to a host computer the recorder acts as a slave Modbus device, the unit address (1 to 247) being set up as a part of the recorder's communications configuration. Only a limited number of function codes have been implemented (ref. Modbus protocol manual) and these are listed in section B4

For wiring details, see section 1 of this manual.

B2 CONFIGURATION

The configuration page for Communications is accessed from the top level Configuration menu:



Protocol ..... Modbus RTU
Stop bits ..... Scrollable 1 or 2
Hardware Handshake ..... None (fixed)
Data bits ..... 8 (fixed)
Baud rate ..... Scrollable: 110, 300, 600, 1,200, 2,400, 4,800, 9,600, 19,200
Parity ..... Scrollable: Odd, Even, None
Address ..... Gould Modicon address: 1 to 247, entered using the keyboard.

B3 USING THE PROTOCOL

B3.1 CHANNEL ADDRESSING

The channel 1address listed in table B4 is the base address at which channel 1 may be accessed.

Note: Addressing starts at zero, whilst channel numbers start at 1

Example: to read a digital input at channel 23, the required address passed with the code 01 would be 22

If an alarm is set for an input or derived channel, the associated alarm parameters can be read using code 03

Example: To read the set point of absolute alarm 1 on channel 8, the required address passed with code 03 should be 1257 (1250 = channel 1; 1251 = channel 2 etc.).

B3.2 ALARM PARAMETER DEFINITION

The interpretation of alarm parameters (A1 to A4 and SP1 to SP4 in table B4) depends on alarm type as shown in table B3.2 below.

Note: Any request to read a non-existant setpoint value will result in the value 0000 being returned. this should not be taken to mean that the setpoint is at 0.000

ALARM TYPE	PARAMETER	DEFINITION
Absolute	A1 to A4	Not used
Absolute	SP1 to SP4	Setpoint values
Deviation	A1 to A4	Deviation Values
Deviation	SP1 to SP4	Setpoint values
Rate	A1 to A4	Rate value
Rate	SP1 to SP4	Period value (secs)
Digital	A1 to A4	Not used
Digital	SP1 to SP4	0000 = Open; FFFF = Closed

Table B3.2 Alarm parameter definition

B3.3 READING ANALOGUE VALUES

B3.3.1 16-bit format

The values read are in the range 0000 to FFFF. To obtain the scaled relative value, the following calculation must be carried out:

$$\text{Scaled value} = \left(\frac{\text{High range - Low range}}{\text{FFFF}} \; x \; \text{Analogue measurement} \right) + \text{low range}$$

where the analogue measurement is in hex.

In the event of a hardware error or under-range value, the value is forced to scale zero. Should the analogue value be over range, the scaled value is forced to scale high.

B3.3.2 32-bit format

Values read from service code 03 addresses based at:

7250 (Analogue channel scale low value)
7750 (Analogue channel scale high value)
8250 (Derived channel scale low value)
8750 (Derived channel scale high value)

and values read from service code 04 addresses based at:

1500 (Analogue channel value)
2000 (Derived channel value)

are in 32-bit IEEE floating point format. Each value resides in two consecutive 16-bit registers transmitted most significant byte first. Two registers per channel must be requested, and the required address increases by two per channel number, for example:

Analogue channel 1: Code04; address 1500
Analogue channel 2: Code 04; address 1502
or generally:
Analogue channel N: code 04; address 1500 + 2(N-1)

Example 1 Read channel 05

(`0x--` means the two characters following the 'x' are in hexadecimal)

```
<slave address><code><register addr high><register addr low><nº of registers high>
<nº of registers low><CRC high><CRC low>
```

Specifically, to read analogue channel 05 from slave address 2:

```
<0x02><0x04><0x05><0xE4><0x00><0x02><CRC high><CRC low>
```

To which the reply should be:

```
<slave address><code><byte count><most significant byte><next byte><next byte>
<least significant byte>
```

Specifically for channel 5 having a value of 1.123 (0x3F8FBE76 in 32-bit IEEE format)

```
<0x02><0x04><0x04><0x3F><0x8F><0xBE><0x76>
```

TOTALISER VALUES

To read a totaliser value, use the derived channel copy facility to import the totaliser value into a derived channel, and read this derived channel using service code 04 (base address 2000). The returned value will be in 32-bit IEEE float as described above.

B4 FUNCTION CODES

CODE	FUNCTION	RECORDER ACTION	CHANNEL 1 ADDRESS (DECIMAL)
01	Read coil status	Digital input state (true = >0.5)	0
02	Digital read input status	Digital input state (true = < 0.5)	0
		I/O alarm 1 status	250
		I/O alarm 2 status	500
		I/O alarm 3 status	750
		I/O alarm 4 status	1000
		Derived alarm 1 status	1250
		Derived alarm 2 status	1500
		Derived alarm 3 status	1750
		Derived alarm 4 status	2000
03	Read holding register	I/O channel value	0
		I/O channel A1 (Table 4.1)	250
		I/O channel A2 (Table 4.1)	500
		I/O channel A3 (Table 4.1)	750
		I/O channel A4 (Table 4.1)	1000
		I/O channel SP1 (Table 4.1)	1250
		I/O channel SP2 (Table 4.1)	1500
		I/O channel SP3 (Table 4.1)	1750
		I/O channel SP4 (Table 4.1)	2000
		Derived channel A1 (Table 4.1)	2250
		Reserved (always returns 0000)	2500
		Derived channel A2 (Table 4.1)	2750
		Reserved (always returns 0000)	3000
		Derived channel A3 (Table 4.1)	3250
		Reserved (always returns 0000)	3500
		Derived channel A4 (Table 4.1)	3750
		Reserved (always returns 0000)	4000
		Derived channel SP1 (Table 4.1)	4250
		Reserved (always returns 0000)	4500
		Derived channel SP2 (Table 4.1)	4750
		Reserved (always returns 0000)	5000
		Derived channel SP3 (Table 4.1)	5250
		Reserved (always returns 0000)	5500
		Derived channel SP4 (Table 4.1)	5750
		Reserved (always returns 0000)	6000
		I/O channel status (read only) (flags - see code 04)	6250
		Derived channel status (read only) (flags - see code 04)	6500
		Instrument status (read only) (flags - see code 07)	6750
		Analogue real channel scale low value (32-bit)	7250
		Analogue real channel scale high value (32-bit)	7750
		Derived channel scale low value (32-bit)	8250
		Derived channel scale high value (32-bit)	8750

Table B4 Modbus implementation channel addresses (Sheet 1: codes 01 to 03)

4.3 FUNCTION CODES (Cont.)

CODE	FUNCTION	RECORDER ACTION	CHANNEL 1 ADDRESS (DECIMAL)
04	Read input register	Analogue input/output value	0
		I/O channel status	250
		No bits set: Channel OK	
		Bit 0 set: Channel off	
		Bit 1 set: Over range	
		Bit 2 set: Under range	
		Bit 3 set: Hardware error / bad PV	
		Bit 4 set: Ranging error / no data	
		Bit 5 set: Overflow	
		Bits 6 to 15: Always 0.	
		Derived channel value	500
		Reserved (returns 0000)	750
		Derived channel status	1000
		(Bits 0 to 15 as for I/O channel status above)	
		Instrument status (flags - code 7)	1250
		Analogue real channel value (32-bit)	1500
		Derived channel value (32-bit)	2000
05	Force single coil	Sets digital input state for comms channel	0
		0 = 0.000; 1 = 1.000	
06	Preset single register	Preset holding register	As code 03
		(Presets values for comms channels only)	
		(Base addresses 7250, 7750, 8250 and 8750 cannot be preset)	
07	Read exception status	Read instrument status	
		Bit 0: System error	
		Bit 1: Writing system failure	
		Bit 2: Paper out (250 mm non-graphics recorders only)	
		Bits 3 to 7 Always 0	
08	Loopback test	Diagnostic code 0 (Echoes message as sent)	
15	Force multiple coil	Sets digital input code for comms channels in address range.	0
		0 = 0.000 1 = 1.000	
16	Preset multiple registers	Preset holding register for each channel in address range.	As code 03
		(Presets values for comms channels only)	
		(Base addresses 7250, 7750, 8250 and 8750 cannot be preset)	
65	Enter XMODEM mode	Holds 1 byte of data specifying which mode to enter	
		0 = standby; 1 = Receiver; 2 = Sender	
66	Report XMODEM error	Returns 1 byte of data as follows:	
		0: Transfer OK - no errors	
		1: Restore failed completely File was incompatible or comms failed to transfer the file, Original configuration unchanged.	
		2: Restore failed on data. Some records ignored, but transfer mostly successful.	
		3: Restore failed on transfer Some config. transferred before failure. New configuration undefined	
		16: Save had no reply from comms and timed out	
		32: Save failed before transfer completed	

Table B4 Modbus implementation channel addresses (Sheet 2)

4.3 FUNCTION CODES (Cont.)

CODE	FUNCTION	RECORDER ACTION	CHANNEL 1 ADDRESS (DECIMAL)
		EXCEPTION RESPONSES	
01	Illegal function	Unsupported or illegal Modbus function	0
02	Illegal data address	Data address out of range for instrument config	0
		Attempt to preset input value of non comms channel	
		Invalid configuration data	
03	Illegal data	Data value out of range for function	
06	Illegal busy	Configuration transfer in progress via another port so unable to action function	

Table 4.3 Modbus implementation channel addresses (Sheet 3)

List of effective pages

This (issue 7) manual consists of the pages listed below, at their stated issue levels

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S

T

U

W

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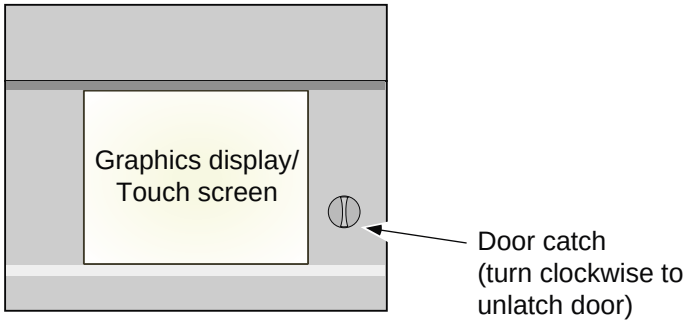

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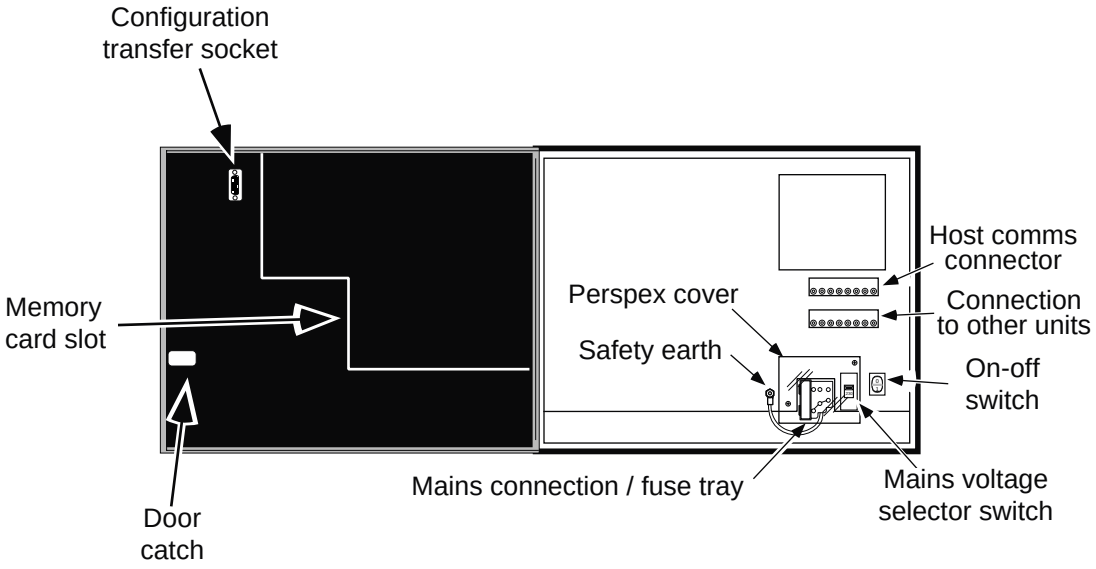

Door open

Model 4250D Major Functional items


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